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Renewables information



International
Energy Agency
Secure
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2018

Renewables information

with 2017 data **2018**

INTERNATIONAL ENERGY AGENCY

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INTRODUCTION

Renewables Information 2018 is the 17th edition of an annual publication which provides comprehensive information on renewable and waste energies to policy and market analysts, and those employed in all sectors of the renewables industry.

Monitoring and reporting of historical trends, as well as the current energy market situation, provides a strong foundation for policy and market analysis to better inform the decision process towards developing policies that are best suited to meet domestic and international objectives.

Renewables Information 2018 brings together in one volume the basic statistics compiled by the IEA on renewables and waste. It covers production, trade, transformation to electricity and heat, final consumption and installed generating capacity from renewables and waste. This introduction is followed by important information that will assist the reader in correctly using the data in this publication.

The information is structured as follows:

Key trend provides an overview of developments in the markets for renewables and waste in the world. The focus is given to OECD Member countries but it also provides selected renewables indicators for non-OECD countries.

Part I of the publication provides Explanatory notes:

1. Definitions
2. Sources and notes
3. Geographical coverage¹
4. Energy conventions and units

1. This document is without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boundaries and to the name of any territory, city or area. In this publication, “country” refers to a country or a territory, as the case may be.

Part II provides, in tabular form, a statistical overview corresponding to key trends.

Part III provides, in tabular form, a more detailed and comprehensive picture of developments in renewables and waste for each OECD Member country, including country notes, which readers should consult to understand the data.

The OECD data shown in this publication are primarily based on the *Annual Renewables and Waste Questionnaire* submissions from OECD Member countries to the Secretariat. The Energy Data Centre of the IEA Secretariat works closely with national administrations to ensure consistency in time series and with IEA product definitions and reporting conventions. The finalised data provide the basis for *World Energy Balances*.

The non-OECD data are based upon official information collected by the IEA Secretariat, or via national submissions to the United Nations and national energy publications. The resulting synthesis is published in *World Energy Balances*. Users of this publication are directed to the methodology sections of that publication for more detail on individual non-member countries covered in the publication.

A data service is available on the internet. It includes unlimited access through an annual subscription as well as the possibility of obtaining data on a pay-per-view basis. Details are available at <http://data.iea.org>.

In addition, all tables are available in our online data service and on CD-ROM. Information on ordering the data services and other energy statistics publications is available at the end of this book, and on the IEA website at www.iea.org/statistics/.

Further information on reporting methodologies is also available on the IEA website.

Data were collected by the team in the Energy Data Centre (EDC) of the IEA Secretariat, headed by Duncan Millard. Within the IEA, for OECD members, data were prepared: by Beatriz Martinez for coal, by Aidan Kennedy, Mark Mateo and Julian Smith for electricity, by Dae Yong Kwon and Samantha Mead for renewables, by Angela Ortega Pastor and Laura Thomson for oil, and by Faidon Papadimoulis and Aitor Soler Garcia for natural gas. OECD fuel data were prepared under the responsibility of Vladimir Kubecek and Julian Prime for coal, electricity and renewables, and under the responsibility of Erica Robin for oil and natural gas. OECD energy balances data were prepared by Rémi Gigoux, under the responsibility of Roberta Quadrelli. Non-OECD countries statistics were prepared by Nicolas Coënt, Laila El-Ashmawy, Musa Erdogan, Markus Fager-Pintilä, Julia Guyon, Nikolaos Kordevas, Agnieszka

Koscielniak, Dae Yong Kwon, Claire Morel, under the responsibility of Céline Rouquette.

Julian Prime has the overall responsibility for this report. The publication and its statistics were produced by Samantha Mead. Desktop publishing was carried out by Sharon Burghraeve.

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What's new?

New IEA Member: Mexico

Mexico became the International Energy Agency's 30th member country on 17 February 2018. Accordingly, starting with the 2018 edition, Mexico appears in the list of IEA Members and is included in the IEA zone aggregates for data starting in 1990 and for the entire time series.

New Association country: Brazil

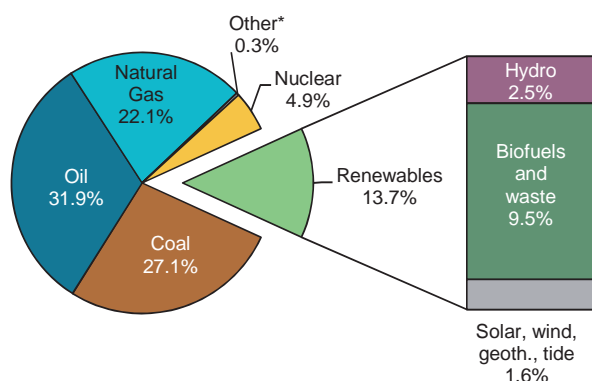
Brazil joined the IEA as an Association country in October 2017. Accordingly, Brazil is now included in the IEA and Accession/Association countries aggregate for data starting in 1990 and for the entire time series.

In the case you would like us to add some more or other information, please contact us at RenewAQ@iea.org.

OVERVIEW OF RENEWABLES AND WASTE IN THE WORLD

In 2016, world Total Primary Energy Supply (TPES) was 13 761 Mtoe, of which 13.7%, or 1 882 Mtoe (from 1 819 Mtoe in 2015), was produced from renewable energy sources (Figure 1).

Figure 1: 2016 fuel shares in world total primary energy supply



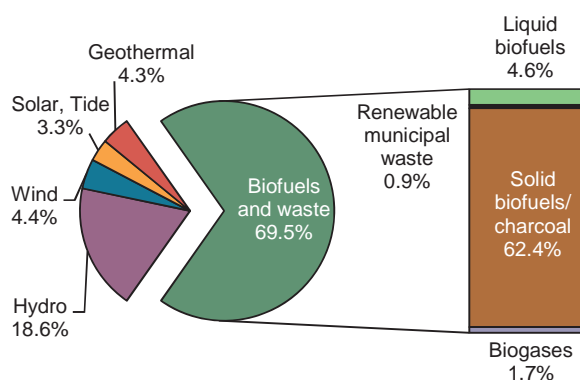
* Other includes non-renewable wastes and other sources not included elsewhere such as fuel cells.

Note: Totals in graphs might not add up due to rounding.

Due to its widespread non-commercial use in developing countries (i.e. residential heating and cooking), solid biofuels/charcoal is by far the largest renewable energy source, representing 62.4% of global renewables supply (Figure 2). The second largest source is hydro¹ power, which provides 2.5% of world TPES and 18.6% of renewables. Liquid biofuels, wind, geothermal, solar, biogases, renewable municipal waste and tide each hold a smaller share making up the rest of the renewables energy supply.

1. Any references to hydro production in this Overview exclude pumped hydro.

Figure 2: 2016 product shares in world renewable energy supply

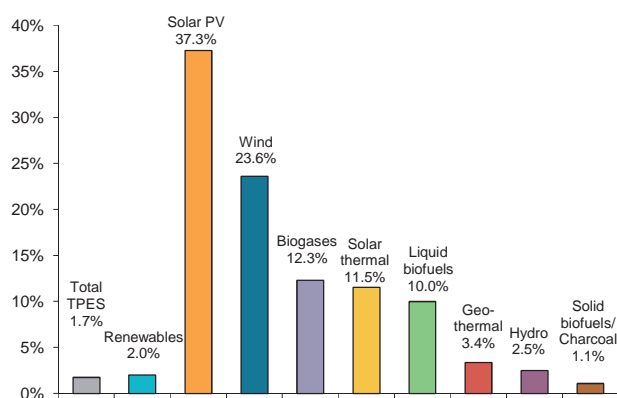


Note: Totals in graphs might not add up due to rounding.

Since 1990, renewable energy sources have grown at an average annual rate of 2%, which is slightly higher than the growth rate of world TPES, 1.7% (Figure 3). Growth has been especially high for solar photovoltaic and wind power, which grew at average annual rates of 37.3% and 23.6%, respectively, from very low bases in 1990. Biogases had the third highest growth rate at 12.3%, followed by solar thermal (11.5%) and liquid biofuels (10%).

Between 1990 and 2016, the average annual growth rate of hydroelectric power in non-OECD countries was 4.0%, larger than in OECD countries, at 0.7%. Growth in the world in this period was driven by China, which accounted for 54.0% of the hydro power increase, with an average annual growth rate of 8.9%. Brazil, Canada and India made the next three biggest contributors to the world increases, with 9.0%, 5.0% and 3.0% of the hydro power increase. The highest average annual growth rates were seen in Mozambique (16.7%), Viet Nam (10.0%) and Ethiopia (9.2%).

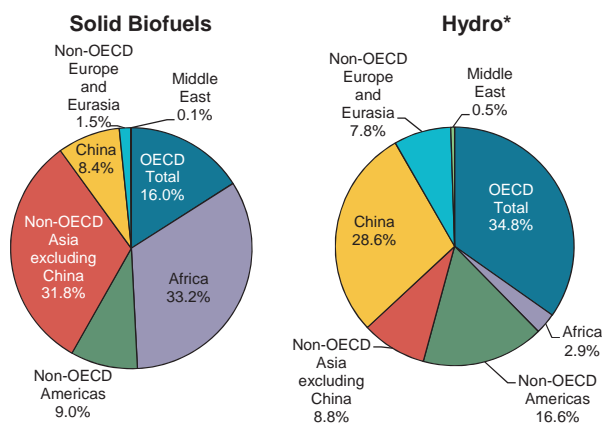
Figure 3: Average annual growth rates of world renewables supply from 1990 to 2016



In 2016, non-OECD countries accounted for 65.2% of total hydro power and any further increase is likely to be from these countries, as most of the remaining hydro potential resides in these countries.

Non-OECD countries account for most of the production of solid biofuels, but the average annual growth rate for these countries is comparable for OECD and non-OECD countries since 1990, 1.3% in OECD and 1.1% in non-OECD. In 2016, 84.0% was produced in non-OECD countries, where developing countries, situated mainly in Asia and Africa, use non-commercial biomass for residential cooking and heating (Figure 4). Africa, which accounted for only 5.9% of the world's total TPES in 2016, accounted for 33.2% of the world's solid biofuels supply.

Figure 4: 2016 regional shares in renewables supply

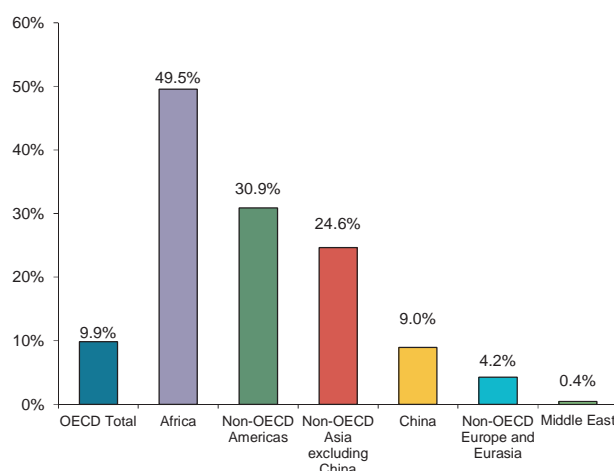


* Excludes pump storage generation.

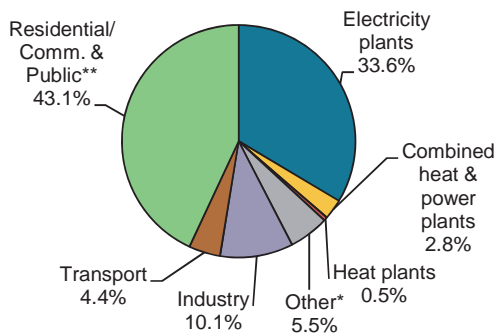
Note: Totals in graphs might not add up due to rounding.

Non-OECD countries are the principal renewable energy users of non-commercial solid biofuels, accounting for 72.3% of world total renewables supply. OECD countries supply 27.7% of world renewables, they constitute 38.3% of the world TPES. Consequently, in OECD countries, the share of renewables in total energy supply is 9.9% compared to 49.5% in Africa, 30.9% in Non-OECD Americas, 24.6% in Asia, and 9.0% in China (Figure 5). However, the OECD countries play a major role when looking at “new” renewables, a loosely defined term used to delineate between traditional and more recent technologies used to produce renewable energy. In 2016, the OECD countries accounted for 63.3% of world energy from solar, wind, tide, renewable municipal waste, biogases and liquid biofuels.

Figure 5: 2016 shares of renewables of regional total primary energy supply



About half of the renewable primary energy supply in OECD countries is used in the transformation sector to generate electricity and heat. However, on a global level, the majority of renewables are consumed in the residential, commercial and public services sectors. This is a consequence of widespread use of solid biofuels in the residential sector of developing countries. 36.9% of renewables are used for electricity and heat production worldwide, while 43.1% are used in the residential, commercial and public sectors (Figure 6).

Figure 6: 2016 world sectoral consumption of renewables

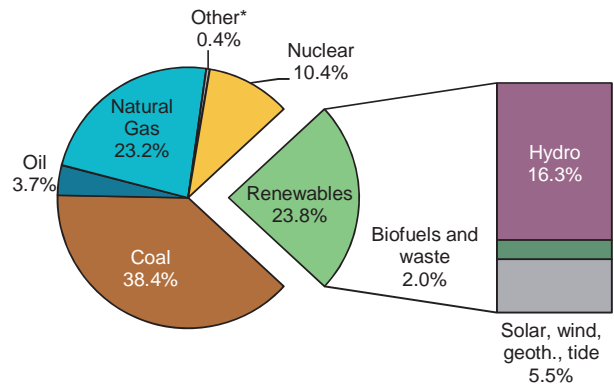
* Other transformation, energy industry own use, losses.

** Includes the Agriculture/ forestry, fishing and non-specified industries.

Note: Totals in graphs might not add up due to rounding.

Renewables are the second largest contributor to global electricity production (Figure 7). They accounted for 23.8% of world generation in 2016, after coal (39.2%) and ahead of gas (23.6%), nuclear (10.6%) and oil (3.8%). Although renewables have jumped ahead of gas this year, the relative positions of renewables and gas can be influenced by various factors, among which the weather conditions play a key role.

Hydroelectricity supplies the vast majority of renewable electricity, generating 16.3% of world electricity, and 68.4% of total renewable electricity. Although growing rapidly, geothermal, solar, wind and tide energies accounted for 5.5% of world electricity production, which is 23.2% of total renewable electricity in

Figure 7: Fuel shares in world electricity production in 2016

* Other includes electricity from non-renewable wastes and other sources not included elsewhere such as fuel cells and chemical heat, etc.

Note: Totals in graphs might not add up due to rounding.

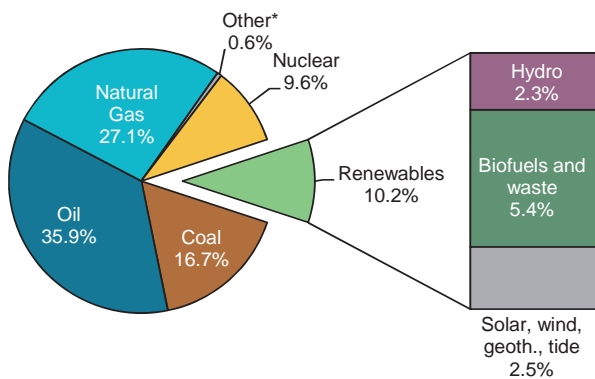
2016. Biofuels and waste, including solid biofuels, play a minor role in electricity generation, supplying 2.0% of world electricity.

Since 1990, renewable electricity generation worldwide grew on average by 3.7% per annum, which is slightly faster than the total electricity generation average growth rate (2.9%). So, whilst 19.4% of global electricity in 1990 was produced from renewable sources, this share increased to 23.8% by 2016. Over this period, hydroelectric power saw its share of total world electricity production falling from 18.1% in 1990 to 16.3% in 2016. The share of the remaining renewable sources used to produce electricity grew from 1.4% in 1990 to 7.5% in 2016.

OVERVIEW OF RENEWABLES AND WASTE IN OECD COUNTRIES

In 2017, the share of renewables in total OECD primary energy supply reached a new high of 10.2% (Figure 8). OECD Europe experienced an increase in renewable TPES from 14.0% in 2016 to 14.3% in 2017. OECD Americas showed an increase in renewable TPES from 8.4% to 8.6% in the same period. OECD Asia also experienced an increase in renewables share in TPES from 4.9% to 5.0%.

Figure 8: 2017 fuel shares in OECD total primary energy supply



* Other includes non-renewable wastes and other sources not included elsewhere such as fuel cells.

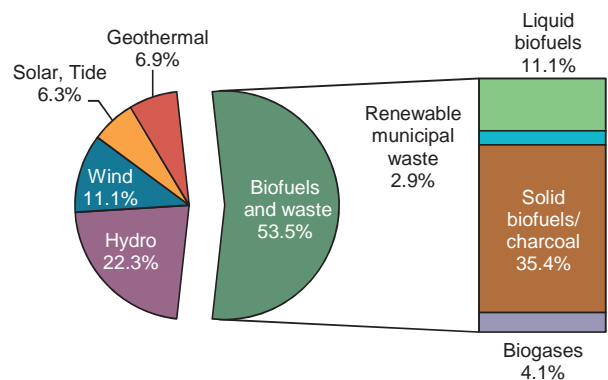
Note: Totals in graphs might not add up due to rounding.

Primary energy supply

In OECD countries, total primary energy supply (TPES) from renewable sources increased from 272 Mtoe to 539 Mtoe between 1990 and 2017, an average annual growth of 2.6%. By comparison, the growth of TPES for non-renewable energy sources (including oil, gas, coal, and nuclear) is 0.4%. Over this time period, renewables contribution to total OECD primary energy supply grew from 6.0% to 10.2%.

The largest proportion of renewable primary energy supply in the OECD comes from biofuels and waste, which accounts for 53.5% of the renewable supply (Figure 9). Of these biofuels, solid biofuels, including wood, wood wastes, other solid wastes and charcoal, constitutes the largest share, 35.4%, of the supply. The second largest renewable energy source is hydroelectric power, providing 22.3% of renewable primary energy supply. These two renewable energy sources constituted 57.7% of the total OECD primary renewable energy supply in 2017.

Figure 9: 2017 product shares in OECD renewable energy supply

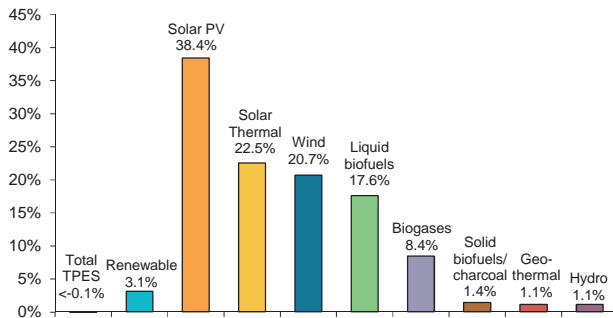


Note: Totals in graphs might not add up due to rounding.

Renewables showed a larger increase in the average annual growth rate in the time period from 2000 to 2017 than in the period from 1990 to 2000, with rates of 3.1% and 1.7%, respectively (Figure 10). Above-average growth rates are seen in “new” renewables, such as solar PV (38.4%), solar thermal (22.5%), wind (20.7%), liquid biofuels (17.6%) and biogases (8.4%). Below-average growth rates are seen in solid biofuels/charcoal (1.4%), geothermal (1.1%) and hydro (1.1%). Since hydroelectric capacity is mature

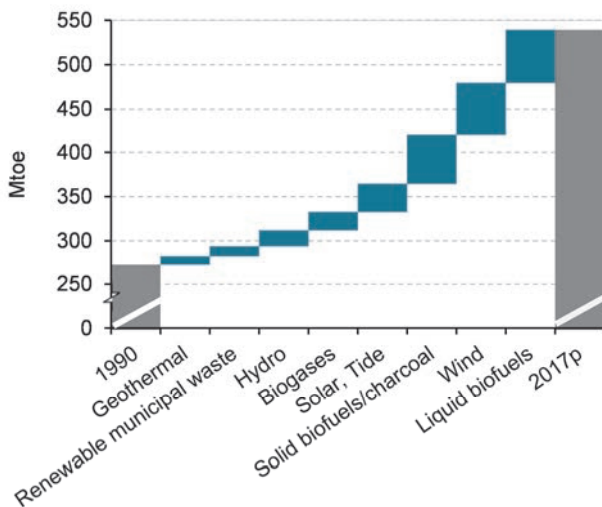
in most OECD member states, it is increasingly difficult to locate environmentally acceptable sites to expand this energy form.

Figure 10: Average annual growth rates of renewable supply from 2000 to 2017 in OECD total



Solid biofuels and hydro influenced much of the growth of total renewables between 1990 and 2001. However, since 2001, the majority of renewables growth can be attributed to “new” renewables. Despite this, the contribution of such “new” renewables to the total energy supply is still minor. Liquid biofuels, wind, solar, biogases, renewable municipal waste, and tide combined still represent only 7.9% of total primary energy supply. Nevertheless, their growing contribution to the renewable energy supply should be noted as their share of total renewables in OECD countries increased from 3.1% in 1990 to 35.5% in 2017 (Figure 11).

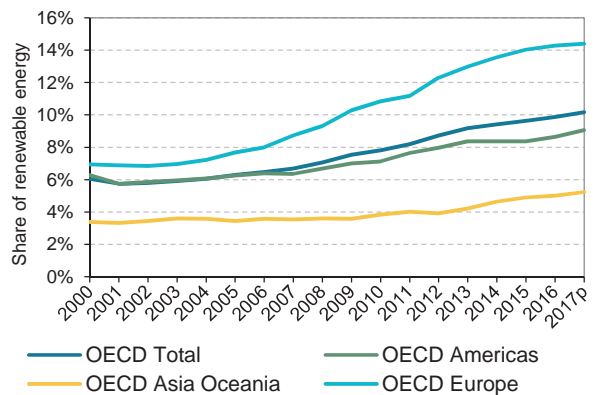
Figure 11: Fluctuation of OECD Renewable Energy Supply by Product



Among the different OECD regions, OECD Europe has the highest share of primary energy supply from renewable sources, with 14.3% in 2017 (Figure 12). It is also the OECD area that has experienced the largest increase (from 7.0%) in its renewable share since 2000.

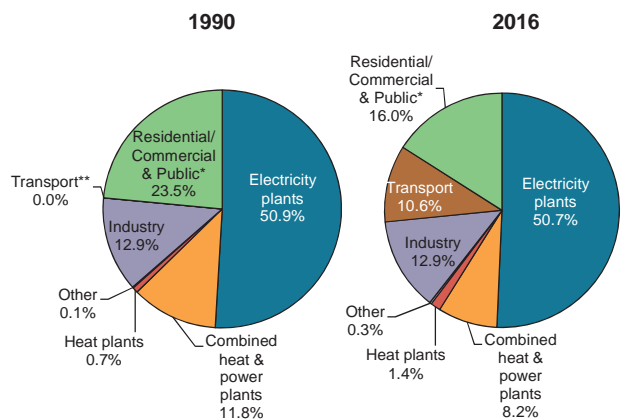
The increase of the renewable share in OECD Europe is the result of the implementation of strong policies supporting renewable energy in the late 1990s and early 2000s, in particular the European Union's directive to increase the share of renewable energy to 20% by 2020, which includes targets for individual countries. The renewable share of TPES in OECD Americas reached a new high of 9.1% in 2017 from 6.3% in 2000. In OECD Asia Oceania the share of renewable primary energy supply increased from 3.4% in 2000 to reach 5.2% in 2017.

Figure 12: OECD regional shares of renewable energy supply



As a result of diversification in the use of renewables, sectoral renewables consumption has changed compared to 1990 (Figure 13). The most significant trend is the steep growth of biofuels used for transport. In 2016, liquid biofuels and biogases used for transport constituted 10.6% of the consumption of renewables. At the time of publication, sectoral consumption data were only available through the end of 2016.

Figure 13: OECD sectoral consumption of renewables



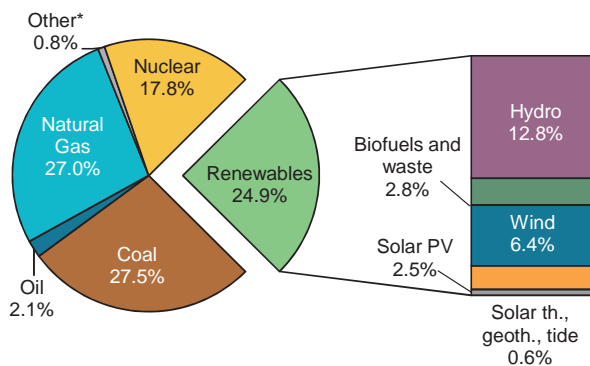
* Includes the Agriculture/ forestry, fishing and non-specified industries.
** Represents less than 0.05%.

Note: Totals in graphs might not add up due to rounding.

Electricity production

OECD gross electricity production from renewable products (excluding generation from pumped storage plants) reached 2,731.8 TWh in 2017, 5.1% higher than the 2016 level of 2,598.3 TWh. This represents one quarter (24.9%) of total OECD electricity production in 2017 (Figure 14), which is the largest share of renewables in gross electricity production.

Figure 14: Renewable shares in OECD electricity production in 2017



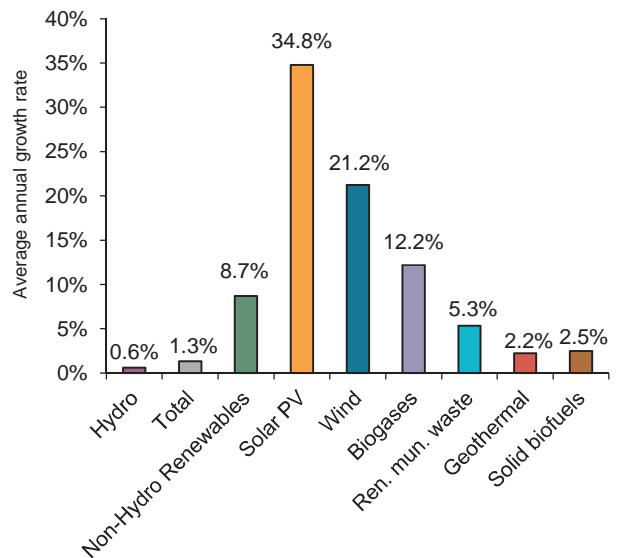
* Other includes electricity from non-renewable wastes and other sources not included elsewhere such as fuel cells and chemical heat, etc.
Note: Totals in graphs might not add up due to rounding.

Since 1990, OECD electricity generation from renewable energy sources has been growing at an average rate of 2.7% per year, almost double the rate for total electricity generation (1.3%), reflecting the strong growth in “new” renewable products, such as solar PV, wind, renewable municipal waste and biogases for electricity production in recent years.

Among renewable sources, hydroelectric power production constitutes the biggest share at 51.4% (1 398.1 TWh) but it has experienced the lowest average growth rate of any electricity source from 1990 to 2017, 0.6% (Figure 15). This is because hydroelectric power has reached its capacity limit in most OECD countries. Wind has grown from 0.3% (3.8 TWh) in 1990 to 25.5% (696.9 TWh) of renewable electricity in 2017, a 21.2% average annual growth rate, making it the second largest renewable source for electricity. The share of solar PV in OECD renewable electricity production increased from 0.0% to 9.8% (268.8 TWh) in the same time period, and biogases increased 0.3% to 3.0% (81.2 TWh), 12.2% average annual growth

from 1990. All of these sources experienced higher than average growth rates than older technologies such as the aforementioned hydro power (0.6%), solid biofuels (2.5%) and geothermal (2.2%). As a result, non-hydro renewable electricity experienced an 8.7% annual growth rate between 1990 and 2017.

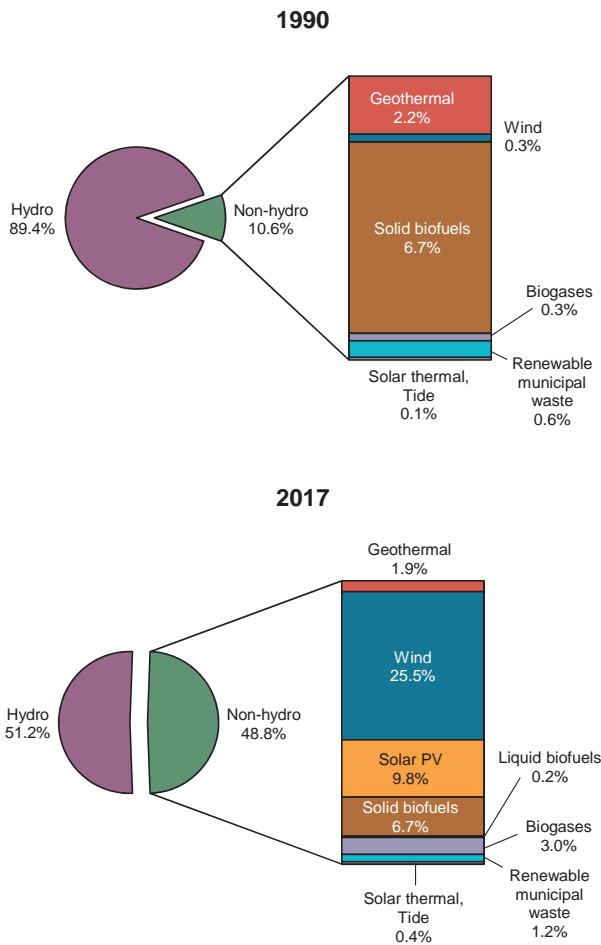
Figure 15: Annual growth rates of electricity production between 1990 and 2017 in OECD countries



With growth in other types of renewables, the hydroelectricity share of electricity from renewable energy sources declined from 89.4% in 1990 to 51.2% in 2017 (Figure 16). In 1990, the majority of non-hydroelectricity was generated by solid biofuels (67.4%) and geothermal energy (20.4%), whilst solar PV and wind represented 0.4% of non-hydro renewable electricity in 1990. However, between 1990 and 2017, these technologies grew much faster than any other power source, to now account for 35.3%.

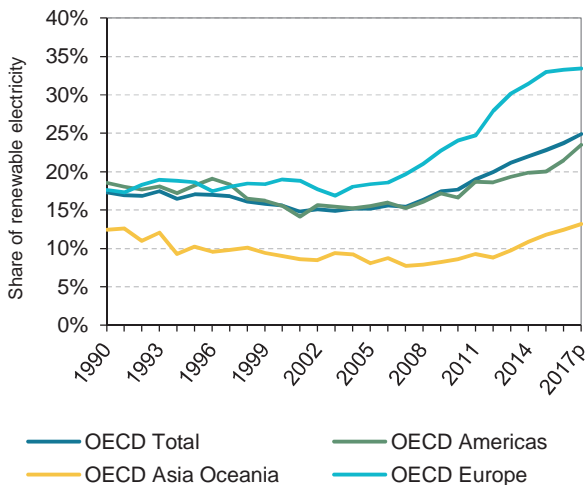
Renewable electricity production in OECD Europe grew 3.6% on an average annual basis since 1990. This growth rate is higher than other OECD regions, 2.1% for OECD Americas and 2.2% for OECD Asia Oceania. The shares of electricity from renewables increased from 18.5% in 1990 to 23.5% in 2017 in OECD Americas, and from 17.6% to 33.4% in OECD Europe, and from 12.4% in 1990 to 13.2% in 2017 in OECD Asia Oceania (Figure 17). As a result of the increases, the OECD region as a whole produced its highest share of electricity from renewable sources from 1990 (17.3%) to 2017 (24.9%).

Figure 16: Changing shares of OECD renewable electricity production



Note: Totals in graphs might not add up due to rounding.

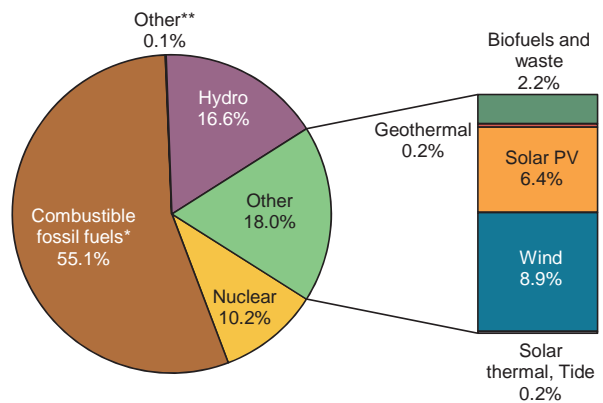
Figure 17: OECD regional shares in renewable electricity production from 1990 to 2017



Installed generating capacity²

At the end of 2016, approximately 1 019.2 GW, or 34.6%, of total OECD generating capacity, was renewable energy and waste sources (Figure 18). Compared to 2015, total capacity had increased by 49.8 GW, driven by solar PV and wind, increasing 28.2 GW and 25.3 GW, respectively (combustible fossil fuel generating capacity decreased 13.4 GW, which is why the sum of the increases in solar PV and wind are greater than the total increases in OECD generating capacity). The largest percentage increase of solar PV capacity was in Turkey, where an additional 235%, or 0.6 GW, of solar PV capacity came on in 2016. The largest increase in solar PV capacity was in the United States, 11.3 GW (51.9%), followed by Japan, 7.9 GW (23.1%), and the United Kingdom, 2.4 GW (24.8%). These three countries accounted for 76.4% of the increases of solar PV generating capacity in the OECD in 2016. For wind, the biggest contributors to the increases were the United States, 8.7 GW (12.0%), Germany, 5.0 GW (11.2%), and the United Kingdom, 1.9 GW (13.3%).

Figure 18: OECD generating capacity 2016



* The capacities of plants which co-fire biofuels and waste with fossil fuels (e.g. solid biofuels that are co-fired with coal) are included under the dominant fuel.
 ** Other: fuel cells, waste/chemical heat.

Note: Totals in graphs might not add up due to rounding.

2. Capacity data is only available for OECD countries through the end of 2016 at the time of publication.

The largest share (16.6%) of total generating capacity is hydroelectric plants, 489.2 GW, excluding pumped storage, followed by 264 GW from wind (8.9%), 189.7 GW from solar photovoltaic (6.4%), and 64.7 GW from biofuels and waste (2.2%).

With biofuels and waste, 32.1 GW was solid biofuel capacity, biogases were 14.7 GW, municipal waste was 13.2 GW, and liquid biofuels was 2.3 GW. The remaining generating capacity was accounted for by geothermal (0.2%), solar thermal, tide, wave and ocean power capacity, with less than 0.2%. Hydro pumped storage capacity represented 70.9 GW.

Detailed electricity production by source

This section provides more detailed analyses of individual renewable and waste energy sources in electricity production. The energy sources are listed in the order of decreasing share in the renewable electricity production of OECD countries.

Hydroelectricity

As mentioned previously, hydroelectric power is nearing its potential capacity limit in most OECD countries. Between 1990 and 2017, electricity generated from hydroelectric plants (excluding generation from pumped storage plants) increased from 1 185 TWh to 1 398.1 TWh in the OECD, yielding an average annual increase of 0.6%. In 1990, 89.4% of electricity produced from renewable sources came from hydroelectric plants and this share decreased to 51.2% in 2017 due to the rapid growth of electricity generation from other renewable sources. Despite this decrease, hydroelectric power is still the largest electricity producer among renewable energy. In 2017, the largest hydroelectric power generating countries were Canada, the United States and Norway which represented 28.2%, 21.6% and 10.2%, respectively, of OECD hydroelectric production. The countries with the highest reliance on hydroelectric power are Norway, Iceland and Canada, where the share of hydro generation was 95.8%, 73.1% and 58.5%, respectively, in each country in 2017. The output from hydro is dependent on rainfall, and fluctuations in weather patterns can have a strong

effect on a country's hydroelectric production. Changing weather conditions in 2017 compared to 2016 led to falls in Portugal, 9.4 TWh (-55.6%), and Spain, 18.9 TWh (-47.4%) and a rise in the United States, 32.7 TWh (32.7%).

Wind

In 2017, wind turbines produced 25.5% of renewable electricity in the OECD. Between 1990 and 2017, wind power increased from 3.8 TWh to 696.9 TWh, achieving an average annual growth rate of 21.2%. This is the second fastest growth rate of renewable electricity after solar photovoltaic. Among OECD regions, wind electricity production is the highest in OECD Europe, with 53.3% of the total OECD production in 2017 and an average growth rate of 25.7% per annum since 1990. In absolute terms, the United States, Germany and the United Kingdom are the largest producers of electricity from wind in 2017 within the OECD, producing 257.2 TWh, 106.6 TWh and 49.6 TWh, respectively.

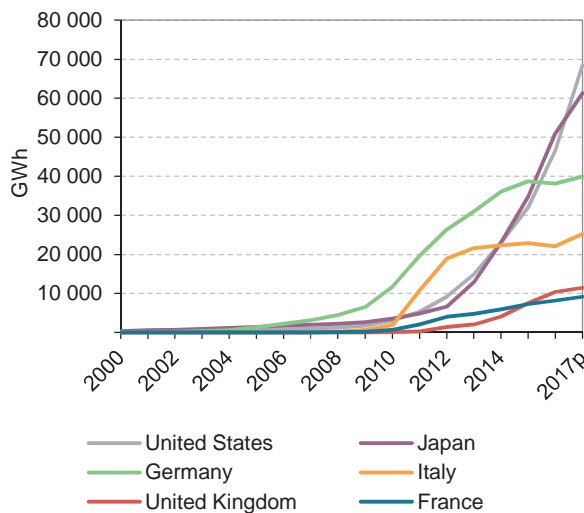
Solar photovoltaic

The OECD as a whole produced 268.8 TWh of solar PV electricity in 2017, 9.8% of its total renewable electricity production. The five largest producers of solar PV electricity in the OECD were United States with 68.4 TWh, Germany with 39.9 TWh, Italy with 25.2 TWh, the United Kingdom with 11.5 TWh, and France with 9.2 TWh. These five countries combined produced 57.4% of the PV electricity in the OECD.

The countries with the highest share of solar PV in their electricity generation in 2017 are Luxembourg (11.5%), Italy (8.6%), Greece (6.8%), Germany (6.1%) and Japan (5.7%). Luxembourg imports most of the electricity consumed in the country, which leads to a higher than average solar PV generation share.

Electricity from solar PV increased from 85 GWh in 1990 to 268.8 TWh in 2017, achieving a 34.8% annual growth rate, the fastest of all renewable electricity technologies. The United States, the largest producer among OECD countries, increased production from 183 GWh in 2000 to 68, 447 GWh in 2017, achieving a 44.8% growth rate over that time (Figure 19).

Figure 19: Solar photovoltaic electricity in six major OECD producing countries from 2000 to 2017



Solid biofuels

Electricity generation from solid biofuels grew from 94.5 TWh to 183.5 TWh between 1990 and 2017, a 2.5% average annual growth. As the fourth largest renewable electricity source after hydropower, wind and solar PV, solid biofuels accounted for 6.7% of renewable electricity generation in 2017. The United States (47.9 TWh) accounted for 26.1% of electricity generated from solid biofuels within the OECD, where it makes up 6.6% of the country's renewable electricity production. The second largest producer of electricity from solid biofuels is the United Kingdom (15.5 TWh), where it represents 6.2% of the country's renewable electricity supply. Other large producers of electricity from biofuels in the OECD in 2017 are Japan, Canada and Finland with 15.5 TWh, 12.6 TWh, and 10.7 TWh, respectively. The countries with the largest share of electricity generation from solid biofuels are Finland, 15.8%, Denmark, 14.9%, Estonia, 7.1%, Chile, 7.0%, and Latvia, 7.0%.

Biogases

Electricity in the OECD from biogases grew from 3.7 TWh in 1990 to 81.2 TWh in 2017. Biogases have an average annual growth rate of 12.2% since 1990, making it the third fastest growing source of renewable electricity in the OECD. The driver of this growth is OECD Europe, which accounted for 79.6% of OECD production in 2017. Much of the growth is due to the Germany, where electricity production grew by an average growth rate of 20.0% per annum since

1990 to 34.3 TWh in 2017, and made it the largest producer in the OECD, 42.2% of the total OECD electricity generation from biogases.

The second largest OECD producer in 2017 is the United States which produced 12.5 TWh, or 15.4% of electricity from biogases in the OECD. However, despite its large share in OECD production, the United States average annual growth rate (6.2% since 1990) has been much slower than many of the European Union countries that use biogases, e.g. 36.1% in Italy and 20.0% in Belgium. The third and fourth largest OECD producers were also located in Europe. Italy produced 8.3 TWh or 10.2% of OECD production, and the United Kingdom produced 7.7 TWh (9.5%).

Geothermal

Similar to hydroelectric power, geothermal electricity production has not experienced significant growth between 1990 and 2017. It grew at an average annual rate of 2.2%, from 28.6 TWh to 51.8 TWh.

The United States is the largest producer with 34.9% of the OECD total in 2017, with a production of 18.1 TWh, slightly above the 16.0 TWh level in 1990. The second largest producer is New Zealand, with 7.5 TWh in 2017, representing 14.4% of total OECD production and 21.3% of its total electricity generation. Other major producers are Italy (11.9%), Turkey (11.8%) and Mexico (11.4%).

Renewable municipal waste

Renewable municipal waste represented 1.2% of renewable electricity generation in 2017 in OECD countries, making it one of the smallest portions of the renewable electricity portfolio. The highest share it represented in any one country was the Netherlands at 11.2%, Luxembourg at 8.0% and Belgium at 6.6%. In 2017, 33.3 TWh of electricity was produced from renewable waste in the OECD.

It should be noted that sometimes data are estimates rather than observations because the energy classification systems of some countries do not separate renewable and non-renewable municipal waste.

Liquid biofuels

Liquid biofuels for electricity production is a relatively new technology. The first country to report electricity production of this type was Germany in 2001 with only 15 GWh. Since then, an increasing number of countries have produced substantial amounts of electricity from liquid biofuels. In 2017, 11 countries

reported a total of 5,683 GWh of production. The largest producer is Italy with 4,421 GWh.

Solar thermal

Solar thermal power production experienced rapid growth in the 1980's and 90's reaching 887 GWh in 1998, but stagnated in the following years. From 2007, solar thermal electricity production grows in Spain, followed by the U.S., with average annual growth rates of 27.7% and 8.0%, respectively. These

two countries account for almost 100% of solar thermal electricity production in 2017 with 5.9 TWh in Spain and 5.4 TWh in the United States. The remaining 6 GWh were produced in Australia.

Tide, wave, ocean

In 2017, at least one country in each OECD region used tide, wave and ocean motion to produce electricity. The countries were Korea (489 GWh), France (410 GWh), Canada (6 GWh) and the United Kingdom (4 GWh).

PART I

EXPLANATORY NOTES

1. DEFINITIONS OF PRODUCTS AND FLOWS

Products

Renewable(s)

Energy products included under the title “renewable” include: hydroelectricity, geothermal, solar photovoltaic, solar thermal, tide, wave, ocean, wind, solid bio-fuels, biogases, liquid biofuels and renewable municipal waste.

Total renewables does not include industrial waste, non-renewable municipal waste, waste heat, net heat generated by heat pumps, and electricity generated with hydro pumped storage.

Further discussion on the definition of “renewables” with regard to energy statistics is listed in Section 2, *Sources and notes*.

Electricity and heat

Electricity

Gross electricity production is measured at the terminals of all alternator sets in a station. It therefore includes the energy taken by station auxiliaries and losses in transformers that are considered integral parts of the station.

Although output from hydro pumped storage plants is included in total hydroelectricity production, it is excluded from primary hydroelectricity generation. Therefore, it also is excluded from the contribution of renewables.

Heat

Heat production includes all heat produced by main activity producer CHP and heat plants, as well as heat sold by autoproducer CHP and heat plants to third parties.

Fuels used to produce quantities of heat for sale are included in transformation processes under the rows *CHP plants* and *heat plants*. The use of fuels for heat which is not sold is included under the sectors in which the fuel use occurs. Data on heat have become available in different years for different countries and thus any aggregated data should be used with caution.

Hydro energy

Hydro energy refers to potential and kinetic energy of water converted into electricity in hydroelectric plants.

Geothermal energy

Geothermal energy is the energy available as heat emitted from within the earth’s crust, usually in the form of hot water or steam. It is exploited at suitable sites:

- for electricity generation using dry stream or high enthalpy brine after flashing
- directly as heat for district heating, agriculture, etc.

Solar energy

Solar radiation exploited for electricity generation and hot water production. Passive solar energy for direct heating, cooling or lighting of dwellings or other buildings is not included.

- **Solar photovoltaic:** This is solar radiation exploited for electricity generation by photovoltaic cells.
- **Solar thermal:** This is solar radiation exploited for:
 - hot water production by flat plate collectors (mainly of the thermosyphon type) for domestic hot water or seasonal heating of swimming pools
 - electricity generation by solar thermal-electric plants.

Tide / wave / ocean energy

Tide, wave and ocean energy represents the mechanical energy derived from tidal movement, wave motion or ocean current and exploited for electricity generation.

Wind energy

Wind energy represents kinetic energy of wind exploited for electricity generation in wind turbines.

Biofuels and Renewable Waste

This section includes solid biofuels, biogases, liquid biofuels, and the renewable portion of municipal waste. The fuels in this section are expressed in terajoules on a **net calorific value** basis, with the exception of liquid biofuels and charcoal, which are in thousand tonnes.

Note that for biomass commodities, only the amounts specifically used for energy purposes (a small part of the total) are included in the energy statistics. Therefore, the non-energy use of biomass is not taken into consideration and the quantities are null by definition.

Solid biofuels

- Solid biofuels covers organic, non-fossil material of biological origin which may be used as fuel for heat and electricity production. Note that for biofuels commodities, only the amounts specifically used for energy purposes (a small part of the total) are included in the energy statistics. Therefore, the non-energy use of biofuels is not taken into consideration and the quantities are null by definition.
- **Primary solid biofuels** is defined as any plant matter used directly as fuel or converted into other forms before combustion. This covers a multitude of woody materials generated by industrial process or provided directly by forestry and agriculture (firewood, wood chips, bark, sawdust, shavings, chips, sulphite lyes also known as black liquor, animal materials/wastes and other solid biofuels). This category excludes charcoal.
- **Fuelwood, wood residues and by-products:** Fuelwood or firewood (in log, brushwood, pellet or chip form) obtained from natural or managed forests or isolated trees. Also included are wood residues used as fuel and in which the original composition of wood is retained. Charcoal and black liquor are excluded.
- **Wood pellets:** Wood pellets are a cylindrical product which has been agglomerated from wood

residues by compression with or without the addition of a small quantity of binder. The pellets have a diameter not exceeding 25 mm and a length not exceeding 45 mm.

- **Black liquor:** Energy from the alkaline-spent liquor obtained from the digesters during the production of sulphate or soda pulp required for paper manufacture.
- **Bagasse:** Fuel obtained from the fibre which remains after juice extraction in sugar cane processing.
- **Animal Waste:** Energy from excreta of animals, meat and fish residues which, when dry, are used directly as a fuel. This excludes waste used in anaerobic fermentation plants. Fuel gases from these plants are included under biogases.
- **Other vegetal materials and residuals:** Biofuels not specified elsewhere and including straw, vegetable husks, ground nut shells, pruning brushwood, olive pomace and other wastes arising from the maintenance, cropping and processing of plants.
- **Charcoal** covers the solid residue of the destructive distillation and pyrolysis of wood and other vegetal material. Charcoal produced from solid biofuels is also included here.

Biogases

Biogases are gases arising from the anaerobic fermentation of biomass and the gasification of solid biomass (including biomass in wastes). The biogases from anaerobic fermentation are composed principally of methane and carbon dioxide and comprise landfill gas, sewage sludge gas and other biogases from anaerobic fermentation.

Biogases can also be produced from thermal processes (by gasification or pyrolysis) of biomass and are mixtures containing hydrogen and carbon monoxide (usually known as syngas) along with other components. These gases may be further processed to modify their composition and can be further processed to produce substitute natural gas.

Biogases are used mainly as a fuel but can be used as a chemical feedstock.

- **Landfill gas:** covers gas formed by the digestion of landfilled waste.
- **Sewage sludge gas:** covers gas produced from the anaerobic fermentation of sewage sludge.
- **Other biogases from anaerobic digestion:** such as biogases produced from the anaerobic fermentation

of animal slurries and of waste abattoirs, breweries and other agro-food industries.

- **Biogases from thermal processes:** biogases produced from thermal processes (by gasification or pyrolysis) of biomass.

Liquid biofuels

Liquid biofuels include the liquid biofuels that are blended into gasoline and gas/diesel oil and other liquid biofuels or used directly in the transportation sector. It does not include the total volume of gasoline or diesel into which the biofuels are blended.

- **Biogasoline:** includes bioethanol (ethanol produced from biomass and/or the biodegradable fraction of waste), biomethanol (methanol produced from biomass and/or the biodegradable fraction of waste), bioETBE (ethyl-tertio-butyl-ether produced on the basis of bioethanol; the percentage by volume of bioETBE that is calculated as biofuel is 47%) and bioMTBE (methyl-tertio-butyl-ether produced on the basis of biomethanol: the percentage by volume of bioMTBE that is calculated as biofuel is 36%).
- **Biodiesels:** includes biodiesel (a methyl-ester produced from vegetable or animal oil, of diesel quality), biodimethylether (dimethylether produced from biomass), Fischer Tropsh (Fischer-Tropsh produced from biomass), cold pressed bio-oil (oil produced from oil seed through mechanical processing only) used straight as road diesel or for electricity and heat generation.
- **Other liquid biofuels:** includes liquid biofuels, used directly as fuel, not included in biogasoline or biodiesels.

Municipal waste - renewable

- Renewable municipal waste consists of the biodegradable part of municipal waste products that are combusted directly to produce heat and/or electricity. It comprises waste produced by the residential, commercial and public services sectors that is collected often by local authorities for disposal in a central location, including biodegradable hospital waste.

Non-renewable waste

This section includes non-renewable municipal waste and industrial waste.

Industrial waste

Industrial waste (e.g. tyres) consists of solid, liquid or gaseous products which are combusted directly, usually in specialised plants, to produce heat and/or electricity. Industrial waste is of non-renewable origin and renewable industrial waste is included with solid biofuels, biogases or liquid biofuels.

Municipal waste - non-renewable

Non-renewable municipal waste consists of the non-biodegradable part of municipal waste products that are combusted directly to produce heat and/or electricity. It includes waste produced by the residential, commercial and public services sectors that is collected by local authorities for disposal in a central location, including non-biodegradable hospital waste.

Flows: energy balance

The renewables and waste balances are presented in detail in Part III. Table 6, Renewables and waste data, presents the sources of energy in the columns and the origins and uses in the rows.

Each table is divided into three main parts: the first shows supply elements, the second shows the transformation processes and energy industries own use, and the third shows final consumption broken down into the various end-use sectors.

The rows, or “flows”, defined below are also used in other tables in this publication (i.e. Total primary energy supply). The energy balance flows have the following functions:

Production

Production refers to the quantities of fuels extracted or produced, calculated after any operation for removal of inert matter or impurities. The calculation of production of hydroelectricity, geothermal, etc. is explained in Section 4, Energy conventions and units.

Import and exports

Imports and exports comprise amounts having crossed the national territorial boundaries of the country, whether or not customs clearance has taken place.

Stock changes

Stock changes reflects the difference between opening stock levels on the first day of the year and closing

levels on the last day of the year of stocks on national territory held by producers, importers, energy transformation industries and large consumers. A stock build is shown as a negative number, and a stock draw as a positive number.

Total primary energy supply

Total primary energy supply (TPES) is made up of **production + imports - exports ± stock changes**. Given that exports and stock builds both are represented as negative numbers, in reality $TPES = production + imports + exports + stock changes$. Marine and aviation bunkers also are not counted in TPES.

Statistical difference

Statistical difference is essentially the difference between supply and demand. It is defined as deliveries to final consumption + use for transformation processes + consumption by energy industry own use + losses - TPES. Statistical differences arise because the data for the individual components of supply and demand are often derived from different data sources by the national administration. Furthermore, the inclusion of changes in some large consumers' stocks in the supply part of the balance introduces distortions which also contribute to the statistical differences.

Electricity plants

Electricity plants refers to plants which are designed to produce electricity only. If one or more units of the plant is a CHP unit (and the inputs and outputs cannot be distinguished on a unit basis), then the whole plant is designated as a CHP plant. The row **electricity plants** shows fuel used by electricity plants for electricity generation. These figures are reported based on the physical energy content method as explained in Section 4. These are shown as a negative and the generation is shown in electricity column as a positive.

Combined heat and power plants

Combined heat and power plants (CHP) refers to plants which are designed to produce both heat and electricity, sometimes referred to as co-generation power stations. If possible, fuel inputs and electricity/heat outputs are on a unit basis rather than on a plant basis. However, if data are not available on a unit basis, the convention for defining a CHP plant noted above is adopted. Both main activity producer and autoproducer plants are included here.

*Note that for autoproducer CHP plants, all fuel inputs to electricity production are taken into account, while only the part of fuel inputs to heat **sold** is shown. Fuel inputs for the production of heat consumed within the autoproducer's establishment are **not** included here but are included with figures for the final consumption of fuels in the appropriate consuming sector.*

Heat plants

Heat plants refers to plants (including heat pumps and electric boilers) designed to produce heat only and who sell heat to a third party (e.g. residential, commercial or industrial consumers) under the provisions of a contract. Both main activity producer and autoproducer plants are included here. Heat pumps that are operated within the residential sector where the heat is not sold are not considered a transformation process and are not included here – the electricity consumption would appear as residential use.

Charcoal production plants

Charcoal production plants includes the transformation of primary solid biofuels into charcoal. Since charcoal is a secondary product, the production of charcoal (which appears as a positive number in this row) is offset by the inputs of primary solid biofuels (which appears as a negative number in this row) into the charcoal production process.

Other transformation

Other transformation covers non-specified transformation not shown elsewhere.

Energy industry own use

Energy industry own use covers the amount of fuels used by the energy producing industries (e.g. for heating, lighting and operation of all equipment used in the extraction process, for traction and for distribution). It includes energy consumed by energy industries for heating, pumping, traction and lighting purposes [ISIC¹ 05, 06, 19 and 35, Group 091 and Classes 0892 and 0721].

Losses

Losses includes losses in energy distribution, transmission and transport.

1. International Standard Industrial Classification of All Economic Activities, Series M, No. 4 / Rev. 4, United Nations, New York, 2008.

Total final consumption

Total final consumption (TFC) is the sum of consumption in the different end-use sectors. This implies that energy used for transformation processes and for own use of the energy producing industries is excluded. Final consumption reflects for the most part deliveries to consumers (see note on stock changes).

Industry

Industry consumption is specified in the following sub-sectors (Energy used for transport by industry is not included here but is reported under transport):

| | |
|---|--|
| Iron and steel | ISIC Group 241 and Class 2431 |
| Chemical and petrochemical industry | ISIC Divisions 20 and 21, excluding petrochemical feedstocks |
| Non-ferrous metals | ISIC Group 242 and Class 2432 |
| Non-metallic minerals | ISIC Division 23, such as glass, ceramic, cement, etc. |
| Transport equipment | ISIC Divisions 29 and 30 |
| Machinery | ISIC Divisions 25 to 28, comprises fabricated metal products, machinery and equipment other than transport equipment |
| Mining (excluding fuels) and quarrying | ISIC Divisions 07 and 08 and Group 099 |
| Food and tobacco | ISIC Divisions 10 to 12 |
| Paper, pulp and printing | ISIC Divisions 17 and 18 |
| Wood and wood products | ISIC Division 16, other than pulp and paper |
| Construction | ISIC Divisions 41 to 43 |
| Textile and leather | ISIC Divisions 13 to 15 |
| Non-specified | ISIC Divisions 22, 31 and 32, includes any manufacturing industry not included above Note: Most countries have difficulties supplying an industrial breakdown for all fuels. In these cases, the non-specified industry row has been used. Regional aggregates of industrial consumption should therefore be used with caution. |

Transport

Transport covers all transport activity (in mobile engines) regardless of the economic sector to which it is contributing [ISIC Divisions 49 to 51], and is specified as follows:

- **Road:** includes fuels used in road vehicles as well as agricultural and industrial highway use. It excludes military consumption as well as motor gasoline used in stationary engines and diesel oil for use in tractors that are not for transportation use.
- **Other:** includes all transport not elsewhere specified.

Other

- **Residential:** includes consumption by households, excluding fuels used for transport. It includes households with employed persons [ISIC Divisions 97 and 98] which is a small part of total residential consumption.
- **Commercial and public services:** Commercial and public services [ISIC Divisions 33, 36-39, 45-47, 52, 53, 55, 56, 58-66, 68-75, 77-82, 84 (excluding Class 8422), 85-88, 90-96 and 99].
- **Agriculture/forestry:** includes deliveries to users classified as agriculture, hunting and forestry by the ISIC, and therefore includes energy consumed by such users whether for traction (excluding agricultural highway use), power or heating (agricultural and domestic) [ISIC Divisions 01 and 02].
- **Fishing:** includes fuels used for inland, coastal and deep-sea fishing. Fishing covers fuels delivered to ships of all flags that have refuelled in the country (including international fishing) as well as energy used in the fishing industry [ISIC Division 03]. *Prior to the 2007 edition, fishing was included with agriculture/forestry and this may continue to be the case for some countries.*
- **Non-specified:** includes all fuel use not elsewhere specified as well as consumption in the above-designated categories for which separate figures have not been provided. Military fuel use for all mobile and stationary consumption is included here (e.g. ships, aircraft, road and energy used in living quarters) regardless of whether the fuel delivered is for the military of that country or for the military of another country.

Electricity and Heat Output

Electricity generated shows the total number of GWh generated by thermal power plants separated into electricity plants and CHP plants, as well as production by hydroelectricity (excluding pumped storage production), geothermal, etc.

Heat generated shows the total number of TJ generated by power plants separated into CHP plants and heat plants.

Flows: commodity balance

The flows defined below describe the aggregated commodity balance presented in Table 7. These tables include sources of renewable and waste energy, both primary (geothermal, solar thermal, industrial waste, municipal waste, primary solid biofuels, biogases, and liquid biofuels) and secondary (charcoal). Data for each product are in original units (see Section 4 for more detail on units).

Production

Production refers to the quantities of fuels extracted or produced, calculated after any operation for removal of inert matter or impurities. The calculation of production of hydroelectricity, geothermal, etc. is explained in Section 4, Energy conventions and Units.

Net imports

Net imports are the sum of total imports minus total exports.

Stock changes

Stock changes reflects the difference between opening stock levels on the first day of the year and closing levels on the last day of the year of stocks on national territory held by producers, importers, energy transformation industries and large consumers. A stock build is shown as a negative number, and a stock draw as a positive number.

Gross consumption

Gross consumption consists of production + net imports \pm stock changes.

Statistical differences

Statistical difference is essentially the difference between supply and demand. It is defined as deliveries to final consumption + use for transformation processes + consumption by energy industry own use + losses - gross consumption. Statistical differences arise because the data for the individual components of supply and demand are often derived from different data sources by the national administration. Furthermore, the inclusion of changes in some large consumers' stocks in the supply part of the balance introduces distortions which also contribute to the statistical differences.

Transformation processes

Transformation processes are the conversion of primary forms of energy to secondary forms including further transformation.

Energy industry own use

Energy industry own use covers the amount of fuels used by the energy producing industries (e.g. for heating, lighting and operation of all equipment used in the extraction process, for traction and for distribution). It includes energy consumed by energy industries for heating, pumping, traction and lighting purposes [ISIC² 05, 06, 19 and 35, Group 091 and Classes 0892 and 0721].

Losses

Losses includes losses in energy distribution, transmission and transport.

Final energy consumption

Final consumption (equal to the sum of the consumption in the end-use sectors) implies that energy used for transformation processes and for own use of the energy producing industries is excluded. Final consumption reflects for the most part deliveries to consumers (see note on stock changes).

Industry

See Flows: Energy Balance for the sub-sectors included in industry.

Transport

See Flows: Energy Balance for the sub-sectors included in transport.

Other

See Flows: Energy Balance for the sub-sectors included in other.

Additional definitions

Net maximum capacity

Net maximum capacity is the maximum active power that can be supplied, continuously, with all plants running, at the point of outlet to the network. It is assumed that all equipment is in full working order, that the power produced can be disposed of without any restrictions and that optimum conditions prevail as regards primary sources (i.e. flow and head in the case of hydroelectric plants; grades and quantity of fuel in hand and water supply, temperature and purity, in the

2. International Standard Industrial Classification of All Economic Activities, Series M, No. 4 / Rev. 4, United Nations, New York, 2008.

case of combustible fuel-fired plants and assuming that the output and method of production in CHP plants are those which contribute to maximum electricity production). It represents the sum of all individual plants' maximum capacities available to run continuously throughout a prolonged period of operation in a day.

The capacity is net in the sense that it is the output capacity measured at the plant busbars, i.e. after deducting the power needed by plant auxiliaries and losses in plant transformers.

Capacity factor

The capacity factor is defined as: the annual gross electricity generation (in MWh) divided by the net capacity (in MW) times 365 (days/year) times 24 (hours/day).

Care should be taken when using this figure for several reasons:

- The ratio is done between the gross generation and the net capacity, hence not taking into account the own use of the plant.
- A large addition to capacity in the year (especially toward the end of the year) will impact negatively the capacity factor, as that capacity would only have been producing for a part of the year.
- Reciprocally, a decommissioning of some of the capacity (especially toward the end of the year) can cause the capacity factor to increase.
- In the case of co-firing, some issues can arise since the capacity is sometimes only reported under the main fuel, and sometimes double reporting of the capacity can occur.

2. SOURCES AND NOTES

General notes

Energy data for OECD countries are submitted by all OECD member countries to the IEA Secretariat in a common format and methodology to allow for international comparisons.

One general issue regarding renewable statistics is that the variety of definitions for the word “renewable” may not refer to the same energy sources. Some of the definitions of renewable energy used by national and international bodies include specific renewables technologies such as large hydro, geothermal, peat, municipal waste or industrial waste while others exclude them. Similarly, renewables may or may not include non-commercial biofuels, which has substantial effects regarding renewable data for developing countries.

The Renewable Energy Working Party of the International Energy Agency set down the following broad definition:

“Renewable Energy is derived from natural processes that are replenished constantly. In its various forms, it derives directly or indirectly from the sun, or from heat generated deep within the earth. Included in the definition is energy generated from solar, wind, biofuels, geothermal, hydropower and ocean resources, and biofuels and hydrogen derived from renewable resources.”

Therefore, in this publication the renewable products are: hydro (large, medium and small), geothermal, solar photovoltaic, solar thermal, tide, wave, ocean, wind, solid biofuels, biogases, liquid biofuels and renewable municipal waste. All these definitions are consistent with the International Recommendations for Energy Statistics (IRES).

It follows that total renewables does not include industrial waste, non-renewable municipal waste, waste

heat, net heat generated by heat pumps, and electricity generated with hydro pumped storage.

While some OECD member countries accept industrial waste and non-renewable municipal waste as renewable energy sources, many countries exclude them on the grounds that they are not biodegradable. Under the IEA methodology, industrial waste and non-renewable municipal waste are excluded from the definition of renewable energy sources. However, these data are included in this publication in order to account for the full range of statistics collected in the Annual Renewables and Waste Questionnaire.

Even though data quality improves with each new edition due to the continuous efforts of the IEA in partnership with national administrations, it is important to highlight that difficulties exist in the collection of some data. As a result, there can be breaks in the time series for the countries, as explained in the country notes.

For example, one continuing problem is the breakdown between municipal waste and industrial waste. In some countries industrial waste statistics are not of the same quality as those for other products, because renewables and waste data collection systems were not in place in many countries in the early 1990s. Furthermore, the breakdown between the renewable and non-renewable portions of municipal waste is sometimes not known and as a result is based on estimates. The breakdown is important because most countries include the renewable (biodegradable) part of municipal waste in their renewables definition, while they exclude the remainder. The classification of waste as renewable is also important because the non-renewable component is counted when calculating CO₂ emissions.

Data collection from off-grid systems that work independently or are connected to a local distribution system remains a problem. These data can be omitted

from national statistics due to difficulties in collecting these data. This is, for example, the case regarding solar energy data, where for a number of countries, production is likely to be higher than indicated in this publication, although capacity is more accurate. Collection of the data presents national governments with some unique challenges. Renewable energy systems tend to be smaller than conventional systems, and harder to track. Operators tend to be more diverse and more numerous.

Many systems are connected to the grid at the distribution level, rather than at the transmission level, and so do not require interconnection permits. National governments are seeking to improve data collection methods to capture the total nature of their renewable energies. In general, the dispersion of renewables and waste production, specifically off-grid production (such as domestic solar collectors and/or small wind turbines), creates transparency and measurement problems. Thus, the nature and structure of the renewables energy market introduces data quality challenges for reliability when compared to that of the traditional fossil fuels, which mainly produce heat and electricity in grid-connected plants.

Non-commercial biofuels are included in the IEA definition, but data are not always complete. Electricity from fuel cells using hydrogen from renewable, as well as non-renewable, sources is not included in this publication due to a lack of reliable information.

When using these data, special attention should also be given to the percentage that renewables represents in TPES in countries where the net trade of electricity is large and also represents a significant percentage. In these cases, the high net imports of electricity can heavily influence the percentage of renewables in TPES.

Additional information on the methodologies and reporting conventions used here are included in the notes in *World Energy Balances*.

Qualifiers

Data marked as ‘e’ are the estimates of the IEA Secretariat. Data marked as ‘c’ means that data are confidential due to country specific regulations. Data marked as ‘.’ means that data are not available (either not collected or not submitted by national government). Data marked as ‘x’ means that the data point is not applicable, that is, there is no meaningful explanation of a value there (for example it is difficult to show the share in total energy sources of stock changes).

Data sources

Historical data (1990-2015)

The annual historical data in Part II of this report are taken from the IEA/OECD databases of Energy Statistics which are based on annual submissions from all OECD member countries.

i) IEA/OECD renewables statistics

This database of annual statistics for OECD countries covers hydroelectricity, solid biofuels, geothermal, renewable municipal waste, wind, gas from biomass, liquid biofuels, solar photovoltaic, solar thermal, tide/wave/ocean, non-renewable municipal waste and industrial waste. It includes electricity and heat production from renewable sources and supply/demand balances of renewable and waste products.

The main data from this system are published annually in this publication.

ii) IEA/OECD electricity statistics

This database of annual statistics for OECD countries covers generating capacity and electricity production from main activity producer and autoproducer plants. It includes information on electricity production by fuel type and supply/demand balances for electricity and for heat sold to third parties from different types of power and heat plants.

The main data from this system are published annually in the IEA/OECD publication *Electricity Information*.

iii) World energy balances

Overall energy balances are constructed annually for all OECD countries from the basic energy statistics systems of the IEA. The overall energy balance data are expressed in a common energy unit of tonnes of oil equivalent (toe) and presented in a standard matrix format. The balances are published annually in the IEA/OECD publication *World Energy Balances* in which detailed country notes referring to historical data can be found.

iv) OECD main economic indicators

OECD Main Economic Indicators is a monthly compilation of a range of indicators on recent economic developments for the 35 OECD member countries. Please refer to this publication for detailed notes regarding the selected indicators.

v) Other sources

GDP: The main source of these series for 1970 to 2017 is the OECD *National Accounts Statistics* database [ISSN: 2074-3947 (online)], last published in book format as *National Accounts of OECD Countries, Volume 2018 Issue 1: Main Aggregates*, OECD 2018. Growth rates from the series in the *OECD Economic Outlook* No 98 and other data previously published by the OECD were also used to estimate data for **Hungary** (prior to 1991) and **Slovak Republic** (prior to 1992). Data for **Estonia** (prior to 1992) are IEA Secretariat estimates based on GDP growth rates from the World Bank.

The GDP data have been compiled for individual countries at market prices in in 2010 US dollars.

Population: The main source of these data for 1990 to 2017 is the OECD *National Accounts Statistics* database [ISSN: 2074-3947 (online)], last published in

book format as *National Accounts of OECD Countries, Volume 2018 Issue 1: Main Aggregates*, OECD 2018. Growth rates from the *OECD Factbook 2015* were used to estimate data for **Estonia** (prior to 1993), **Israel** (prior to 1995) and **Slovenia** (prior to 1995).

Latest year data: 2017

Energy data reported for 2017 (shown as 2017p) in this publication are provisional estimates based on submissions received in spring 2018 and on monthly submissions to the IEA from member countries. In some instances it has been necessary for the IEA to estimate some data; explanations of the estimates are provided in the country notes. Final 2017 data on renewables and waste will be submitted by OECD member countries to the secretariat in Annual Questionnaires in late 2018. As a result, final data for 2017 and provisional 2018 data will be published in the 2019 edition of *Renewables Information*.

3. GEOGRAPHICAL COVERAGE

In this publication:

World includes OECD Total; Africa; Non-OECD Americas; Non-OECD Asia (excluding China); China (People's Republic of China and Hong Kong, China); Non-OECD Europe and Eurasia; Middle East; World aviation bunkers and World marine bunkers. It is also the sum of Africa, Americas, Asia, Europe, Oceania, World aviation bunkers and World marine bunkers.

Africa includes Algeria; Angola; Benin; Botswana; Burkina Faso; Burundi; Cabo Verde; Cameroon; Central African Republic; Chad; Comoros; the Republic of the Congo (Congo); Côte d'Ivoire; the Democratic Republic of the Congo; Djibouti; Egypt; Equatorial Guinea; Eritrea; Ethiopia; Gabon; Gambia; Ghana; Guinea; Guinea-Bissau; Kenya; Lesotho; Liberia; Libya; Madagascar; Malawi; Mali; Mauritania; Mauritius; Morocco; Mozambique; Namibia; Niger; Nigeria; Réunion; Rwanda; Sao Tome and Principe; Senegal; the Seychelles; Sierra Leone; Somalia; South Africa; South Sudan (from 2012); Sudan; Swaziland; the United Republic of Tanzania (Tanzania); Togo; Tunisia; Uganda; Zambia; Zimbabwe.

Americas includes Antigua and Barbuda; Argentina; Aruba; the Bahamas; Barbados; Belize; Bermuda; the Plurinational State of Bolivia (Bolivia); Bonaire (from 2012); the British Virgin Islands; Brazil; Canada; the Cayman Islands; Chile; Colombia; Costa Rica; Cuba; Curaçao¹; Dominica; the Dominican Republic; Ecuador; El Salvador; the Falkland Islands (Malvinas);

1. The Netherlands Antilles was dissolved on 10 October 2010 resulting in two new 'constituent countries' (Curaçao and Sint Maarten) with the other islands joining The Netherlands as "special municipalities". However, due to lack of detailed data the IEA Secretariat's data and estimates under the "Netherlands Antilles" still refer to the whole territory of the Netherlands Antilles as it was known prior to 10 October 2010 up to the end of 2011. Data refer only to the island of Curaçao from 2012. The other islands of the former Netherlands Antilles are added to Other non-OECD Americas from 2012.

Guatemala; French Guiana; Grenada; Guadeloupe; Guyana; Haiti; Honduras; Jamaica; Martinique; Mexico; Montserrat; Nicaragua; Panama; Paraguay; Peru; Puerto Rico (for natural gas and electricity)²; Saba (from 2012); Saint Kitts and Nevis; Saint Lucia; Saint Pierre and Miquelon; Saint Vincent and the Grenadines; Sint Eustatius (from 2012); Sint Maarten (from 2012); Suriname; Trinidad and Tobago; the Turks and Caicos Islands; the United States; Uruguay; the Bolivarian Republic of Venezuela (Venezuela).

Asia (from 1990) includes Afghanistan; Armenia; Azerbaijan; Bahrain; Bangladesh; Bhutan; Brunei Darussalam; Cambodia; the People's Republic of China; Cyprus³; Georgia; Hong Kong, China; India; Indonesia; the Islamic Republic of Iran; Iraq; Israel⁴; Japan; Jordan; the Democratic People's Republic of Korea; Korea; Kazakhstan; Kuwait; Kyrgyzstan; Lao People's Democratic Republic; Lebanon; Macau, China; Malaysia; the Maldives; Mongolia; Myanmar; Nepal; Oman; Pakistan; the Philippines; Qatar; Saudi Arabia; Singapore; Sri Lanka; the Syrian Arab Republic; Tajikistan; Chinese Taipei; Thailand; Timor-Leste;

2. Oil statistics as well as coal trade statistics for Puerto Rico are included under the United States.

3. Note by Turkey:

The information in this document with reference to "Cyprus" relates to the southern part of the Island. There is no single authority representing both Turkish and Greek Cypriot people on the Island. Turkey recognises the Turkish Republic of Northern Cyprus (TRNC). Until a lasting and equitable solution is found within the context of the United Nations, Turkey shall preserve its position concerning the "Cyprus issue".

Note by all the European Union member states of the OECD and the European Union:

The Republic of Cyprus is recognised by all members of the United Nations with the exception of Turkey. The information in this document relates to the area under the effective control of the Government of the Republic of Cyprus.

4. The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

Turkey; Turkmenistan; the United Arab Emirates; Uzbekistan; Viet Nam; and Yemen.

Europe (from 1990) includes Albania; Austria; Belarus; Belgium; Bosnia and Herzegovina; Bulgaria; Croatia; the Czech Republic; Denmark; Estonia; Finland; the Former Yugoslav Republic of Macedonia; France; Germany; Gibraltar; Greece; Hungary; Iceland; Ireland; Italy; Kosovo⁵; Latvia; Lithuania; Luxembourg; Malta; the Republic of Moldova (Moldova); Montenegro; the Netherlands; Norway; Poland; Portugal; Romania; the Russian Federation; Serbia⁶; the Slovak Republic; Slovenia; Spain; Sweden; Switzerland; Ukraine; the United Kingdom.

Oceania includes Australia; New Zealand; Cook Islands; Fiji; French Polynesia; Kiribati; New Caledonia; Palau; Papua New Guinea; Samoa; the Solomon Islands; Tonga; Vanuatu.

The **International Energy Agency (IEA)** includes Australia; Austria; Belgium; Canada; the Czech Republic; Denmark; Estonia⁷; Finland; France; Germany; Greece; Hungary; Ireland; Italy; Japan; Korea; Luxembourg; Mexico; the Netherlands; New Zealand; Norway; Poland; Portugal; the Slovak Republic; Spain; Sweden; Switzerland; Turkey; the United Kingdom; the United States.

The **IEA and Accession/Association countries** includes: IEA member countries: Australia; Austria; Belgium; Canada; the Czech Republic; Denmark; Estonia⁷; Finland; France; Germany; Greece; Hungary; Ireland; Italy; Japan; Korea; Luxembourg; Mexico; the Netherlands; New Zealand; Norway; Poland; Portugal; the Slovak Republic; Spain; Sweden; Switzerland; Turkey; the United Kingdom and the United States; Accession country: Chile; Association countries: Brazil; the People's Republic of China; India; Indonesia; Morocco; Singapore; Thailand.

The **Organisation for Economic Co-Operation and Development (OECD)** includes Australia; Austria; Belgium; Canada; Chile; the Czech Republic; Denmark; Estonia; Finland; France; Germany;

Greece; Hungary; Iceland; Ireland; Israel; Italy; Japan; Korea; Latvia⁸; Luxembourg; Mexico; the Netherlands; New Zealand; Norway; Poland; Portugal; the Slovak Republic; Slovenia; Spain; Sweden; Switzerland; Turkey; the United Kingdom; the United States.

Lithuania was not an OECD Member at the time of preparation of this publication. Accordingly, Lithuania does not appear in the list of OECD Members and is not included in the zone aggregates.

OECD Americas includes Canada; Chile; Mexico; the United States.

OECD Asia Oceania includes Australia; Israel; Japan; Korea; New Zealand.

OECD Europe⁹ includes Austria; Belgium; the Czech Republic; Denmark; Estonia; Finland; France; Germany; Greece; Hungary; Iceland; Ireland; Italy; Latvia⁸; Luxembourg; the Netherlands; Norway; Poland; Portugal; the Slovak Republic; Slovenia; Spain; Sweden; Switzerland; Turkey; the United Kingdom.

Estonia, Latvia and Slovenia are included starting in 1990. Prior to 1990, Estonia and Latvia are included in Former Soviet Union and Slovenia is included in Former Yugoslavia.

Within the **OECD**:

Australia excludes the overseas territories;

- **Denmark** excludes Greenland and the Faroe Islands, except prior to 1990, where data on oil for Greenland were included with the Danish statistics. The administration is planning to revise the series back to 1974 to exclude these amounts;
- **France** includes Monaco and excludes the following overseas departments: Guadeloupe; French Guiana; Martinique; Mayotte; and Réunion; and collectivities: New Caledonia; French Polynesia; Saint Barthélemy; Saint Martin; Saint Pierre and Miquelon; and Wallis and Futuna;
- **Germany** includes the new federal states of Germany from 1970 onwards;
- The statistical data for **Israel** are supplied by and under the responsibility of the relevant Israeli

5. This designation is without prejudice to positions on status, and is in line with United Nations Security Council Resolution 1244/99 and the Advisory Opinion of the International Court of Justice on Kosovo's declaration of independence.

6. Serbia includes Montenegro until 2004 and Kosovo until 1999.

7. Estonia is included starting in 1990. Prior to 1990, data for Estonia are included in Former Soviet Union.

8. Latvia is included starting in 1990. Prior to 1990, data for Latvia are included in Former Soviet Union.

9. Lithuania was not an OECD Member at the time of preparation of this publication. Accordingly, Lithuania does not appear in the list of OECD Members and is not included in the zone aggregates.

authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law;

- **Italy** includes San Marino and the Holy See;
- **Japan** includes Okinawa;
- **Netherlands** excludes Suriname, Aruba and the other former Netherlands Antilles (Bonaire, Curaçao, Saba, Saint Eustatius and Sint Maarten);
- **Portugal** includes the Azores and Madeira;
- **Spain** includes the Canary Islands;
- **Switzerland** includes Liechtenstein for oil data; data for other fuels do not include Liechtenstein;
- Shipments of coal and oil to the Channel Islands and the Isle of Man from the **United Kingdom** are not classed as exports. Supplies of coal and oil to these islands are, therefore, included as part of UK supply. Exports of natural gas to the Isle of Man are included with the exports to Ireland;
- **United States** includes the 50 states and the District of Columbia but generally excludes all territories, and all trade between the U.S. and its territories. Oil statistics include Guam, Puerto Rico¹⁰ and the United States Virgin Islands; trade statistics for coal include international trade to and from Puerto Rico and the United States Virgin Islands.

Non-OECD Europe and Eurasia includes Albania; Armenia; Azerbaijan; Belarus; Bosnia and Herzegovina; Bulgaria; Croatia; Cyprus³; the Former Yugoslav Republic of Macedonia; Georgia; Gibraltar; Kazakhstan; Kosovo⁵; Kyrgyzstan; Lithuania¹¹; Malta; the Republic of Moldova (Moldova); Montenegro; Romania; the Russian Federation; Serbia⁶; Tajikistan; Turkmenistan; Ukraine; Uzbekistan; the Former Soviet Union; the Former Yugoslavia.

Non-OECD Asia excluding China includes Bangladesh; Brunei Darussalam; Cambodia (from 1995); India; Indonesia; the Democratic People's Republic of Korea; Malaysia; Mongolia (from 1985); Myanmar; Nepal; Pakistan; the Philippines; Singapore; Sri Lanka; Chinese Taipei; Thailand; Viet Nam; **Other non-OECD Asia.**

China includes the (People's Republic of) China; Hong Kong, China.

Non-OECD Americas includes Argentina; the Plurinational State of Bolivia (Bolivia); Brazil; Colombia; Costa Rica; Cuba; Curaçao¹; the Dominican Republic; Ecuador; El Salvador; Guatemala; Haiti; Honduras; Jamaica; Nicaragua; Panama; Paraguay; Peru; Suriname (from 2000), Trinidad and Tobago; Uruguay; the Bolivarian Republic of Venezuela (Venezuela); **Other non-OECD Americas.**

Middle East includes Bahrain; the Islamic Republic of Iran; Iraq; Jordan; Kuwait; Lebanon; Oman; Qatar; Saudi Arabia; the Syrian Arab Republic; the United Arab Emirates; Yemen.

Other Africa includes Botswana (until 1980); Burkina Faso; Burundi; Cabo Verde; Central African Republic; Chad; Comoros; Djibouti; Equatorial Guinea; Gambia; Guinea; Guinea-Bissau; Lesotho; Liberia; Madagascar; Malawi; Mali; Mauritania; Namibia (until 1990); Niger (until 1999); Réunion; Rwanda; Sao Tome and Principe; the Seychelles; Sierra Leone; Somalia; Swaziland; Uganda.

Other non-OECD Americas includes Anguilla, Antigua and Barbuda; Aruba; the Bahamas; Barbados; Belize; Bermuda; Bonaire (from 2012); the British Virgin Islands; the Cayman Islands; Dominica; the Falkland Islands (Malvinas); the French Guiana; Grenada; Guadeloupe; Guyana; Martinique; Montserrat; Puerto Rico (for natural gas and electricity)¹⁰; Saba (from 2012); Saint Eustatius (from 2012); Saint Kitts and Nevis; Saint Lucia; Saint Pierre and Miquelon; Saint Vincent and the Grenadines; Sint Maarten (from 2012); Suriname (until 1999); the Turks and Caicos Islands.

Other non-OECD Asia includes Afghanistan; Bhutan; Cambodia (until 1994); Cook Islands; Fiji; French Polynesia; Kiribati; Lao People's Democratic Republic; Macau, China; the Maldives; Mongolia (until 1984); New Caledonia; Palau (from 1994); Papua New Guinea; Samoa; the Solomon Islands; Timor-Leste; Tonga; Vanuatu.

The **European Union - 28 (EU-28)** (from 1990) includes Austria; Belgium; Bulgaria; Croatia; Cyprus³; the Czech Republic; Denmark; Estonia; Finland; France; Germany; Greece; Hungary; Ireland; Italy; Latvia; Lithuania; Luxembourg; Malta; the Netherlands; Poland; Portugal; Romania; the Slovak Republic; Slovenia; Spain; Sweden; the United Kingdom.

10. Natural gas and electricity data for Puerto Rico are included under Other non-OECD Americas.

11. Lithuania was not an OECD Member at the time of preparation of this publication. Accordingly, Lithuania does not appear in the list of OECD Members and is still included in the non-OECD aggregates.

Please note that in the interest of having comparable data, all these countries are included since 1990 despite different entry dates into the European Union.

G7 includes Canada; France; Germany; Italy; Japan; United Kingdom; the United States.

G8 includes Canada; France; Germany; Italy; Japan; the Russian Federation; the United Kingdom; the United States.

G20 includes Argentina; Australia; Brazil; Canada; China (including Hong Kong, China); India; Indonesia; Japan; Korea; Mexico; the Russian Federation; Saudi Arabia; South Africa; Turkey; the United States; the European Union – 28.

The **Organisation of the Petroleum Exporting Countries (OPEC)** includes Algeria; Angola; Ecuador; Gabon; the Islamic Republic of Iran; Iraq; Kuwait; Libya; Nigeria; Qatar; Saudi Arabia; the United Arab Emirates; the Bolivarian Republic of Venezuela (Venezuela).¹²

Please note that the following countries have not been considered:

- **Non-OECD Europe and Eurasia:** Andorra; Far-oe Islands (after 1990); Liechtenstein¹³ (except for oil data); the Palestinian Authority; Svalbard; Jan Mayen Islands;
- **Africa:** British Indian Ocean Territory; French Southern and Antarctic Lands; Mayotte; Saint Helena; Western Sahara;
- **Non-OECD Americas:** Bouvet Island; Saint Barthélemy; Greenland (after 1990); Saint Martin (French Part); South Georgia and the South Sandwich Islands; Antarctica;
- **Non-OECD Asia excluding China:** American Samoa; Cocos (Keeling) Islands; Christmas Island; Heard Island and McDonald Islands; Marshall Islands; Micronesia (Federated States of); Nauru; Niue; Norfolk Island; Northern Mariana Islands; Pitcairn; Tokelau; Tuvalu; United States Minor Outlying Islands; Wallis and Futuna Islands.

12. Data for Equatorial Guinea, that joined OPEC in May 2017, and for Congo, that joined OPEC in June 2018, are not included in the OPEC aggregate in this edition.

13. Oil data for Liechtenstein are included under Switzerland.

4. ENERGY CONVENTIONS AND UNITS

Primary energy conventions

When constructing an energy balance, it is necessary to adopt conventions for primary energy from several sources, such as nuclear, geothermal, solar, hydro, wind, etc. The two types of assumptions that have to be made are described below.

Choice of the primary energy form

For each of these sources, there is a need to define the form of primary energy to be considered; for instance, in the case of hydro energy, a choice must be made between the kinetic energy of falling water and the electricity produced. For nuclear energy, the choice is between the energy content of the nuclear fuel, the heat generated in the reactors and the electricity produced. For photovoltaic electricity, the choice is between the solar radiation received and the electricity produced.

The principle adopted by the IEA is that the primary energy form should be the first energy form downstream in the production process for which multiple energy uses are practical. The application of this principle leads to the choice of the following primary energy forms:

- **Heat** for nuclear, geothermal and solar thermal;
- **Electricity** for hydro, wind, tide/wave/ocean and solar photovoltaic.

Calculation of the primary energy equivalent

There are essentially two methods that can be used to calculate the primary energy equivalent of the above energy sources: the partial substitution method and the physical energy content method.

The physical energy content method (the method used by the IEA): This method uses the physical energy

content of the primary energy source as the primary energy equivalent. As a consequence, there is an obvious link between the principles adopted in defining the primary energy forms of energy sources and the primary energy equivalent of these sources.

For instance, in the case of nuclear electricity production, as heat is the primary energy form, the primary energy equivalent is the quantity of heat generated in the reactors. However, as the amount of heat produced is not always known, the IEA estimates the primary energy equivalent from the electricity generation by assuming an efficiency of 33%, which is the average of nuclear power plants in Europe.

In the case of hydro and solar PV, as electricity is the primary energy form selected, the primary energy equivalent is the physical energy content of the electricity generated in the plant, which amounts to assuming an efficiency of 100%. A more detailed presentation of the assumptions used by the IEA in establishing its energy balances is given in this section.

For geothermal and solar thermal, if no country-specific information is reported, the primary energy equivalent is calculated as follows:

- 10% for geothermal electricity;
- 50% for geothermal heat;
- 33% for solar thermal electricity;
- 100% for solar thermal heat.

The partial substitution method: In this method, the primary energy equivalent of the above sources of electricity generation represents the amount of energy that would be necessary to generate an identical amount of electricity in conventional thermal power plants. The primary energy equivalent is calculated using an average generating efficiency of these plants. This method has several shortcomings, including the difficulty of

choosing an appropriate generating efficiency and the fact that the partial substitution method is not relevant for countries with a high share of hydroelectricity. For these reasons, the IEA, as most international organisations, has now stopped using this method and adopted the physical energy content method.

Since these two methods differ significantly in the treatment of electricity from solar, hydro, wind, etc., the share of renewables in total energy supply will appear to be very different depending on the method used. As a result, when looking at the percentages of various energy sources in total supply, it is important to understand the underlying conventions that were used to calculate the primary energy supply.

Units

Original units

Electricity is expressed in gigawatt hours and heat is expressed in terajoules

Non-combustible renewables have original units of their primary energy form (see Primary energy conventions for the primary energy form of non-combustible renewables).

Primary solid biofuels, biogases, municipal waste, and industrial waste are presented in their original units in terajoules on a net calorific basis. The Secretariat does not receive information on volumes and other characteristics of these fuels.

Liquid biofuels and charcoal have original units in 1000 tonnes.

Energy balance units

The IEA energy balance methodology is based on the net calorific content of the energy commodities and a common unit of account. The unit of account adopted by the IEA is the tonne of oil equivalent (toe) which is defined as 10^7 kilocalories (41.868 gigajoules). This quantity of energy is, within a few percent, equal to the net heat content of 1 tonne of crude oil. Throughout this publication 1 tonne means 1 metric ton or 1000 kg.

Conversion (from original units to toe)

The change from using the original units to tonnes of oil equivalent implies choosing coefficients of equivalence between different forms and sources of energy. This

problem can be approached in many different ways. For example, one could adopt a single equivalence for each major primary energy source in all countries, e.g. 29 307 kJ/kg (7 000 kcal/kg) for hard coal, 41 868 kJ/kg (10 000 kcal/kg) for oil, etc.

The main objection to this method is that it results in distortions since there can be a wide spread between calorific values of fuels (i.e. liquid biofuels) in different countries.

For charcoal, biogasoline, biodiesels and other liquid biofuels, specific factors have been used for production, imports and exports based on consultations with experts from the national administrations.

The balances are expressed in terms of “net” calorific value. The difference between the “net” and the “gross” calorific value for each fuel is the latent heat of vaporisation of the water produced during combustion of the fuel. For coal and oil, net calorific value is about 5% less than gross, for most forms of natural and manufactured gas the difference is 9-10%, while for electricity and heat there is no difference as the concept has no meaning in this case. The use of net calorific value is consistent with the practice of the Statistical Offices of the European Communities and the United Nations.

Electricity data are converted from original units of gigawatt hours to million tonnes of oil equivalent using the relationship: 1 terawatt hour = 0.086 Mtoe.

Biofuels and waste

Data for primary solid biofuels, biogases, municipal waste and industrial waste are converted from original units in terajoules to energy balance units in tonne of oil equivalent using 1 terajoule = 0.00002388 Mtoe.

Data for charcoal and liquid biofuels are converted from original units in tonnes to energy balance units in tonne of oil equivalent using the average net calorific values. Unless country-specific information has been provided, data are converted using the following average net calorific values:

- Charcoal: 30 800 kJ/kg
- Biogasoline: 26 800 kJ/kg
- Biodiesels: 36 800 kJ/kg
- Other liquid biofuels: 36 800 kJ/kg

Electricity

Figures for electricity production, trade, and final consumption are calculated using the energy content of the electricity (i.e. at a rate of 1 TWh = 86 ktoe).

Hydroelectricity production (excluding pumped storage) and electricity produced by other non-thermal means (wind, tide/wave/ocean, solar PV, etc.) are accounted for similarly using 1 TWh = 86 ktoe.

The primary energy equivalent of nuclear electricity is calculated from the gross generation by assuming a 33% conversion efficiency, i.e. 1 TWh = $(86 \div 0.33)$ ktoe.

In the case of electricity produced from geothermal heat, if the actual geothermal efficiency is not known, then the primary equivalent is calculated assuming an efficiency of 10%, so 1 TWh = $(86 \div 0.1)$ ktoe.

For electricity produced from solar thermal heat, the primary equivalent is calculated assuming an efficiency

of 33%, so 1 TWh = $(86 \div 0.33)$ ktoe, unless the actual efficiency is known.

Heat

Information on heat is supplied in terajoules and 1 terajoule = 0.02388 ktoe.

In the case of heat produced in a geothermal plant, if the actual geothermal efficiency is not known, then the primary equivalent is calculated assuming an efficiency of 50%, so 1 TJ = $(0.02388 \div 0.5)$ ktoe.

For heat produced (output) in a solar thermal plant, the primary equivalent is equal to the heat content (input) assuming an efficiency of 100%, i.e. 1 TJ = 0.02388 ktoe.

For direct use of geothermal and solar thermal heat, all the heat consumed is accounted for in production and consumption.

ABBREVIATIONS

| | | |
|------------------|---|-------------------------------------|
| kW | : | kilowatt |
| kW _p | : | kilowatt peak |
| kW _{th} | : | kilowatt thermal |
| GW | : | gigawatt |
| MW | : | megawatt (electric) |
| MW _{th} | : | megawatt thermal |
| kWh | : | kilowatt hour |
| MWh | : | megawatt hour |
| GWh | : | gigawatt hour |
| TWh | : | terawatt hour |
| GJ | : | gigajoule (10 ⁹ joules) |
| TJ | : | terajoule (10 ¹² joules) |
| EJ | : | exajoule (10 ¹⁸ joules) |
| m ² | : | metre squared |
| t | : | metric ton = tonne |
| kt | : | kilotonne (1000 tonnes) |
| 1 toe | : | tonne of oil equivalent |
| 1 ktoe | : | kilotonne of oil equivalent |
| 1 Mtoe | : | million tonnes of oil equivalent |
| | | |
| GDP | : | Gross domestic product |
| RES | : | Renewable energy Sources |
| TPES | : | Total primary energy supply |
| | | |
| 0 or 0.0 | : | negligible |
| c | : | confidential data |
| e | : | estimated data |
| .. | : | data not available |
| x | : | not applicable |

CONVERSION FACTORS

General conversion factors for energy

| To: | TJ | Gcal | Mtoe | MBtu | GWh |
|---|------------------------|------------------------|------------------------|-----------------------|------------------------|
| From: | multiply by: | | | | |
| terajoule (TJ) | 1 | 2.388x10 ² | 2.388x10 ⁻⁵ | 9.478x10 ² | 2.778x10 ⁻¹ |
| gigacalorie (Gcal) | 4.187x10 ⁻³ | 1 | 1.000x10 ⁻⁷ | 3.968 | 1.163x10 ⁻³ |
| million tonnes of oil equivalent (Mtoe) | 4.187x10 ⁴ | 1.000x10 ⁷ | 1 | 3.968x10 ⁷ | 1.163x10 ⁴ |
| million British thermal units (MBtu) | 1.055x10 ⁻³ | 2.520x10 ⁻¹ | 2.520x10 ⁻⁸ | 1 | 2.931x10 ⁻⁴ |
| gigawatt hour (GWh) | 3.600 | 8.598x10 ² | 8.598x10 ⁻⁵ | 3.412x10 ³ | 1 |

Conversion factors for mass

| To: | kg | t | lt | st | lb |
|-----------------|------------------------|------------------------|------------------------|------------------------|-----------------------|
| From: | multiply by: | | | | |
| kilogramme (kg) | 1 | 1.000x10 ⁻³ | 9.842x10 ⁻⁴ | 1.102x10 ⁻³ | 2.205 |
| tonne (t) | 1.000x10 ³ | 1 | 9.842x10 ⁻¹ | 1.102 | 2.205x10 ³ |
| long ton (lt) | 1.016x10 ³ | 1.016 | 1 | 1.120 | 2.240x10 ³ |
| short ton (st) | 9.072x10 ² | 9.072x10 ⁻¹ | 8.929x10 ⁻¹ | 1 | 2.000x10 ³ |
| pound (lb) | 4.536x10 ⁻¹ | 4.536x10 ⁻⁴ | 4.464x10 ⁻⁴ | 5.000x10 ⁻⁴ | 1 |

Conversion factors for volume

| To: | gal U.S. | gal U.K. | bbl | ft ³ | l | m ³ |
|-------------------------------|------------------------|------------------------|------------------------|------------------------|-----------------------|------------------------|
| From: | multiply by: | | | | | |
| U.S. gallon (gal) | 1 | 8.327x10 ⁻¹ | 2.381x10 ⁻² | 1.337x10 ⁻¹ | 3.785 | 3.785x10 ⁻³ |
| U.K. gallon (gal) | 1.201 | 1 | 2.859x10 ⁻² | 1.605x10 ⁻¹ | 4.546 | 4.546x10 ⁻³ |
| Barrel (bbl) | 4.200x10 ¹ | 3.497x10 ¹ | 1 | 5.615 | 1.590x10 ² | 1.590x10 ⁻¹ |
| Cubic foot (ft ³) | 7.481 | 6.229 | 1.781x10 ⁻¹ | 1 | 2.832x10 ¹ | 2.832x10 ⁻² |
| Litre (l) | 2.642x10 ⁻¹ | 2.200x10 ⁻¹ | 6.290x10 ⁻³ | 3.531x10 ⁻² | 1 | 1.000x10 ⁻³ |
| Cubic metre (m ³) | 2.642x10 ² | 2.200x10 ² | 6.290 | 3.531x10 ¹ | 1.000x10 ³ | 1 |

Decimal prefixes

| | | | |
|------------------|-----------|-------------------|-----------|
| 10 ¹ | deca (da) | 10 ⁻¹ | deci (d) |
| 10 ² | hecto (h) | 10 ⁻² | centi (c) |
| 10 ³ | kilo (k) | 10 ⁻³ | milli (m) |
| 10 ⁶ | mega (M) | 10 ⁻⁶ | micro (μ) |
| 10 ⁹ | giga (G) | 10 ⁻⁹ | nano (n) |
| 10 ¹² | tera (T) | 10 ⁻¹² | pico (p) |
| 10 ¹⁵ | peta (P) | 10 ⁻¹⁵ | femto (f) |
| 10 ¹⁸ | exa (E) | 10 ⁻¹⁸ | atto (a) |

PART II

WORLD and OECD RENEWABLES AND WASTE DATA

Table 1. World energy balance in 2016

| Million tonnes of oil equivalent | | | | | | | | | | | |
|------------------------------------|-------------------|------------------------|----------------|----------------|----------------|----------------|----------------------|----------------|----------------|---------------|-----------------|
| SUPPLY AND CONSUMPTION | Coal ¹ | Crude oil ² | Oil products | Natural gas | Nuclear | Hydro | Geotherm./Solar/etc. | Biofuels/Waste | Electricity | Heat | Total |
| Production | 3657.19 | 4473.27 | - | 3032.41 | 679.65 | 349.22 | 225.63 | 1344.87 | - | 1.76 | 13763.99 |
| Imports | 795.23 | 2379.32 | 1329.40 | 915.52 | - | - | - | 23.92 | 62.11 | 0.01 | 5505.50 |
| Exports | -833.43 | -2354.63 | -1414.63 | -932.53 | - | - | - | -19.44 | -62.25 | -0.01 | -5616.91 |
| Stock changes | 111.90 | -15.32 | -7.21 | 19.55 | - | - | - | -0.06 | - | - | 108.86 |
| TPES | 3730.89 | 4482.63 | -92.43 | 3034.95 | 679.65 | 349.22 | 225.63 | 1349.29 | -0.14 | 1.77 | 13761.45 |
| Transfers | -1.36 | -233.00 | 262.09 | - | - | - | - | - | - | - | 27.73 |
| Statistical differences | 28.63 | 11.25 | 14.35 | -11.26 | - | - | 0.09 | 0.84 | -1.14 | -0.35 | 42.41 |
| Electricity plants | -1672.04 | -40.48 | -178.55 | -868.18 | -672.06 | -349.22 | -177.96 | -120.97 | 1811.30 | -0.72 | -2268.88 |
| CHP plants | -623.84 | -0.01 | -17.99 | -314.57 | -7.59 | - | -2.56 | -60.58 | 335.99 | 239.30 | -451.86 |
| Heat plants | -23.38 | -0.83 | -10.95 | -61.70 | - | - | -1.56 | -13.13 | -0.46 | 102.63 | -9.39 |
| Blast furnaces | -207.69 | - | -0.05 | -0.01 | - | - | - | -0.04 | - | - | -207.78 |
| Gas works | -13.32 | - | -2.17 | 5.42 | - | - | - | -0.27 | - | - | -10.34 |
| Coke/pat.fuel/BKB/PB plants | -89.82 | - | -2.32 | -0.03 | - | - | - | -0.12 | - | - | -92.29 |
| Oil refineries | - | -4246.76 | 4165.65 | - | - | - | - | - | - | - | -81.11 |
| Petrochemical plants | - | 35.90 | -35.37 | - | - | - | - | - | - | - | 0.53 |
| Liquefaction plants | -12.08 | 15.16 | - | -16.47 | - | - | - | - | - | - | -13.40 |
| Other transformation | -0.30 | 10.75 | -0.54 | -13.01 | - | - | - | -90.54 | - | -0.68 | -94.32 |
| Energy industry own use | -75.28 | -11.24 | -208.00 | -296.17 | - | - | -0.00 | -13.46 | -181.96 | -36.50 | -822.61 |
| Losses | -4.91 | -8.69 | -0.47 | -18.71 | - | - | -0.01 | -0.14 | -169.65 | -22.26 | -224.84 |
| TFC | 1035.50 | 14.68 | 3893.25 | 1440.26 | - | - | 43.63 | 1050.88 | 1793.94 | 283.18 | 9555.32 |
| INDUSTRY | 826.95 | 6.66 | 299.71 | 537.77 | - | - | 0.92 | 198.33 | 746.69 | 135.57 | 2752.60 |
| Iron and steel | 293.80 | - | 6.65 | 51.93 | - | - | - | 3.43 | 95.81 | 13.70 | 465.32 |
| Chemical and petrochemical | 119.29 | 0.04 | 57.95 | 120.65 | - | - | 0.00 | 2.18 | 106.98 | 57.16 | 464.26 |
| Non-ferrous metals | 23.79 | - | 5.02 | 16.67 | - | - | 0.00 | 0.10 | 92.26 | 4.16 | 142.00 |
| Non-metallic minerals | 221.58 | 0.00 | 36.05 | 52.22 | - | - | 0.00 | 8.96 | 52.34 | 2.83 | 373.98 |
| Transport equipment | 2.53 | - | 2.00 | 12.59 | - | - | 0.00 | 0.03 | 25.06 | 3.84 | 46.05 |
| Machinery | 11.63 | - | 6.07 | 25.72 | - | - | 0.00 | 0.20 | 79.07 | 9.67 | 132.37 |
| Mining and quarrying | 7.58 | - | 21.97 | 7.98 | - | - | 0.00 | 0.18 | 27.61 | 2.15 | 67.46 |
| Food and tobacco | 30.57 | 0.01 | 10.19 | 47.92 | - | - | 0.00 | 31.78 | 44.65 | 11.22 | 176.34 |
| Paper pulp and printing | 16.86 | 0.01 | 3.95 | 24.14 | - | - | 0.11 | 60.22 | 38.81 | 12.18 | 156.28 |
| Wood and wood products | 1.92 | - | 2.18 | 3.00 | - | - | 0.00 | 8.84 | 9.09 | 2.33 | 27.36 |
| Construction | 4.35 | - | 29.91 | 8.29 | - | - | 0.00 | 0.37 | 16.39 | 0.91 | 60.21 |
| Textile and leather | 12.02 | 0.01 | 3.09 | 7.23 | - | - | 0.00 | 0.27 | 30.06 | 9.66 | 62.34 |
| Non-specified | 81.02 | 6.59 | 114.67 | 159.45 | - | - | 0.80 | 81.75 | 128.57 | 5.77 | 578.62 |
| TRANSPORT | 0.07 | 0.01 | 2533.20 | 101.89 | - | - | - | 81.97 | 30.73 | - | 2747.87 |
| World aviation bunkers | - | - | 186.31 | - | - | - | - | - | - | - | 186.31 |
| Domestic aviation | - | - | 118.95 | - | - | - | - | - | - | - | 118.95 |
| Road | - | - | 1926.98 | 41.97 | - | - | - | 81.57 | 4.38 | - | 2054.90 |
| Rail | 0.06 | - | 28.68 | - | - | - | - | 0.31 | 21.06 | - | 50.11 |
| Pipeline transport | - | 0.01 | 0.36 | 59.69 | - | - | - | - | 2.75 | - | 62.81 |
| World marine bunkers | - | - | 212.15 | 0.05 | - | - | - | - | - | - | 212.19 |
| Domestic navigation | - | - | 50.31 | 0.10 | - | - | - | 0.09 | - | - | 50.50 |
| Non-specified | 0.01 | 0.01 | 9.45 | 0.07 | - | - | - | 0.01 | 2.54 | - | 12.09 |
| OTHER | 152.78 | 0.02 | 423.17 | 631.82 | - | - | 42.71 | 770.58 | 1016.51 | 147.61 | 3185.21 |
| Residential | 72.73 | - | 209.30 | 431.24 | - | - | 31.64 | 728.60 | 488.44 | 99.20 | 2061.15 |
| Comm. and public services | 33.90 | - | 85.72 | 187.45 | - | - | 7.88 | 28.28 | 395.52 | 36.99 | 775.73 |
| Agriculture/forestry | 16.08 | 0.01 | 104.20 | 9.66 | - | - | 2.07 | 9.84 | 52.79 | 3.21 | 197.87 |
| Fishing | 0.00 | - | 5.68 | 0.06 | - | - | 0.05 | 0.01 | 0.55 | 0.05 | 6.41 |
| Non-specified | 30.08 | 0.01 | 18.27 | 3.42 | - | - | 1.06 | 3.84 | 79.21 | 8.16 | 144.05 |
| NON-ENERGY USE | 55.70 | 8.00 | 637.17 | 168.78 | - | - | - | - | - | - | 869.64 |
| in industry/transf./energy | 55.38 | 8.00 | 595.49 | 168.78 | - | - | - | - | - | - | 827.64 |
| of which: chem./petrochem. | 3.47 | 7.95 | 447.24 | 167.62 | - | - | - | - | - | - | 626.28 |
| in transport | - | - | 9.77 | - | - | - | - | - | - | - | 9.77 |
| in other | 0.32 | - | 31.91 | - | - | - | - | - | - | - | 32.23 |
| Electricity and Heat Output | | | | | | | | | | | |
| Electr. Generated - TWh | 9594.34 | 130.17 | 801.18 | 5793.90 | 2605.99 | 4061.47 | 1411.78 | 570.57 | - | 3.63 | 24973.02 |
| Electricity plants | 7293.16 | 130.16 | 736.32 | 4513.76 | 2579.29 | 4061.47 | 1401.83 | 345.79 | - | 2.69 | 21064.47 |
| CHP plants | 2301.18 | 0.01 | 64.86 | 1280.14 | 26.69 | - | 9.95 | 224.78 | - | 0.94 | 3908.55 |
| Heat Generated - PJ | 6053.21 | 19.06 | 597.46 | 6091.67 | 26.63 | - | 450.67 | 1053.86 | 11.38 | 85.98 | 14389.92 |
| CHP plants | 5200.63 | 0.15 | 205.26 | 3939.71 | 26.63 | - | 26.11 | 620.64 | 0.48 | 43.37 | 10062.97 |
| Heat plants | 852.59 | 18.90 | 392.19 | 2151.97 | - | - | 424.57 | 433.22 | 10.90 | 42.61 | 4326.95 |

1. Includes peat and oil shale.

2. Includes crude oil, NGL, refinery feedstocks, additives and other hydrocarbons.

Source: IEA/OECD World Energy Balances.

Table 2. OECD energy balance in 2016

| Million tonnes of oil equivalent | | | | | | | | | | | |
|------------------------------------|-------------------|------------------------|----------------|----------------|----------------|----------------|--------------------------|------------------|---------------|--------------|-----------------|
| SUPPLY AND CONSUMPTION | Coal ¹ | Crude oil ² | Oil products | Natural gas | Nuclear | Hydro | Geotherm. / Solar / etc. | Biofuels / Waste | Electricity | Heat | Total |
| Production | 820.54 | 1093.97 | - | 1092.36 | 512.24 | 121.45 | 116.93 | 305.34 | - | 0.72 | 4063.54 |
| Imports | 380.43 | 1442.50 | 630.67 | 661.55 | - | - | - | 21.83 | 40.91 | 0.01 | 3177.90 |
| Exports | -347.32 | -421.59 | -672.12 | -349.44 | - | - | - | -14.06 | -41.12 | -0.01 | -1845.67 |
| Intl. marine bunkers | - | - | -77.13 | -0.05 | - | - | - | - | - | - | -77.18 |
| Intl. aviation bunkers | - | - | -99.13 | - | - | - | - | - | - | - | -99.13 |
| Stock changes | 39.26 | -1.74 | 0.82 | 17.14 | - | - | - | -0.17 | - | - | 55.31 |
| TPES | 892.90 | 2113.14 | -216.89 | 1421.57 | 512.24 | 121.45 | 116.93 | 312.93 | -0.22 | 0.73 | 5274.78 |
| Transfers | - | -96.02 | 110.46 | - | - | - | - | - | - | - | 14.44 |
| Statistical differences | 2.00 | -1.91 | 17.76 | -0.35 | - | - | 0.09 | 0.52 | 1.35 | -0.42 | 19.02 |
| Electricity plants | -629.40 | -2.40 | -41.39 | -424.01 | -505.16 | -121.45 | -103.12 | -50.78 | 844.34 | -0.41 | -1033.77 |
| CHP plants | -74.75 | - | -11.93 | -109.31 | -7.07 | - | -2.56 | -47.78 | 96.58 | 57.20 | -99.62 |
| Heat plants | -3.84 | - | -1.08 | -8.35 | - | - | -1.53 | -7.65 | -0.46 | 18.71 | -4.20 |
| Blast furnaces | -52.61 | - | -0.05 | -0.01 | - | - | - | - | - | - | -52.66 |
| Gas works | -2.20 | - | -1.85 | 3.20 | - | - | - | -0.26 | - | - | -1.11 |
| Coke/pat. fuel/BKB/PB plants | -11.31 | - | -0.93 | -0.03 | - | - | - | -0.12 | - | - | -12.39 |
| Oil refineries | - | -2048.87 | 2017.96 | - | - | - | - | - | - | - | -30.91 |
| Petrochemical plants | - | 32.13 | -32.23 | - | - | - | - | - | - | - | -0.10 |
| Liquefaction plants | -1.15 | 0.68 | - | - | - | - | - | - | - | - | -0.47 |
| Other transformation | -0.16 | 9.18 | -0.00 | -9.33 | - | - | - | -0.22 | - | -0.68 | -1.22 |
| Energy industry own use | -15.53 | -0.11 | -108.39 | -135.72 | - | - | -0.00 | -1.01 | -66.37 | -8.58 | -335.72 |
| Losses | -1.34 | - | -0.05 | -1.74 | - | - | -0.01 | -0.60 | -57.33 | -6.61 | -67.12 |
| TFC | 102.59 | 5.81 | 1731.38 | 735.92 | - | - | 9.79 | 205.60 | 817.89 | 59.94 | 3668.93 |
| INDUSTRY | 81.45 | 0.03 | 89.13 | 264.25 | - | - | 0.47 | 74.15 | 260.62 | 25.00 | 795.10 |
| Iron and steel | 33.70 | - | 2.50 | 24.96 | - | - | - | 0.06 | 27.55 | 0.70 | 89.48 |
| Chemical and petrochemical | 10.45 | 0.02 | 18.56 | 74.60 | - | - | 0.00 | 2.01 | 38.94 | 11.63 | 156.21 |
| Non-ferrous metals | 2.13 | - | 1.61 | 11.73 | - | - | 0.00 | 0.09 | 24.17 | 0.24 | 39.97 |
| Non-metallic minerals | 18.84 | - | 14.01 | 27.22 | - | - | 0.00 | 6.17 | 14.74 | 0.24 | 81.21 |
| Transport equipment | 0.35 | - | 1.08 | 8.55 | - | - | 0.00 | 0.02 | 13.42 | 0.73 | 24.15 |
| Machinery | 0.18 | - | 2.81 | 18.25 | - | - | 0.00 | 0.18 | 31.03 | 0.66 | 53.10 |
| Mining and quarrying | 0.40 | - | 10.31 | 4.55 | - | - | 0.00 | 0.13 | 10.46 | 0.12 | 25.95 |
| Food and tobacco | 5.62 | 0.00 | 4.38 | 38.29 | - | - | 0.00 | 4.70 | 22.64 | 1.96 | 77.59 |
| Paper, pulp and printing | 4.76 | - | 2.36 | 20.13 | - | - | 0.11 | 49.74 | 25.46 | 3.07 | 105.63 |
| Wood and wood products | 0.07 | - | 1.48 | 2.47 | - | - | - | 7.94 | 4.90 | 0.73 | 17.59 |
| Construction | 0.03 | - | 16.12 | 3.09 | - | - | 0.00 | 0.35 | 8.36 | 0.05 | 28.02 |
| Textile and leather | 0.87 | 0.01 | 0.64 | 4.63 | - | - | 0.00 | 0.11 | 6.18 | 0.68 | 13.12 |
| Non-specified | 4.05 | - | 13.25 | 25.81 | - | - | 0.36 | 2.64 | 32.76 | 4.19 | 83.07 |
| TRANSPORT | 0.01 | - | 1146.52 | 26.10 | - | - | - | 55.41 | 9.77 | - | 1237.81 |
| Domestic aviation | - | - | 76.70 | - | - | - | - | - | - | - | 76.70 |
| Road | - | - | 1031.12 | 4.18 | - | - | - | 55.01 | 0.58 | - | 1090.89 |
| Rail | 0.01 | - | 17.44 | - | - | - | - | 0.31 | 7.47 | - | 25.22 |
| Pipeline transport | - | - | 0.05 | 21.78 | - | - | - | - | 0.71 | - | 22.53 |
| Domestic navigation | - | - | 20.40 | 0.10 | - | - | - | 0.08 | - | - | 20.58 |
| Non-specified | - | - | 0.81 | 0.05 | - | - | - | 0.01 | 1.01 | - | 1.88 |
| OTHER | 18.21 | - | 175.77 | 407.93 | - | - | 9.32 | 76.05 | 547.51 | 34.94 | 1269.72 |
| Residential | 11.87 | - | 73.82 | 250.86 | - | - | 5.67 | 63.15 | 254.38 | 22.84 | 682.59 |
| Comm. and public services | 5.21 | - | 51.11 | 150.28 | - | - | 2.68 | 8.61 | 260.39 | 11.66 | 489.94 |
| Agriculture/forestry | 1.09 | - | 43.40 | 5.78 | - | - | 0.84 | 3.20 | 12.31 | 0.23 | 66.84 |
| Fishing | 0.00 | - | 4.13 | 0.04 | - | - | 0.05 | 0.01 | 0.40 | 0.04 | 4.66 |
| Non-specified | 0.04 | - | 3.31 | 0.96 | - | - | 0.08 | 1.09 | 20.03 | 0.18 | 25.68 |
| NON-ENERGY USE | 2.93 | 5.78 | 319.97 | 37.63 | - | - | - | - | - | - | 366.30 |
| in industry/transf./energy | 2.74 | 5.78 | 305.39 | 37.63 | - | - | - | - | - | - | 351.54 |
| of which: chem./petrochem. | 1.73 | 5.78 | 231.27 | 37.63 | - | - | - | - | - | - | 276.41 |
| in transport | - | - | 7.68 | - | - | - | - | - | - | - | 7.68 |
| in other | 0.18 | - | 6.90 | - | - | - | - | - | - | - | 7.08 |
| Electricity and Heat Output | | | | | | | | | | | |
| Electr. generated - TWh | 3043.76 | 11.72 | 231.25 | 3003.49 | 1965.45 | 1412.47 | 920.25 | 353.31 | - | 1.28 | 10942.97 |
| Electricity plants | 2755.70 | 11.72 | 187.97 | 2416.21 | 1938.76 | 1412.47 | 910.30 | 185.32 | - | 0.69 | 9819.13 |
| CHP plants | 288.06 | - | 43.28 | 587.28 | 26.69 | - | 9.95 | 167.99 | - | 0.59 | 1123.84 |
| Heat generated - PJ | 744.30 | - | 165.45 | 1336.85 | 5.04 | - | 87.09 | 818.52 | 8.85 | 42.44 | 3208.53 |
| CHP plants | 613.20 | - | 134.17 | 1053.38 | 5.04 | - | 26.11 | 562.94 | 0.48 | 19.48 | 2414.79 |
| Heat plants | 131.10 | - | 31.28 | 283.47 | - | - | 60.98 | 255.57 | 8.38 | 22.97 | 793.74 |

1. Includes peat and oil shale.

2. Includes crude oil, NGL, refinery feedstocks, additives and other hydrocarbons.

Source: IEA/OECD *World Energy Balances*.

Table 3. Share of renewables in TPES in 2016

| | TPES Mtoe | Of which: renewables Mtoe | Share of renewables in TPES ¹ (%) | Share of main fuel categories in total renewables (%) | | |
|--|----------------|---------------------------------|---|---|----------------------------------|---------------------------------|
| | | | | Hydro | Geothermal, solar, wind, tide | Biofuels and renewable waste |
| Africa | 817.8 | 405.2 | 49.5 | 2.5 | 1.3 | 96.3 |
| Non-OECD Americas | 617.1 | 190.6 | 30.9 | 30.5 | 4.3 | 65.3 |
| Non-OECD Asia excluding China | 1816.3 | 447.5 | 24.6 | 6.9 | 7.7 | 85.4 |
| China | 2972.5 | 266.6 | 9.0 | 37.5 | 22.0 | 40.5 |
| Non-OECD Europe and Eurasia | 1130.4 | 47.9 | 4.2 | 56.6 | 3.7 | 39.7 |
| Middle East | 734.1 | 3.1 | 0.4 | 57.9 | 13.5 | 28.6 |
| OECD | 5274.8 | 520.9 | 9.9 | 23.3 | 22.3 | 54.4 |
| World Marine & Aviation Bunkers | 398.5 | x | x | x | x | x |
| World | 13761.4 | 1881.8 | 13.7 | 18.6 | 12.0 | 69.5 |
| Albania | 2.3 | 1.0 | 42.2 | 70.4 | 1.3 | 28.3 |
| Algeria | 53.7 | 0.0 | 0.1 | 54.0 | 28.7 | 17.3 |
| Angola | 16.3 | 8.8 | 53.8 | 5.7 | - | 94.3 |
| Argentina | 86.3 | 6.6 | 7.7 | 48.3 | 0.7 | 50.9 |
| Armenia | 3.0 | 0.3 | 11.5 | 58.1 | 0.1 | 41.9 |
| Australia | 129.8 | 8.3 | 6.4 | 15.6 | 23.4 | 61.0 |
| Austria | 33.3 | 10.1 | 30.2 | 34.1 | 7.6 | 58.3 |
| Azerbaijan | 14.2 | 0.2 | 1.7 | 69.9 | 2.1 | 28.0 |
| Bahrain | 14.2 | - | - | - | - | - |
| Bangladesh | 39.6 | 9.5 | 24.0 | 0.5 | 0.2 | 99.3 |
| Belarus | 25.0 | 1.4 | 5.5 | 0.9 | 0.6 | 98.5 |
| Belgium | 56.5 | 3.9 | 6.9 | 0.8 | 19.4 | 79.8 |
| Benin | 4.5 | 2.5 | 56.0 | 0.1 | 0.0 | 99.9 |
| Bolivia | 8.8 | 1.3 | 14.5 | 11.6 | 0.3 | 88.1 |
| Bosnia and Herzegovina | 6.8 | 1.1 | 15.6 | 46.1 | 0.2 | 53.7 |
| Botswana | 2.6 | 0.6 | 21.2 | - | 0.0 | 100.0 |
| Brazil | 284.5 | 121.7 | 42.8 | 26.9 | 3.0 | 70.1 |
| Brunei Darussalam | 3.0 | 0.0 | 0.0 | - | 100.0 | - |
| Bulgaria | 18.2 | 1.9 | 10.7 | 17.4 | 15.4 | 67.2 |
| Cambodia | 7.6 | 4.6 | 60.2 | 4.9 | 0.0 | 95.1 |
| Cameroon | 9.3 | 6.8 | 73.0 | 5.9 | - | 94.1 |
| Canada | 280.1 | 48.8 | 17.4 | 68.2 | 6.0 | 25.7 |
| Chile | 37.8 | 10.2 | 27.1 | 19.5 | 4.6 | 75.9 |
| China (People's Rep. of) | 2958.0 | 266.5 | 9.0 | 37.5 | 22.0 | 40.5 |
| Colombia | 40.0 | 9.7 | 24.1 | 43.6 | 0.0 | 56.3 |
| Congo | 2.7 | 1.6 | 61.0 | 5.0 | - | 95.0 |
| Costa Rica | 5.1 | 2.6 | 50.5 | 26.9 | 49.1 | 24.1 |
| Cote d'Ivoire | 12.5 | 9.5 | 75.9 | 1.4 | - | 98.6 |
| Croatia | 8.5 | 2.0 | 23.6 | 29.4 | 5.7 | 64.9 |
| Cuba | 9.6 | 1.3 | 13.9 | 0.4 | 0.4 | 99.2 |
| Cyprus ² | 2.2 | 0.2 | 7.1 | - | 67.1 | 32.9 |
| Czech Republic | 41.5 | 4.3 | 10.4 | 4.0 | 5.7 | 90.3 |
| DPR of Korea | 8.8 | 2.2 | 25.0 | 49.8 | - | 50.2 |
| Dem. Rep. of the Congo | 29.6 | 29.0 | 97.9 | 2.7 | - | 97.3 |
| Denmark | 16.5 | 5.0 | 30.3 | 0.0 | 24.3 | 75.6 |
| Dominican Republic | 8.8 | 1.1 | 12.7 | 14.7 | 9.4 | 75.9 |
| Ecuador | 14.3 | 2.2 | 15.0 | 63.3 | 0.6 | 36.1 |
| Egypt | 86.2 | 3.2 | 3.7 | 36.4 | 6.0 | 57.6 |
| El Salvador | 4.4 | 2.0 | 46.2 | 5.4 | 67.1 | 27.6 |
| Eritrea | 0.9 | 0.7 | 78.0 | - | 0.0 | 100.0 |
| Estonia | 5.5 | 1.0 | 17.5 | 0.3 | 5.3 | 94.4 |
| Ethiopia | 51.5 | 48.0 | 93.2 | 1.9 | 0.1 | 98.0 |

1. Share may exceed 100% due to large hydro production included in renewables and electricity trade in the TPES calculations. 2. Please refer to Part I Section 3, Geographical coverage

Source: IEA/OECD World Energy Balances.

Table 3. Share of renewables in TPES in 2016 (continued)

| | TPES Mtoe | Of which: renewables Mtoe | Share of renewables in TPES ¹ (%) | Share of main fuel categories in total renewables (%) | | |
|-------------------------------|--------------|---------------------------------|---|---|----------------------------------|---------------------------------|
| | | | | Hydro | Geothermal, solar, wind, tide | Biofuels and renewable waste |
| Finland | 34.0 | 10.6 | 31.2 | 12.8 | 2.5 | 84.7 |
| France | 244.3 | 24.6 | 10.1 | 21.0 | 11.9 | 67.1 |
| FYR of Macedonia | 2.7 | 0.4 | 14.3 | 42.9 | 4.5 | 52.6 |
| Gabon | 5.3 | 4.0 | 75.1 | 2.0 | 0.0 | 97.9 |
| Georgia | 4.8 | 1.2 | 25.2 | 66.3 | 1.8 | 31.9 |
| Germany | 310.1 | 38.9 | 12.5 | 4.5 | 28.2 | 67.3 |
| Ghana | 9.4 | 4.1 | 43.5 | 11.7 | 0.1 | 88.2 |
| Gibraltar | 0.2 | - | - | - | - | - |
| Greece | 22.7 | 2.6 | 11.6 | 18.1 | 37.5 | 44.4 |
| Guatemala | 14.1 | 9.1 | 64.5 | 3.8 | 3.6 | 92.6 |
| Haiti | 4.3 | 3.4 | 77.5 | 0.2 | - | 99.8 |
| Honduras | 5.8 | 2.9 | 49.6 | 7.0 | 4.3 | 88.7 |
| Hong Kong, China | 14.5 | 0.1 | 0.7 | - | 0.2 | 99.8 |
| Hungary | 25.6 | 3.0 | 11.7 | 0.7 | 6.9 | 92.3 |
| Iceland | 5.3 | 4.6 | 87.2 | 25.1 | 74.5 | 0.4 |
| India | 862.4 | 208.9 | 24.2 | 5.7 | 2.8 | 91.6 |
| Indonesia | 230.2 | 77.5 | 33.7 | 2.1 | 23.6 | 74.2 |
| Islamic Rep. of Iran | 247.7 | 1.9 | 0.8 | 72.5 | 1.1 | 26.4 |
| Iraq | 55.6 | 0.3 | 0.6 | 85.0 | - | 15.0 |
| Ireland | 13.9 | 1.1 | 7.9 | 5.3 | 49.1 | 45.7 |
| Israel | 22.9 | 0.6 | 2.4 | - | 92.0 | 8.0 |
| Italy | 151.0 | 26.0 | 17.2 | 14.0 | 35.3 | 50.6 |
| Jamaica | 2.9 | 0.4 | 12.6 | 2.8 | 4.7 | 92.5 |
| Japan | 425.6 | 22.3 | 5.2 | 30.5 | 33.6 | 36.0 |
| Jordan | 9.0 | 0.3 | 3.0 | 1.3 | 88.7 | 9.9 |
| Kazakhstan | 81.6 | 1.1 | 1.4 | 87.8 | 2.8 | 9.4 |
| Kenya | 26.0 | 20.8 | 79.9 | 1.4 | 17.4 | 81.2 |
| Korea | 282.4 | 4.3 | 1.5 | 5.7 | 19.0 | 75.3 |
| Kuwait | 35.8 | 0.0 | 0.0 | - | 100.0 | - |
| Kyrgyzstan | 3.9 | 1.0 | 25.6 | 99.9 | - | 0.1 |
| Latvia | 4.3 | 1.6 | 38.2 | 13.4 | 0.7 | 85.9 |
| Lebanon | 7.8 | 0.2 | 2.4 | 17.6 | 13.0 | 69.3 |
| Libyan Arab Jamahiriya | 15.1 | 0.2 | 1.0 | - | 0.4 | 99.6 |
| Lithuania | 7.2 | 1.5 | 20.2 | 2.7 | 7.2 | 90.1 |
| Luxembourg | 3.7 | 0.2 | 6.0 | 4.5 | 8.7 | 86.8 |
| Malaysia | 88.9 | 3.7 | 4.2 | 46.6 | 0.7 | 52.6 |
| Malta | 0.6 | 0.0 | 4.2 | - | 60.1 | 39.9 |
| Mauritius | 1.5 | 0.2 | 15.0 | 3.7 | 1.8 | 94.5 |
| Mexico | 185.2 | 15.6 | 8.4 | 16.9 | 27.7 | 55.4 |
| Republic of Moldova | 3.8 | 0.7 | 18.9 | 2.7 | 0.1 | 97.2 |
| Mongolia | 5.0 | 0.2 | 3.3 | 3.1 | 8.5 | 88.3 |
| Morocco | 19.5 | 1.6 | 8.4 | 6.6 | 15.7 | 77.8 |
| Mozambique | 13.2 | 11.0 | 83.1 | 12.2 | - | 87.8 |
| Myanmar | 19.3 | 11.0 | 57.0 | 7.6 | - | 92.4 |
| Namibia | 2.0 | 0.4 | 20.0 | 29.0 | 0.7 | 70.2 |
| Nepal | 12.8 | 10.0 | 77.8 | 3.6 | 0.0 | 96.3 |
| Netherlands | 74.5 | 3.8 | 5.1 | 0.2 | 24.7 | 75.1 |
| Netherland Antilles / Curaçao | 1.8 | 0.0 | 1.1 | - | 100.0 | - |
| New Zealand | 21.0 | 8.7 | 41.5 | 25.4 | 57.7 | 16.9 |
| Nicaragua | 3.9 | 2.2 | 54.9 | 1.7 | 31.1 | 67.2 |

1. Share may exceed 100% due to large hydro production included in renewables and electricity trade in the TPES calculations.

Source: IEA/OECD *World Energy Balances*.

Table 3. Share of renewables in TPES in 2016 (continued)

| | TPES Mtoe | Of which: renewables Mtoe | Share of renewables in TPES ¹ (%) | Share of main fuel categories in total renewables (%) | | |
|-------------------------|--------------|---------------------------------|---|---|----------------------------------|---------------------------------|
| | | | | Hydro | Geothermal, solar, wind, tide | Biofuels and renewable waste |
| Niger | 2.9 | 2.3 | 78.4 | - | 0.0 | 100.0 |
| Nigeria | 150.0 | 114.6 | 76.4 | 0.4 | - | 99.6 |
| Norway | 27.2 | 13.9 | 51.2 | 88.2 | 1.3 | 10.5 |
| Oman | 24.1 | - | - | - | - | - |
| Pakistan | 95.7 | 37.0 | 38.6 | 8.5 | 0.2 | 91.2 |
| Panama | 4.5 | 0.9 | 21.1 | 59.4 | 6.3 | 34.2 |
| Paraguay | 5.9 | 7.9 | 134.0 | 69.2 | - | 30.8 |
| Peru | 24.1 | 5.1 | 21.0 | 40.9 | 2.9 | 56.2 |
| Philippines | 54.8 | 18.7 | 34.1 | 3.7 | 51.9 | 44.3 |
| Poland | 99.3 | 8.8 | 8.8 | 2.1 | 13.3 | 84.6 |
| Portugal | 22.1 | 5.6 | 25.4 | 24.1 | 24.6 | 51.3 |
| Qatar | 42.3 | - | - | - | - | - |
| Romania | 31.7 | 6.2 | 19.5 | 25.0 | 12.3 | 62.7 |
| Russian Federation | 732.4 | 19.0 | 2.6 | 83.7 | 0.9 | 15.4 |
| Saudi Arabia | 210.4 | 0.0 | 0.0 | - | 1.1 | 98.9 |
| Senegal | 4.3 | 1.6 | 36.5 | 2.0 | 0.0 | 98.0 |
| Serbia | 15.3 | 2.0 | 13.1 | 46.4 | 0.4 | 53.2 |
| Singapore | 27.4 | 0.4 | 1.5 | - | 2.9 | 97.1 |
| Slovak Republic | 16.5 | 1.6 | 9.6 | 23.8 | 3.8 | 72.4 |
| Slovenia | 6.8 | 1.1 | 16.6 | 34.4 | 7.0 | 58.5 |
| South Africa | 140.4 | 13.0 | 9.3 | 0.5 | 6.1 | 93.5 |
| South Sudan | 0.8 | 0.2 | 24.9 | - | 0.1 | 99.9 |
| Spain | 119.8 | 17.4 | 14.5 | 18.0 | 42.5 | 39.6 |
| Sri Lanka | 11.7 | 5.1 | 43.4 | 7.1 | 0.6 | 92.2 |
| Sudan | 18.5 | 12.2 | 66.2 | 5.7 | - | 94.3 |
| Suriname | 0.6 | 0.1 | 21.4 | 78.7 | - | 21.3 |
| Sweden | 49.2 | 18.3 | 37.1 | 29.2 | 7.4 | 63.4 |
| Switzerland | 23.9 | 5.3 | 22.3 | 55.8 | 10.6 | 33.6 |
| Syrian Arab Republic | 9.9 | 0.1 | 0.9 | 93.4 | - | 6.6 |
| Chinese Taipei | 109.7 | 1.7 | 1.6 | 33.1 | 19.1 | 47.7 |
| Tajikistan | 2.9 | 1.4 | 49.6 | 100.0 | - | - |
| United Rep. of Tanzania | 26.5 | 22.8 | 86.2 | 0.9 | 0.0 | 99.1 |
| Thailand | 138.5 | 29.1 | 21.0 | 2.1 | 1.1 | 96.8 |
| Togo | 3.5 | 2.8 | 79.5 | 0.6 | - | 99.4 |
| Trinidad and Tobago | 18.3 | 0.0 | 0.1 | - | - | 100.0 |
| Tunisia | 11.0 | 1.2 | 10.7 | 0.3 | 8.1 | 91.5 |
| Turkey | 136.7 | 17.1 | 12.5 | 33.7 | 48.3 | 17.9 |
| Turkmenistan | 27.6 | 0.0 | 0.0 | - | - | 100.0 |
| Ukraine | 94.4 | 3.6 | 3.8 | 18.2 | 3.4 | 78.3 |
| United Arab Emirates | 74.3 | 0.1 | 0.2 | - | 62.2 | 37.8 |
| United Kingdom | 178.9 | 15.4 | 8.6 | 3.0 | 27.1 | 69.9 |
| United States | 2166.6 | 156.2 | 7.2 | 14.8 | 22.8 | 62.4 |
| Uruguay | 5.2 | 3.1 | 58.9 | 21.9 | 8.8 | 69.3 |
| Uzbekistan | 37.6 | 1.0 | 2.7 | 99.6 | - | 0.4 |
| Venezuela | 56.2 | 6.5 | 11.7 | 88.8 | - | 11.2 |
| Viet Nam | 81.0 | 21.2 | 26.2 | 26.0 | 0.1 | 73.9 |
| Yemen | 2.9 | 0.2 | 6.2 | - | 34.5 | 65.5 |
| Zambia | 11.1 | 9.8 | 87.8 | 9.7 | - | 90.3 |
| Zimbabwe | 11.1 | 8.0 | 72.1 | 3.2 | - | 96.8 |

1. Share may exceed 100% due to large hydro production included in renewables and electricity trade in the TPES calculations.

Source: IEA/OECD *World Energy Balances*.

Table 4. Share of renewables in TFC in 2016

| | TFC Mtoe | Of which: renewables Mtoe | Share of renewables in TFC (%) | Share of main fuel categories in total renewables (%) | | | |
|--|---------------|---------------------------------|---|---|-------------------------------------|----------------|-----------------|
| | | | | Geothermal and Solar thermal | Renewable wastes and Biogases | Solid biofuels | Liquid biofuels |
| Africa | 594.1 | 319.7 | 53.8 | 0.1 | 0.0 | 99.9 | 0.0 |
| Non-OECD Americas | 461.4 | 93.6 | 20.3 | 0.9 | 0.0 | 79.2 | 20.0 |
| Non-OECD Asia excluding China | 1257.5 | 330.9 | 26.3 | 0.2 | 0.3 | 97.9 | 1.6 |
| China | 1978.5 | 116.9 | 5.9 | 27.1 | 6.2 | 64.7 | 2.0 |
| Non-OECD Europe and Eurasia | 713.5 | 15.5 | 2.2 | 1.4 | 0.5 | 94.0 | 4.0 |
| Middle East | 483.0 | 1.0 | 0.2 | 18.7 | - | 81.3 | - |
| OECD | 3668.9 | 205.8 | 5.6 | 4.8 | 2.2 | 65.4 | 27.6 |
| World Marine & Aviation Bunkers | 398.5 | x | x | x | x | x | x |
| World | 9555.3 | 1083.4 | 11.3 | 4.0 | 1.2 | 87.1 | 7.7 |
| Albania | 2.0 | 0.3 | 14.3 | 4.5 | - | 67.3 | 28.2 |
| Algeria | 37.8 | 0.0 | 0.0 | - | - | 100.0 | - |
| Angola | 12.3 | 6.2 | 50.2 | - | - | 100.0 | - |
| Argentina | 62.0 | 2.7 | 4.3 | - | - | 52.9 | 47.1 |
| Armenia | 2.1 | 0.1 | 6.9 | - | - | 100.0 | - |
| Australia | 81.3 | 4.5 | 5.5 | 7.9 | 1.7 | 86.8 | 3.6 |
| Austria | 27.8 | 4.0 | 14.5 | 4.7 | 1.5 | 79.8 | 14.1 |
| Azerbaijan | 9.0 | 0.0 | 0.3 | - | - | 100.0 | - |
| Bahrain | 6.4 | - | - | - | - | - | - |
| Bangladesh | 28.8 | 9.3 | 32.2 | - | - | 100.0 | - |
| Belarus | 18.4 | 0.6 | 3.3 | - | 0.1 | 97.1 | 2.9 |
| Belgium | 42.2 | 1.9 | 4.5 | 1.2 | 5.2 | 70.0 | 23.6 |
| Benin | 3.8 | 1.9 | 49.8 | - | - | 100.0 | - |
| Bolivia | 7.0 | 0.9 | 13.2 | - | - | 100.0 | - |
| Bosnia and Herzegovina | 3.7 | 0.6 | 15.8 | - | - | 100.0 | - |
| Botswana | 2.0 | 0.6 | 28.1 | - | - | 100.0 | - |
| Brazil | 224.3 | 61.5 | 27.4 | 1.2 | - | 71.9 | 26.9 |
| Brunei Darussalam | 1.3 | - | - | - | - | - | - |
| Bulgaria | 10.0 | 1.3 | 12.7 | 4.5 | 4.1 | 78.8 | 12.6 |
| Cambodia | 6.4 | 3.7 | 58.5 | - | - | 100.0 | - |
| Cameroon | 7.3 | 5.4 | 73.3 | - | 0.0 | 100.0 | - |
| Canada | 191.4 | 9.5 | 5.0 | 0.4 | 0.8 | 80.8 | 18.0 |
| Chile | 26.5 | 3.7 | 14.1 | 0.9 | 0.1 | 99.0 | - |
| China (People's Rep. of) | 1969.4 | 116.8 | 5.9 | 27.1 | 6.2 | 64.7 | 2.0 |
| Colombia | 29.7 | 5.0 | 16.7 | - | - | 99.3 | 0.7 |
| Congo | 2.1 | 1.3 | 60.4 | - | - | 100.0 | - |
| Costa Rica | 3.9 | 0.6 | 15.1 | - | 0.0 | 100.0 | - |
| Cote d'Ivoire | 7.2 | 4.4 | 60.8 | - | - | 100.0 | - |
| Croatia | 7.0 | 1.2 | 16.7 | 1.8 | - | 98.2 | 0.1 |
| Cuba | 6.4 | 1.0 | 16.2 | - | - | 78.1 | 21.9 |
| Cyprus ² | 1.5 | 0.1 | 7.3 | 63.6 | 13.0 | 15.5 | 7.9 |
| Czech Republic | 25.4 | 2.8 | 11.0 | 0.7 | 6.7 | 81.8 | 10.8 |
| DPR of Korea | 7.4 | 0.9 | 12.0 | - | - | 100.0 | - |
| Dem. Rep. of the Congo | 21.9 | 20.7 | 94.3 | - | - | 100.0 | - |
| Denmark | 13.7 | 1.6 | 11.4 | 0.9 | 6.5 | 77.5 | 15.1 |
| Dominican Republic | 6.0 | 0.8 | 12.9 | 1.1 | - | 98.9 | - |
| Ecuador | 11.6 | 0.5 | 4.3 | 0.5 | - | 95.8 | 3.7 |
| Egypt | 58.0 | 1.8 | 3.2 | - | - | 100.0 | - |
| El Salvador | 2.5 | 0.2 | 9.8 | - | - | 100.0 | - |
| Eritrea | 0.6 | 0.5 | 79.9 | - | - | 100.0 | - |
| Estonia | 2.9 | 0.4 | 14.2 | - | 1.2 | 98.2 | 0.6 |
| Ethiopia | 42.1 | 37.9 | 89.9 | - | - | 100.0 | 0.0 |

Source: IEA/OECD World Energy Balances.

Table 4. Share of renewables in TFC in 2016 (continued)

| | TFC Mtoe | Of which: renewables Mtoe | Share of renewables in TFC (%) | Share of main fuel categories in total renewables (%) | | | |
|-------------------------------|-------------|---------------------------------|---|---|-------------------------------------|----------------|-----------------|
| | | | | Geothermal and Solar thermal | Renewable wastes and Biogases | Solid biofuels | Liquid biofuels |
| Finland | 26.0 | 5.4 | 20.7 | 0.0 | 1.2 | 95.4 | 3.4 |
| France | 152.2 | 12.4 | 8.2 | 1.0 | 2.4 | 71.5 | 25.0 |
| FYR of Macedonia | 2.0 | 0.2 | 10.2 | 2.5 | - | 97.5 | - |
| Gabon | 4.9 | 3.9 | 80.4 | - | - | 100.0 | - |
| Georgia | 4.3 | 0.4 | 9.3 | 4.5 | - | 95.5 | - |
| Germany | 223.9 | 14.3 | 6.4 | 5.3 | 13.0 | 62.7 | 19.1 |
| Ghana | 6.8 | 2.4 | 35.4 | - | - | 100.0 | - |
| Gibraltar | 0.2 | - | - | - | - | - | - |
| Greece | 16.4 | 1.3 | 7.9 | 16.3 | 1.1 | 69.4 | 13.2 |
| Guatemala | 10.9 | 6.3 | 58.5 | - | - | 100.0 | - |
| Haiti | 3.3 | 2.5 | 75.9 | - | - | 100.0 | - |
| Honduras | 4.9 | 2.4 | 48.9 | - | - | 100.0 | - |
| Hong Kong, China | 9.1 | 0.1 | 0.7 | - | - | 91.6 | 8.4 |
| Hungary | 19.4 | 2.2 | 11.1 | 2.9 | 0.8 | 87.7 | 8.7 |
| Iceland | 3.0 | 0.1 | 3.3 | 82.2 | 1.7 | 1.4 | 14.7 |
| India | 572.3 | 163.6 | 28.6 | 0.4 | - | 99.2 | 0.4 |
| Indonesia | 164.7 | 56.2 | 34.1 | - | - | 96.3 | 3.7 |
| Islamic Rep. of Iran | 188.5 | 0.5 | 0.3 | - | - | 100.0 | - |
| Iraq | 18.5 | 0.0 | 0.2 | - | - | 100.0 | - |
| Ireland | 10.9 | 0.4 | 3.4 | 3.8 | 12.8 | 51.6 | 31.8 |
| Israel | 15.2 | 0.4 | 2.7 | 93.7 | - | 6.3 | - |
| Italy | 117.9 | 8.0 | 6.8 | 4.0 | 0.5 | 82.5 | 12.9 |
| Jamaica | 1.9 | 0.2 | 10.8 | - | - | 84.1 | 15.9 |
| Japan | 294.0 | 4.6 | 1.5 | 9.4 | - | 82.1 | 8.5 |
| Jordan | 6.1 | 0.2 | 3.4 | 78.3 | - | 21.7 | - |
| Kazakhstan | 37.7 | 0.1 | 0.2 | - | - | 100.0 | - |
| Kenya | 16.5 | 11.2 | 67.9 | - | - | 100.0 | - |
| Korea | 178.7 | 1.8 | 1.0 | 10.3 | 14.6 | 48.2 | 26.9 |
| Kuwait | 19.2 | - | - | - | - | - | - |
| Kyrgyzstan | 3.5 | 0.0 | 0.0 | - | - | 100.0 | - |
| Latvia | 3.8 | 0.9 | 23.5 | - | 0.9 | 97.7 | 1.4 |
| Lebanon | 5.0 | 0.1 | 2.8 | 17.4 | - | 82.6 | - |
| Libyan Arab Jamahiriya | 10.0 | 0.2 | 1.5 | - | - | 100.0 | - |
| Lithuania | 6.0 | 0.7 | 11.4 | - | 1.2 | 90.5 | 8.3 |
| Luxembourg | 3.6 | 0.1 | 4.1 | 1.4 | 3.1 | 33.9 | 61.6 |
| Malaysia | 55.9 | 1.2 | 2.2 | - | - | 68.6 | 31.4 |
| Malta | 0.5 | 0.0 | 2.6 | 35.8 | 4.9 | 9.0 | 50.4 |
| Mauritius | 0.8 | 0.0 | 3.8 | - | - | 100.0 | - |
| Mexico | 121.8 | 7.2 | 5.9 | 3.4 | - | 96.6 | - |
| Republic of Moldova | 2.8 | 0.7 | 24.3 | - | - | 100.0 | - |
| Mongolia | 3.3 | 0.1 | 2.8 | - | - | 100.0 | - |
| Morocco | 15.4 | 1.2 | 8.1 | - | - | 100.0 | - |
| Mozambique | 10.7 | 7.7 | 72.3 | - | - | 100.0 | - |
| Myanmar | 16.5 | 10.1 | 61.3 | - | - | 100.0 | - |
| Namibia | 1.8 | 0.2 | 9.4 | 1.7 | - | 98.3 | - |
| Nepal | 12.7 | 9.6 | 75.8 | - | 2.9 | 97.1 | - |
| Netherlands | 57.9 | 1.2 | 2.0 | 8.1 | 12.8 | 57.0 | 22.1 |
| Netherland Antilles / Curaçao | 0.7 | - | - | - | - | - | - |
| New Zealand | 14.6 | 1.5 | 10.1 | 12.9 | 0.4 | 86.5 | 0.2 |
| Nicaragua | 2.6 | 1.0 | 40.2 | - | - | 100.0 | - |

Source: IEA/OECD World Energy Balances.

Table 4. Share of renewables in TFC in 2016 (continued)

| | TFC Mtoe | Of which: renewables Mtoe | Share of renewables in TFC (%) | Share of main fuel categories in total renewables (%) | | | |
|-------------------------|-------------|---------------------------------|---|---|-------------------------------------|----------------|-----------------|
| | | | | Geothermal and Solar thermal | Renewable wastes and Biogases | Solid biofuels | Liquid biofuels |
| | | | | | | | |
| Niger | 2.8 | 2.2 | 79.6 | - | - | 100.0 | - |
| Nigeria | 129.6 | 105.2 | 81.2 | - | - | 100.0 | - |
| Norway | 20.6 | 1.1 | 5.4 | - | 4.8 | 64.0 | 31.2 |
| Oman | 20.3 | - | - | - | - | - | - |
| Pakistan | 81.6 | 32.8 | 40.2 | - | - | 100.0 | - |
| Panama | 3.6 | 0.3 | 7.1 | - | - | 100.0 | - |
| Paraguay | 5.2 | 2.1 | 40.9 | - | - | 93.2 | 6.8 |
| Peru | 18.2 | 2.6 | 14.3 | 1.3 | - | 84.6 | 14.1 |
| Philippines | 31.6 | 5.8 | 18.2 | - | - | 91.9 | 8.1 |
| Poland | 70.7 | 5.5 | 7.8 | 1.3 | 2.8 | 87.6 | 8.3 |
| Portugal | 16.1 | 2.2 | 13.5 | 3.9 | 0.4 | 83.0 | 12.7 |
| Qatar | 18.0 | - | - | - | - | - | - |
| Romania | 22.9 | 3.7 | 16.1 | 0.7 | 0.2 | 92.1 | 7.0 |
| Russian Federation | 469.8 | 2.3 | 0.5 | - | - | 100.0 | - |
| Saudi Arabia | 139.6 | 0.0 | 0.0 | - | - | 100.0 | - |
| Senegal | 3.0 | 1.1 | 36.6 | - | - | 100.0 | - |
| Serbia | 9.1 | 1.0 | 11.5 | 0.5 | 0.2 | 99.3 | - |
| Singapore | 18.4 | - | - | - | - | - | - |
| Slovak Republic | 10.3 | 0.6 | 5.6 | 1.2 | 6.0 | 67.6 | 25.2 |
| Slovenia | 5.0 | 0.6 | 12.7 | 8.6 | 0.3 | 88.2 | 2.9 |
| South Africa | 70.0 | 9.0 | 12.9 | 1.3 | - | 98.7 | - |
| South Sudan | 0.5 | 0.2 | 28.5 | - | - | 100.0 | - |
| Spain | 82.3 | 5.5 | 6.7 | 5.7 | 1.0 | 73.0 | 20.3 |
| Sri Lanka | 9.8 | 4.6 | 46.9 | - | - | 100.0 | - |
| Sudan | 12.4 | 6.9 | 55.5 | - | - | 100.0 | - |
| Suriname | 0.5 | 0.0 | 5.1 | - | - | 100.0 | - |
| Sweden | 33.3 | 6.8 | 20.3 | 0.2 | 2.2 | 79.6 | 18.0 |
| Switzerland | 19.2 | 1.5 | 7.8 | 29.4 | 5.7 | 60.0 | 4.9 |
| Syrian Arab Republic | 6.4 | 0.0 | 0.1 | - | - | 100.0 | - |
| Chinese Taipei | 70.3 | 0.2 | 0.3 | 52.6 | 4.0 | 43.5 | - |
| Tajikistan | 2.5 | - | - | - | - | - | - |
| United Rep. of Tanzania | 23.2 | 19.8 | 85.2 | - | - | 100.0 | - |
| Thailand | 97.5 | 13.8 | 14.1 | - | 4.9 | 83.4 | 11.7 |
| Togo | 2.3 | 1.5 | 67.3 | - | - | 100.0 | - |
| Trinidad and Tobago | 12.9 | 0.0 | 0.1 | - | - | 100.0 | - |
| Tunisia | 8.0 | 0.9 | 11.5 | 5.4 | - | 94.6 | - |
| Turkey | 97.8 | 5.4 | 5.5 | 50.2 | - | 47.8 | 2.0 |
| Turkmenistan | 18.0 | 0.0 | 0.1 | - | - | 100.0 | - |
| Ukraine | 51.6 | 1.7 | 3.3 | - | - | 97.8 | 2.2 |
| United Arab Emirates | 52.6 | 0.0 | 0.1 | - | - | 100.0 | - |
| United Kingdom | 128.2 | 4.1 | 3.2 | 1.3 | 5.9 | 69.8 | 23.1 |
| United States | 1515.0 | 82.3 | 5.4 | 2.7 | 0.5 | 48.3 | 48.5 |
| Uruguay | 4.7 | 1.8 | 39.0 | - | - | 95.4 | 4.6 |
| Uzbekistan | 26.8 | 0.0 | 0.0 | - | - | 100.0 | - |
| Venezuela | 32.7 | 0.7 | 2.2 | - | - | 100.0 | - |
| Viet Nam | 64.9 | 14.7 | 22.7 | 0.0 | - | 100.0 | - |
| Yemen | 2.4 | 0.1 | 2.4 | - | - | 100.0 | - |
| Zambia | 8.8 | 6.9 | 77.8 | - | - | 100.0 | - |
| Zimbabwe | 9.7 | 7.7 | 79.9 | - | - | 99.6 | 0.4 |

Source: IEA/OECD *World Energy Balances*.

Table 5. Contribution of renewable¹ energy sources to TPES (%)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|--------------------------|------|------|------|------|------|------|-------|-------------------------------------|
| <i>OECD Total</i> | 6.0 | 6.0 | 7.8 | 9.4 | 9.6 | 9.9 | 10.2 | 3.1 |
| <i>OECD Americas</i> | 6.7 | 6.3 | 7.1 | 8.4 | 8.4 | 8.6 | 9.1 | 2.2 |
| <i>OECD Asia Oceania</i> | 4.0 | 3.4 | 3.8 | 4.6 | 4.9 | 5.0 | 5.2 | 2.6 |
| <i>OECD Europe</i> | 5.8 | 7.0 | 10.8 | 13.6 | 14.0 | 14.3 | 14.4 | 4.4 |
| <i>IEA Total</i> | 5.9 | 5.9 | 7.6 | 9.2 | 9.4 | 9.7 | 10.0 | 3.1 |
| <i>Non-OECD Total</i> | 21.0 | 21.7 | 16.5 | 16.1 | 16.4 | 16.8 | .. | .. |
| <i>World</i> | 12.8 | 12.8 | 12.4 | 13.1 | 13.3 | 13.7 | .. | .. |
| Australia | 5.9 | 5.9 | 5.2 | 6.3 | 6.4 | 6.4 | 6.7 | 0.8 |
| Austria | 20.2 | 23.0 | 26.8 | 30.3 | 29.6 | 30.2 | 29.7 | 1.5 |
| Belgium | 1.0 | 1.1 | 4.7 | 6.4 | 6.9 | 6.9 | 7.4 | 11.9 |
| Canada | 17.2 | 17.6 | 16.7 | 17.5 | 17.6 | 17.4 | 17.3 | -0.1 |
| Chile | 27.8 | 25.1 | 22.1 | 27.5 | 27.3 | 27.1 | 26.4 | 0.3 |
| Czech Republic | 2.3 | 3.9 | 6.9 | 9.9 | 10.2 | 10.4 | 10.3 | 5.9 |
| Denmark | 5.9 | 9.6 | 20.1 | 28.0 | 29.8 | 30.3 | 34.9 | 7.9 |
| Estonia | 2.0 | 10.9 | 15.1 | 14.9 | 16.5 | 17.5 | 16.9 | 2.6 |
| Finland | 19.3 | 23.9 | 25.5 | 30.2 | 32.2 | 31.2 | 32.6 | 1.8 |
| France | 6.8 | 6.3 | 8.1 | 8.9 | 9.0 | 10.1 | 9.8 | 2.7 |
| Germany | 1.5 | 2.7 | 8.4 | 11.6 | 12.4 | 12.5 | 13.5 | 10.0 |
| Greece | 5.2 | 5.2 | 7.7 | 10.6 | 12.0 | 11.6 | 11.2 | 4.6 |
| Hungary | 2.6 | 3.3 | 10.5 | 12.0 | 12.0 | 11.7 | 10.9 | 7.2 |
| Iceland | 71.4 | 77.4 | 88.5 | 89.1 | 88.3 | 87.2 | 88.5 | 0.8 |
| Ireland | 1.7 | 1.7 | 4.6 | 7.5 | 8.1 | 7.9 | 9.4 | 10.6 |
| Israel | 3.2 | 3.3 | 5.0 | 2.3 | 2.3 | 2.4 | 2.4 | -1.9 |
| Italy | 4.4 | 5.9 | 12.6 | 18.1 | 17.2 | 17.2 | 17.0 | 6.4 |
| Japan | 3.4 | 3.1 | 3.7 | 4.6 | 5.1 | 5.2 | 5.5 | 3.5 |
| Korea | 1.1 | 0.4 | 0.7 | 1.5 | 1.5 | 1.5 | 2.0 | 9.9 |
| Latvia | 13.2 | 31.1 | 31.8 | 37.2 | 36.1 | 38.2 | 40.4 | 1.6 |
| Luxembourg | 0.5 | 1.2 | 3.0 | 5.0 | 5.5 | 6.0 | 6.9 | 11.1 |
| Mexico | 12.1 | 11.2 | 8.5 | 8.5 | 8.4 | 8.4 | 8.6 | -1.6 |
| Netherlands | 1.1 | 1.8 | 3.8 | 4.7 | 5.0 | 5.1 | 5.4 | 6.7 |
| New Zealand | 32.9 | 30.3 | 38.7 | 39.7 | 40.5 | 41.5 | 39.5 | 1.6 |
| Norway | 54.1 | 51.5 | 39.8 | 45.8 | 46.8 | 51.2 | 52.8 | 0.1 |
| Poland | 1.5 | 4.3 | 7.2 | 9.2 | 9.5 | 8.8 | 8.0 | 3.7 |
| Portugal | 19.5 | 15.3 | 23.2 | 26.0 | 22.6 | 25.4 | 20.5 | 1.8 |
| Slovak Republic | 1.5 | 2.8 | 7.4 | 8.9 | 9.6 | 9.6 | 9.5 | 7.5 |
| Slovenia | 9.1 | 12.3 | 15.3 | 18.1 | 16.0 | 16.6 | 15.6 | 1.4 |
| Spain | 6.9 | 5.6 | 11.8 | 15.5 | 14.0 | 14.5 | 13.0 | 5.1 |
| Sweden | 24.4 | 31.0 | 33.4 | 35.9 | 42.0 | 37.1 | 39.0 | 1.4 |
| Switzerland | 14.9 | 17.7 | 19.0 | 21.1 | 22.3 | 22.3 | 22.4 | 1.4 |
| Turkey | 18.8 | 13.2 | 11.0 | 10.1 | 12.1 | 12.5 | 12.2 | -0.5 |
| United Kingdom | 0.5 | 1.0 | 3.6 | 6.9 | 8.1 | 8.6 | 9.6 | 14.2 |
| United States | 5.0 | 4.5 | 5.7 | 6.9 | 6.9 | 7.2 | 7.7 | 3.2 |

1. Renewable sources include hydroelectricity, geothermal, solar thermal, solar PV, tide, wind, renewable municipal waste, solid biofuels, liquid biofuels and biogases.

Source: IEA/OECD *World Energy Balances*.

Table 6. Contribution of renewable¹ energy sources to TFC (%)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | Average annual percent change 00-16 |
|--------------------------|------|------|------|------|------|------|---|
| <i>OECD Total</i> | 3.2 | 3.8 | 5.1 | 5.6 | 5.6 | 5.6 | 2.5 |
| <i>OECD Americas</i> | 2.8 | 4.0 | 4.9 | 5.7 | 5.6 | 5.5 | 2.0 |
| <i>OECD Asia Oceania</i> | 2.0 | 1.8 | 2.1 | 2.2 | 2.3 | 2.2 | 1.2 |
| <i>OECD Europe</i> | 4.1 | 4.4 | 6.6 | 7.1 | 7.3 | 7.3 | 3.3 |
| <i>IEA Total</i> | 3.1 | 3.7 | 5.0 | 5.5 | 5.6 | 5.5 | 2.6 |
| <i>Non-OECD Total</i> | 23.6 | 24.7 | 17.6 | 16.1 | 16.1 | 16.0 | -2.7 |
| <i>World</i> | 13.6 | 14.0 | 12.7 | 12.4 | 12.4 | 12.4 | -0.8 |
| Australia | 5.6 | 6.1 | 5.6 | 5.4 | 5.7 | 5.5 | -0.6 |
| Austria | 10.7 | 10.3 | 13.2 | 14.1 | 14.4 | 14.5 | 2.2 |
| Belgium | 1.0 | 1.0 | 3.6 | 4.1 | 3.8 | 4.5 | 9.9 |
| Canada | 6.1 | 6.1 | 5.5 | 5.6 | 5.5 | 5.0 | -1.3 |
| Chile | 24.8 | 20.1 | 18.0 | 16.3 | 14.8 | 14.1 | -2.2 |
| Czech Republic | 3.1 | 4.6 | 8.3 | 10.6 | 10.7 | 11.0 | 5.6 |
| Denmark | 4.2 | 4.5 | 8.5 | 10.0 | 11.0 | 11.4 | 6.0 |
| Estonia | 3.3 | 16.5 | 18.6 | 16.7 | 17.0 | 14.2 | -0.9 |
| Finland | 15.7 | 18.3 | 18.4 | 21.9 | 21.7 | 20.7 | 0.8 |
| France | 6.9 | 5.5 | 7.2 | 7.5 | 7.7 | 8.2 | 2.5 |
| Germany | 1.2 | 2.1 | 5.5 | 6.1 | 6.3 | 6.4 | 7.2 |
| Greece | 6.6 | 5.7 | 6.1 | 8.7 | 8.8 | 7.9 | 2.1 |
| Hungary | 3.4 | 4.5 | 10.4 | 11.7 | 11.5 | 11.1 | 5.8 |
| Iceland | 4.8 | 4.6 | 4.0 | 3.2 | 3.4 | 3.3 | -2.0 |
| Ireland | 1.4 | 1.1 | 2.6 | 3.3 | 3.2 | 3.4 | 7.4 |
| Israel | 5.2 | 5.0 | 7.7 | 2.8 | 2.7 | 2.7 | -3.9 |
| Italy | 0.8 | 1.4 | 6.8 | 6.4 | 7.0 | 6.8 | 10.7 |
| Japan | 1.3 | 1.1 | 1.5 | 1.5 | 1.5 | 1.5 | 2.2 |
| Korea | 0.7 | 0.3 | 0.5 | 1.5 | 1.4 | 1.0 | 8.7 |
| Latvia | 9.6 | 25.0 | 23.2 | 27.0 | 24.8 | 23.5 | -0.4 |
| Luxembourg | - | 0.5 | 2.4 | 3.4 | 3.8 | 4.1 | 14.3 |
| Mexico | 10.3 | 8.6 | 6.1 | 6.0 | 6.0 | 5.9 | -2.4 |
| Netherlands | 0.7 | 0.8 | 1.4 | 2.2 | 2.2 | 2.0 | 5.7 |
| New Zealand | 8.1 | 9.0 | 9.9 | 8.4 | 8.6 | 10.1 | 0.7 |
| Norway | 5.2 | 6.0 | 6.3 | 4.3 | 4.6 | 5.4 | -0.7 |
| Poland | 1.8 | 6.1 | 7.5 | 8.1 | 8.2 | 7.8 | 1.6 |
| Portugal | 17.5 | 12.6 | 13.3 | 13.2 | 13.4 | 13.5 | 0.4 |
| Slovak Republic | 1.1 | 0.8 | 4.7 | 5.3 | 6.3 | 5.6 | 12.9 |
| Slovenia | 7.1 | 9.4 | 12.6 | 12.4 | 12.9 | 12.7 | 1.9 |
| Spain | 6.5 | 4.1 | 5.8 | 6.5 | 6.6 | 6.7 | 3.2 |
| Sweden | 14.4 | 15.0 | 16.3 | 19.3 | 20.2 | 20.3 | 1.9 |
| Switzerland | 4.2 | 4.4 | 6.2 | 6.6 | 7.2 | 7.8 | 3.6 |
| Turkey | 18.8 | 12.7 | 8.0 | 6.5 | 6.0 | 5.5 | -5.1 |
| United Kingdom | 0.3 | 0.4 | 2.0 | 2.9 | 3.0 | 3.2 | 14.1 |
| United States | 1.8 | 3.3 | 4.6 | 5.5 | 5.4 | 5.4 | 3.2 |

1. Renewable sources include hydroelectricity, geothermal, solar thermal, solar PV, tide, wind, renewable municipal waste, solid biofuels, liquid biofuels and biogases.

Source: IEA/OECD *World Energy Balances*.

Table 7. Share of electricity production from renewable¹ sources (%)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|--------------------------|------|------|-------|-------|-------|-------|-------|---|
| <i>OECD Total</i> | 17.3 | 15.6 | 17.7 | 22.0 | 22.8 | 23.7 | 24.9 | 2.8 |
| <i>OECD Americas</i> | 18.5 | 15.5 | 16.6 | 19.9 | 20.1 | 21.5 | 23.5 | 2.5 |
| <i>OECD Asia Oceania</i> | 12.4 | 9.0 | 8.6 | 10.9 | 11.7 | 12.4 | 13.2 | 2.2 |
| <i>OECD Europe</i> | 17.6 | 19.0 | 24.1 | 31.5 | 33.0 | 33.3 | 33.4 | 3.4 |
| <i>IEA Total</i> | 17.2 | 15.4 | 17.5 | 21.8 | 22.6 | 23.6 | 24.7 | 2.8 |
| <i>Non-OECD Total</i> | 23.2 | 23.1 | 21.5 | 22.6 | 22.8 | 23.8 | .. | .. |
| <i>World</i> | 19.4 | 18.4 | 19.5 | 22.3 | 22.8 | 23.8 | .. | .. |
| Australia | 9.7 | 8.4 | 8.6 | 14.6 | 13.3 | 14.5 | 15.6 | 3.7 |
| Austria | 66.2 | 72.5 | 66.2 | 81.1 | 76.5 | 77.8 | 75.5 | 0.2 |
| Belgium | 0.8 | 1.3 | 6.9 | 17.1 | 21.0 | 16.8 | 18.4 | 17.1 |
| Canada | 62.4 | 60.6 | 61.4 | 63.4 | 63.5 | 65.0 | 65.7 | 0.5 |
| Chile | 53.8 | 48.5 | 40.2 | 42.9 | 43.6 | 43.3 | 44.4 | -0.5 |
| Czech Republic | 1.9 | 3.1 | 6.9 | 10.8 | 11.4 | 11.4 | 11.2 | 7.8 |
| Denmark | 3.2 | 15.5 | 32.0 | 55.9 | 65.5 | 60.5 | 70.7 | 9.4 |
| Estonia | - | 0.2 | 8.1 | 11.2 | 14.4 | 12.4 | 13.2 | 27.6 |
| Finland | 29.5 | 33.4 | 30.0 | 38.6 | 44.5 | 44.2 | 46.3 | 1.9 |
| France | 13.4 | 13.0 | 13.9 | 16.4 | 15.8 | 17.6 | 16.5 | 1.4 |
| Germany | 3.5 | 6.2 | 16.7 | 26.1 | 29.2 | 29.3 | 33.6 | 10.5 |
| Greece | 5.1 | 7.8 | 18.3 | 24.2 | 28.7 | 27.4 | 23.5 | 6.7 |
| Hungary | 0.7 | 0.7 | 8.1 | 10.7 | 10.6 | 10.1 | 10.5 | 17.4 |
| Iceland | 99.9 | 99.9 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 0.0 |
| Ireland | 4.9 | 5.0 | 13.2 | 24.8 | 28.0 | 24.9 | 28.9 | 10.9 |
| Israel | 0.0 | 0.1 | 0.3 | 1.5 | 1.9 | 2.5 | 2.5 | 23.0 |
| Italy | 16.4 | 18.8 | 25.8 | 43.4 | 38.7 | 37.5 | 35.6 | 3.8 |
| Japan | 11.5 | 9.3 | 9.7 | 12.5 | 14.3 | 14.8 | 15.6 | 3.1 |
| Korea | 6.0 | 1.4 | 1.2 | 1.6 | 1.9 | 2.8 | 3.5 | 5.5 |
| Latvia | 67.6 | 68.3 | 54.9 | 54.5 | 50.2 | 54.2 | 72.5 | 0.4 |
| Luxembourg | 13.3 | 41.0 | 8.3 | 20.9 | 32.3 | 58.2 | 66.1 | 2.9 |
| Mexico | 24.7 | 19.8 | 16.6 | 17.5 | 15.3 | 15.3 | 15.1 | -1.6 |
| Netherlands | 1.1 | 3.3 | 9.4 | 11.3 | 12.4 | 12.8 | 14.9 | 9.2 |
| New Zealand | 80.0 | 71.5 | 73.0 | 79.1 | 80.0 | 83.9 | 81.8 | 0.8 |
| Norway | 99.8 | 99.7 | 95.7 | 97.7 | 97.7 | 97.8 | 97.8 | -0.1 |
| Poland | 1.1 | 1.6 | 6.9 | 12.5 | 13.8 | 13.7 | 14.1 | 13.6 |
| Portugal | 34.7 | 29.7 | 52.8 | 60.7 | 47.5 | 54.6 | 39.0 | 1.6 |
| Slovak Republic | 7.4 | 15.0 | 21.6 | 22.9 | 22.7 | 24.7 | 25.0 | 3.1 |
| Slovenia | 23.7 | 28.7 | 29.2 | 38.5 | 29.4 | 31.2 | 27.7 | -0.2 |
| Spain | 17.2 | 15.6 | 32.8 | 40.1 | 35.0 | 38.6 | 32.4 | 4.4 |
| Sweden | 51.0 | 57.2 | 55.3 | 55.8 | 63.3 | 57.2 | 58.1 | 0.1 |
| Switzerland | 55.0 | 57.0 | 56.7 | 58.0 | 62.2 | 61.9 | 62.5 | 0.5 |
| Turkey | 40.4 | 24.9 | 26.4 | 20.9 | 32.0 | 32.9 | 29.3 | 1.0 |
| United Kingdom | 1.8 | 2.7 | 6.9 | 19.2 | 24.8 | 24.7 | 29.7 | 15.2 |
| United States | 11.5 | 8.2 | 10.1 | 13.0 | 13.2 | 14.8 | 17.0 | 4.4 |

1. Renewable sources include hydroelectricity, geothermal, solar thermal, solar PV, tide, wind, renewable municipal waste, solid biofuels, liquid biofuels and biogases.

Source: IEA/OECD *World Energy Balances*.

**Table 8. Share of electricity production from renewable¹ sources
excluding hydroelectricity (%)**

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|--------------------------|------|------|------|------|------|------|-------|---|
| <i>OECD Total</i> | 1.8 | 1.8 | 5.2 | 9.0 | 10.1 | 10.8 | 12.2 | 11.8 |
| <i>OECD Americas</i> | 2.8 | 1.9 | 3.9 | 6.7 | 7.2 | 8.3 | 9.4 | 9.7 |
| <i>OECD Asia Oceania</i> | 1.2 | 1.2 | 2.2 | 4.2 | 5.2 | 6.2 | 7.0 | 11.2 |
| <i>OECD Europe</i> | 0.7 | 2.0 | 8.6 | 15.2 | 17.0 | 17.2 | 19.1 | 14.2 |
| <i>IEA Total</i> | 1.8 | 1.8 | 5.2 | 9.0 | 10.1 | 10.8 | 12.2 | 11.8 |
| <i>Non-OECD Total</i> | 0.4 | 0.7 | 1.8 | 3.4 | 4.0 | 4.9 | .. | .. |
| <i>World</i> | 1.3 | 1.4 | 3.5 | 6.0 | 6.7 | 7.5 | .. | .. |
| Australia | 0.5 | 0.6 | 3.3 | 7.2 | 8.0 | 8.6 | 9.3 | 17.7 |
| Austria | 2.3 | 2.7 | 9.7 | 14.6 | 16.5 | 16.8 | 18.1 | 11.9 |
| Belgium | 0.4 | 0.7 | 6.6 | 16.7 | 20.6 | 16.3 | 18.1 | 21.0 |
| Canada | 0.8 | 1.4 | 3.2 | 5.6 | 6.3 | 7.0 | 7.2 | 10.1 |
| Chile | 5.2 | 2.3 | 4.3 | 10.2 | 11.9 | 13.9 | 16.5 | 12.1 |
| Czech Republic | - | 0.7 | 3.6 | 8.5 | 9.2 | 9.0 | 9.0 | 16.0 |
| Denmark | 3.1 | 15.4 | 31.9 | 55.9 | 65.5 | 60.4 | 70.7 | 9.4 |
| Estonia | - | 0.2 | 7.8 | 10.9 | 14.2 | 12.1 | 13.0 | 29.9 |
| Finland | 9.5 | 12.5 | 14.0 | 18.9 | 20.1 | 21.2 | 24.4 | 4.0 |
| France | 0.5 | 0.6 | 2.7 | 5.2 | 6.2 | 6.7 | 7.5 | 16.4 |
| Germany | 0.3 | 2.4 | 13.4 | 23.0 | 26.3 | 26.1 | 30.5 | 16.1 |
| Greece | 0.0 | 0.8 | 5.3 | 15.3 | 16.9 | 17.2 | 16.8 | 19.2 |
| Hungary | 0.1 | 0.2 | 7.6 | 9.7 | 9.8 | 9.3 | 9.9 | 26.4 |
| Iceland | 6.7 | 17.2 | 26.2 | 29.0 | 26.7 | 27.4 | 26.9 | 2.7 |
| Ireland | - | 1.4 | 11.1 | 22.0 | 25.1 | 22.7 | 26.7 | 18.8 |
| Israel | - | - | 0.2 | 1.5 | 1.9 | 2.5 | 2.5 | - |
| Italy | 1.5 | 2.5 | 8.7 | 22.3 | 22.5 | 22.8 | 23.3 | 14.1 |
| Japan | 1.2 | 1.3 | 2.2 | 4.6 | 5.9 | 7.3 | 8.1 | 11.3 |
| Korea | 0.0 | 0.0 | 0.5 | 1.1 | 1.5 | 2.3 | 3.0 | 30.0 |
| Latvia | - | 0.1 | 1.7 | 15.8 | 16.6 | 14.8 | 14.3 | 34.2 |
| Luxembourg | 2.1 | 11.6 | 4.9 | 15.3 | 24.9 | 43.6 | 56.4 | 9.7 |
| Mexico | 4.4 | 3.7 | 3.1 | 4.6 | 5.4 | 5.7 | 5.7 | 2.6 |
| Netherlands | 1.0 | 3.2 | 9.3 | 11.2 | 12.4 | 12.7 | 14.8 | 9.5 |
| New Zealand | 8.2 | 9.2 | 18.1 | 23.4 | 24.7 | 24.1 | 23.8 | 5.7 |
| Norway | 0.2 | 0.2 | 1.0 | 1.8 | 1.9 | 1.6 | 2.1 | 14.7 |
| Poland | 0.0 | 0.2 | 5.1 | 11.1 | 12.7 | 12.4 | 12.6 | 29.4 |
| Portugal | 2.5 | 3.6 | 22.7 | 30.8 | 30.6 | 28.0 | 29.0 | 13.1 |
| Slovak Republic | - | - | 2.5 | 7.4 | 8.2 | 8.5 | 8.0 | - |
| Slovenia | - | 0.5 | 1.4 | 3.0 | 3.7 | 3.4 | 3.5 | 12.0 |
| Spain | 0.4 | 2.8 | 18.6 | 25.9 | 24.8 | 25.2 | 25.5 | 13.8 |
| Sweden | 1.3 | 3.1 | 10.6 | 14.3 | 16.8 | 17.4 | 17.8 | 10.8 |
| Switzerland | 0.8 | 1.3 | 2.1 | 3.8 | 4.3 | 5.2 | 5.7 | 9.1 |
| Turkey | 0.1 | 0.2 | 1.9 | 4.8 | 6.3 | 8.4 | 9.8 | 25.0 |
| United Kingdom | 0.2 | 1.3 | 6.0 | 17.5 | 22.9 | 23.1 | 27.9 | 19.7 |
| United States | 3.0 | 1.9 | 4.1 | 6.9 | 7.4 | 8.5 | 9.9 | 10.1 |

1. Renewable sources include geothermal, solar thermal, solar PV, tide, wind, renewable municipal waste, solid biofuels, liquid biofuels and biogases.

Source: IEA/OECD *World Energy Balances*.

Table 9. Primary energy supply from renewable sources in 2016 (ktoe)

| | Hydro ¹ | Wind | Solar/ tide | Geo-thermal | Biofuels and renewable waste ² | Total ³ |
|--------------------------|--------------------|---------|-------------|-------------|---|--------------------|
| <i>OECD Total</i> | 121450.3 | 52059.7 | 28186.3 | 36070.1 | 283183.3 | 520949.7 |
| <i>OECD Americas</i> | 61112.6 | 23479.3 | 7556.6 | 12327.3 | 126408.1 | 230883.8 |
| <i>OECD Asia Oceania</i> | 10537.7 | 1903.4 | 6556.0 | 7320.2 | 17820.5 | 44137.8 |
| <i>OECD Europe</i> | 49800.1 | 26677.0 | 14073.7 | 16422.7 | 138954.7 | 245928.1 |
| <i>IEA Total</i> | 117686.2 | 51836.8 | 27380.2 | 32592.4 | 273295.1 | 502790.6 |
| <i>Non-OECD Total</i> | 227773.1 | 30287.2 | 33904.4 | 44506.6 | 1024370.9 | 1360842.2 |
| <i>World</i> | 349223.4 | 82346.9 | 62090.7 | 80576.7 | 1307554.2 | 1881791.9 |
| Australia | 1296.1 | 1048.9 | 889.8 | 0.2 | 5052.8 | 8287.9 |
| Austria | 3425.5 | 450.1 | 279.1 | 33.7 | 5861.7 | 10050.2 |
| Belgium | 31.8 | 467.4 | 288.3 | 3.4 | 3125.1 | 3916.0 |
| Canada | 33284.4 | 2645.4 | 304.2 | - | 12559.5 | 48793.5 |
| Chile | 2001.2 | 210.6 | 260.0 | - | 7772.1 | 10243.9 |
| Czech Republic | 172.0 | 42.7 | 202.0 | - | 3894.2 | 4310.9 |
| Denmark | 1.6 | 1099.1 | 113.4 | 5.4 | 3788.6 | 5008.1 |
| Estonia | 3.0 | 51.1 | - | - | 911.6 | 965.7 |
| Finland | 1358.5 | 263.8 | 3.1 | - | 8987.1 | 10612.5 |
| France | 5162.8 | 1840.1 | 845.5 | 243.3 | 16490.1 | 24581.7 |
| Germany | 1766.7 | 6758.2 | 3946.6 | 269.3 | 26174.4 | 38915.3 |
| Greece | 476.6 | 442.5 | 538.2 | 10.1 | 1172.2 | 2639.5 |
| Hungary | 22.3 | 58.8 | 28.5 | 119.9 | 2769.2 | 2998.7 |
| Iceland | 1158.2 | 0.8 | - | 3432.9 | 18.2 | 4610.0 |
| Ireland | 58.6 | 528.7 | 14.3 | - | 505.5 | 1107.0 |
| Israel | c | c | 512.2 | - | 44.7 | 556.9 |
| Italy | 3648.5 | 1521.0 | 2100.8 | 5570.6 | 13178.1 | 26018.9 |
| Japan | 6784.4 | 511.7 | 4629.2 | 2337.1 | 8016.5 | 22278.8 |
| Korea | 244.8 | 144.7 | 511.6 | 162.0 | 3235.8 | 4298.9 |
| Latvia | 217.5 | 11.0 | - | - | 1395.2 | 1623.8 |
| Luxembourg | 9.9 | 8.7 | 10.6 | - | 191.6 | 220.8 |
| Mexico | 2639.6 | 892.3 | 264.8 | 3167.6 | 8654.4 | 15618.7 |
| Netherlands | 8.6 | 702.5 | 161.5 | 67.9 | 2833.8 | 3774.3 |
| New Zealand | 2212.4 | 198.0 | 13.2 | 4820.8 | 1470.7 | 8715.1 |
| Norway | 12296.3 | 181.9 | .. | - | 1463.6 | 13941.8 |
| Poland | 184.0 | 1082.4 | 62.9 | 22.2 | 7417.7 | 8769.2 |
| Portugal | 1351.9 | 1072.6 | 154.6 | 157.7 | 2883.9 | 5620.7 |
| Slovak Republic | 374.8 | 0.5 | 51.4 | 8.3 | 1141.8 | 1576.8 |
| Slovenia | 387.2 | 0.5 | 33.9 | 44.8 | 658.0 | 1124.4 |
| Spain | 3129.4 | 4205.2 | 3178.2 | 18.8 | 6899.3 | 17430.9 |
| Sweden | 5332.6 | 1331.0 | 23.5 | - | 11595.2 | 18282.2 |
| Switzerland | 2977.1 | 9.4 | 173.1 | 380.5 | 1791.7 | 5331.8 |
| Turkey | 5780.8 | 1334.2 | 916.7 | 6033.0 | 3070.6 | 17135.3 |
| United Kingdom | 463.9 | 3213.0 | 947.3 | 0.8 | 10736.5 | 15361.4 |
| United States | 23187.4 | 19731.0 | 6727.5 | 9159.8 | 97422.0 | 156227.8 |

1. Hydro does not include pumped hydro.

2. Biofuels and renewable waste include solid biofuels, liquid biofuels, renewable municipal waste and biogases.

3. Total does not include non-renewable waste.

Source: IEA/OECD *World Energy Balances*.

Table 10. Provisional primary energy supply from renewable sources in 2017 (ktoe)

| | Hydro ¹ | Wind | Solar/ tide | Geo-thermal | Biofuels and renewable waste ² | Total ³ |
|--------------------------|--------------------|---------|-------------|-------------|---|--------------------|
| <i>OECD Total</i> | 120217.1 | 59921.4 | 33724.9 | 36969.8 | 288514.6 | 539347.8 |
| <i>OECD Americas</i> | 64394.5 | 26012.1 | 10746.0 | 11983.4 | 126943.1 | 240079.2 |
| <i>OECD Asia Oceania</i> | 10700.2 | 1980.5 | 7791.7 | 6958.4 | 19787.8 | 47218.5 |
| <i>OECD Europe</i> | 45122.4 | 31928.8 | 15187.2 | 18027.9 | 141783.8 | 252050.1 |
| <i>IEA Total</i> | 116404.4 | 59604.6 | 32808.1 | 32988.8 | 278785.3 | 520591.3 |
| <i>Non-OECD Total</i> | .. | .. | .. | .. | .. | .. |
| <i>World</i> | .. | .. | .. | .. | .. | .. |
| Australia | 1405.6 | 1073.3 | 1067.3 | - | 5361.2 | 8907.4 |
| Austria | 3326.7 | 536.0 | 291.1 | 33.1 | 5848.7 | 10035.6 |
| Belgium | 23.6 | 572.1 | 286.6 | 3.3 | 3243.5 | 4129.0 |
| Canada | 33913.9 | 2704.5 | 325.6 | - | 13333.6 | 50277.6 |
| Chile | 1894.6 | 302.7 | 368.1 | 55.0 | 7477.0 | 10097.3 |
| Czech Republic | 160.7 | 50.8 | 208.1 | - | 4046.4 | 4466.1 |
| Denmark | 1.3 | 1270.6 | 122.5 | 8.6 | 4524.3 | 5927.2 |
| Estonia | 2.6 | 63.4 | - | - | 847.8 | 913.8 |
| Finland | 1272.2 | 412.9 | 4.1 | - | 9502.1 | 11191.3 |
| France | 4233.1 | 2090.9 | 926.0 | 282.0 | 16393.7 | 23925.6 |
| Germany | 1732.2 | 9166.0 | 4116.0 | 275.8 | 26892.8 | 42182.8 |
| Greece | 341.1 | 476.1 | 548.7 | 10.7 | 1214.1 | 2590.8 |
| Hungary | 18.9 | 65.2 | 43.1 | 133.8 | 2631.2 | 2892.2 |
| Iceland | 1208.9 | 0.7 | - | 3881.4 | 18.2 | 5109.1 |
| Ireland | 59.5 | 640.2 | 14.7 | - | 579.0 | 1293.4 |
| Israel | c | c | 513.3 | - | 44.7 | 558.0 |
| Italy | 3108.3 | 1518.3 | 2376.4 | 5496.8 | 13647.1 | 26147.0 |
| Japan | 6907.2 | 543.4 | 5515.6 | 2280.5 | 8235.1 | 23481.8 |
| Korea | 240.2 | 185.7 | 680.6 | 194.5 | 4610.6 | 5911.6 |
| Latvia | 376.7 | 12.9 | - | - | 1522.0 | 1911.6 |
| Luxembourg | 7.4 | 19.9 | 10.9 | - | 223.7 | 261.9 |
| Mexico | 2586.2 | 890.2 | 301.3 | 2996.8 | 8830.1 | 15604.7 |
| Netherlands | 5.2 | 909.2 | 207.9 | 72.6 | 2864.8 | 4059.7 |
| New Zealand | 2147.1 | 178.0 | 14.9 | 4483.4 | 1536.2 | 8359.6 |
| Norway | 12209.3 | 245.2 | - | - | 1762.8 | 14217.3 |
| Poland | 219.8 | 1281.7 | 68.1 | 22.6 | 6675.5 | 8267.7 |
| Portugal | 495.8 | 1053.0 | 171.5 | 178.5 | 2878.3 | 4777.0 |
| Slovak Republic | 384.6 | 0.4 | 56.4 | 8.1 | 1158.1 | 1607.7 |
| Slovenia | 332.6 | 0.5 | 35.3 | 44.5 | 667.6 | 1080.5 |
| Spain | 1606.7 | 4221.3 | 3341.0 | 18.9 | 7084.2 | 16272.2 |
| Sweden | 5546.8 | 1505.4 | 30.8 | - | 11343.4 | 18426.4 |
| Switzerland | 2931.4 | 11.4 | 198.0 | 397.2 | 1844.7 | 5382.7 |
| Turkey | 5005.9 | 1539.5 | 1091.4 | 7159.1 | 3193.3 | 17989.2 |
| United Kingdom | 511.0 | 4265.3 | 1038.6 | 0.8 | 11176.5 | 16992.1 |
| United States | 25999.7 | 22114.8 | 9751.0 | 8931.6 | 97302.5 | 164099.6 |

1. Hydro does not include pumped hydro.

2. Biofuels and renewable waste include solid biofuels, liquid biofuels, renewable municipal waste and biogases.

3. Total does not include non-renewable waste.

Source: IEA/OECD *World Energy Balances*.

PART III

DETAILED OECD RENEWABLES AND WASTE DATA

DIRECTORY OF PART III TABLES

Part III of *Renewables Information* contains detailed statistical information on renewables and waste for the 35 member countries of the OECD and for OECD/IEA regional aggregates. The tables of regional aggregates are presented before the country tables, which are set out in alphabetical order. As data for some countries were not available for all years (particularly the early years), these aggregate regional table should be used with caution.

A full list of the figures and the tables is set out below.

Tables:

1. Energy supply, GDP and population
2. Net generating capacity of renewable and waste sources (in MW)
3. Capacity factors (%)
4. Gross electricity generation from renewable and waste sources (in GWh)
- 5A. Heat production from renewable and waste sources in the transformation sector (in TJ)
- 5B. Heat production from heat pumps and waste heat (in TJ)
6. Renewable and waste balance for 2016 (in ktoe)
7. Aggregated renewable and waste statistics (in TJ and kt)

Graphs:

1. Contribution of renewables in 1990 (%)
2. Contribution of renewables in 2017 provisional (%)
3. Electricity production by renewables and waste energy source (in TWh)

OECD TOTAL

Figure 1. Contribution of renewables in 1990

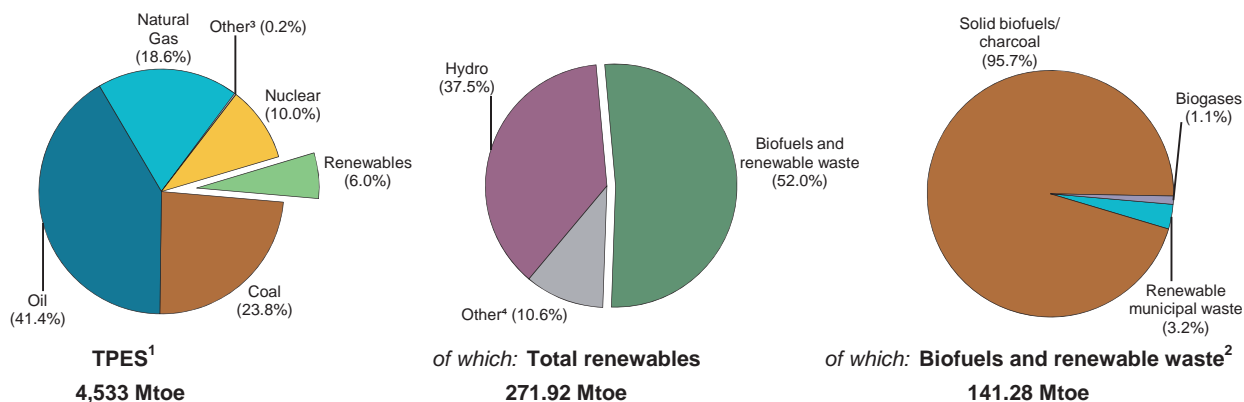


Figure 2. Contribution of renewables in 2017 provisional

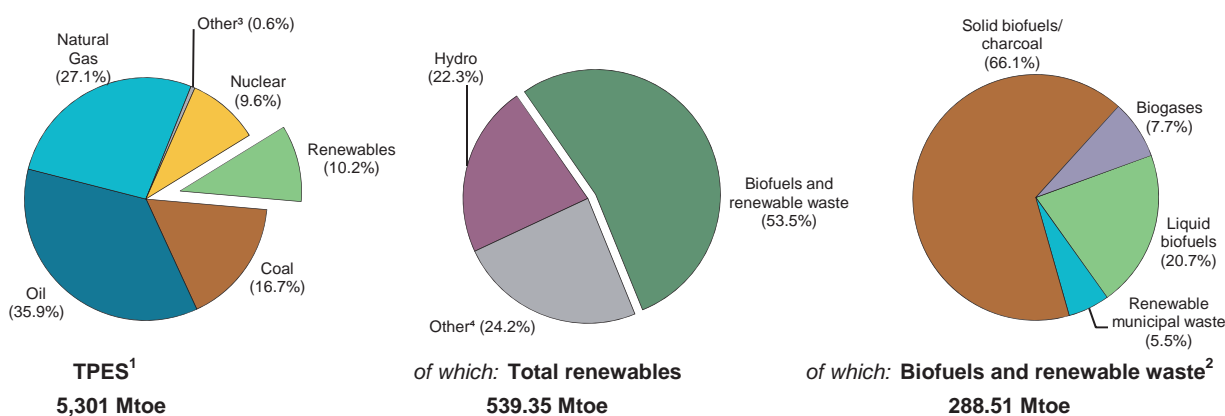
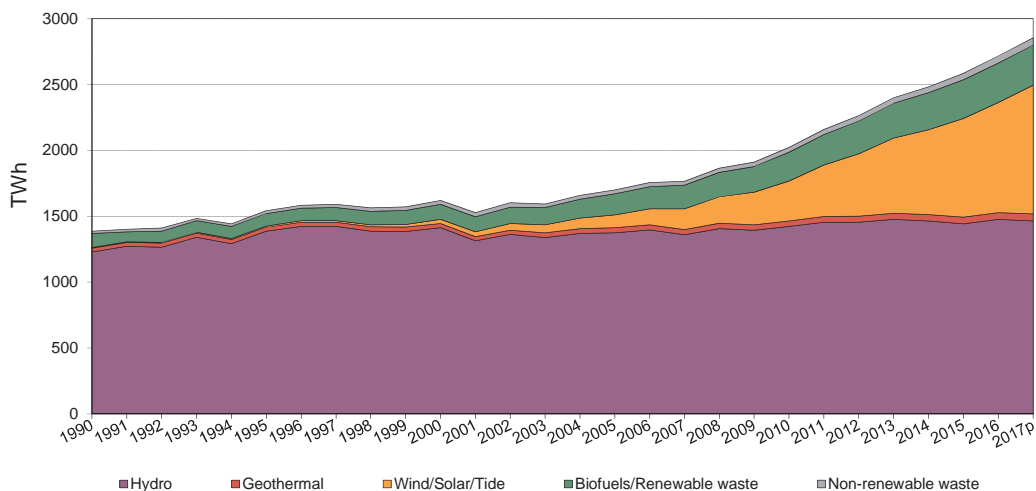


Figure 3. Electricity production by renewables and waste energy source



1. Total primary energy supply includes electricity trade.
2. Biofuels and renewable waste include solid biofuels, liquid biofuels, biogases, and renewable municipal waste.
3. Includes non-renewable municipal waste, industrial waste, peat, shale oil, electricity trade, and other sources of primary energy. (In the case of negative values, the net exports of electricity are greater than the other products in this category).
4. Includes geothermal, solar, wind and tide.

Note: Totals may not sum due to rounding.
Source: IEA/OECD World Energy Balances.

OECD TOTAL

Table 1. Energy supply, GDP and population

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|---|----------|----------|----------|----------|----------|----------|----------|-------------------------------------|
| TPES (Mtoe) | 4533.07 | 5305.11 | 5431.06 | 5267.24 | 5268.79 | 5274.78 | 5301.42 | -0.0 |
| of which: Renewables (Mtoe) ¹ | 271.92 | 320.44 | 424.78 | 495.50 | 507.28 | 520.95 | 539.35 | 3.1 |
| Renewables/TPES(%) | 6.0 | 6.0 | 7.8 | 9.4 | 9.6 | 9.9 | 10.2 | 3.1 |
| GDP (billion 2010 US dollars) | 29399.32 | 38347.57 | 44767.44 | 47779.59 | 48949.28 | 49786.93 | 50975.23 | 1.7 |
| TPES/GDP ² | 0.15 | 0.14 | 0.12 | 0.11 | 0.11 | 0.11 | 0.10 | -1.7 |
| TPES/GDP (year 2010 = 100) | 127 | 114 | 100 | 91 | 89 | 87 | 86 | -1.7 |
| Population (millions) | 1072.95 | 1156.45 | 1240.41 | 1269.42 | 1276.85 | 1284.48 | 1291.72 | 0.7 |
| TPES/population (toe per capita) | 4.22 | 4.59 | 4.38 | 4.15 | 4.13 | 4.11 | 4.10 | -0.7 |
| Electricity generation (TWh) ³ | 7660.8 | 9742.2 | 10886.9 | 10806.0 | 10861.7 | 10943.0 | 10964.7 | 0.7 |
| of which: Renewables (TWh) ^{1,3} | 1325.09 | 1518.67 | 1922.58 | 2377.65 | 2476.92 | 2598.27 | 2731.79 | 3.5 |
| Renew./Total Elec.(%) ^{1,4} | 17.3 | 15.6 | 17.7 | 22.0 | 22.8 | 23.7 | 24.9 | 2.8 |
| Road energy consumption (Mtoe) | 793.1 | 990.0 | 1062.3 | 1047.3 | 1075.7 | 1090.9 | .. | .. |
| of which: Liquid biofuels (Mtoe) | 0.01 | 4.03 | 38.24 | 51.41 | 52.24 | 55.01 | .. | .. |
| Liq. biofuels/road tr.(%) ⁵ | 0.0 | 0.4 | 3.6 | 4.9 | 4.9 | 5.0 | - | - |

1. Renewables do not include industrial waste, non-renewable municipal waste and pumped storage production.

2. In units of toe per thousand 2010 US dollars.

3. Electricity generation = gross production - amount of electricity produced in pumped storage plants.

4. Electricity share generated from renewables over the total electricity production.

5. Energy from liquid biofuels consumed in road transport over the total energy consumed in road transport.

Source: IEA/OECD *World Energy Balances* and OECD *Main Economic Indicators*.

Table 2. Net generating capacity of renewable and waste sources (MWe)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | Average annual percent change 00-16 |
|---|---------------|---------------|---------------|---------------|---------------|----------------|-------------------------------------|
| Total capacity | 401470 | 472202 | 685385 | 893751 | 958030 | 1019245 | 4.9 |
| Hydro | 376960 | 425914 | 457055 | 474750 | 483404 | 489133 | 0.9 |
| Hydro <1MW | 968 | 3149 | 3281 | 3595 | 3677 | 3864 | 1.3 |
| Hydro 1-10MW | 5604 | 16806 | 20256 | 22001 | 22752 | 19544 | 0.9 |
| Hydro 10+MW | 103952 | 247256 | 325757 | 337364 | 343620 | 350871 | 2.2 |
| Mixed plants | 19791 | 21507 | 41476 | 42184 | 42610 | 43958 | 4.6 |
| Pure pumped storage | .. | 68281 | 66284 | 69606 | 70746 | 70895 | .. |
| Geothermal | 4463 | 5393 | 6069 | 6704 | 7061 | 7250 | 1.9 |
| Solar photovoltaic | .. | 757 | 37980 | 133921 | 161549 | 189713 | .. |
| Solar thermal | 339 | 419 | 1210 | 3972 | 4063 | 4063 | 15.3 |
| Tide, wave, ocean | 260 | 234 | 242 | 506 | 503 | 509 | 5.0 |
| Wind | 2369 | 15392 | 133779 | 213425 | 238554 | 263868 | 19.4 |
| Industrial waste | .. | 1777 | 2464 | 2634 | 2212 | 2406 | .. |
| Municipal waste | .. | 6632 | 10553 | 11883 | 12739 | 13202 | .. |
| Solid biofuels | .. | 13280 | 25654 | 29892 | 31366 | 32134 | .. |
| Biogases | .. | 2404 | 9051 | 13750 | 14192 | 14654 | .. |
| Liquid biofuels | - | - | 1328 | 2314 | 2387 | 2313 | - |
| Solar collectors surface (1000 m ²) | 22493 | 46445 | 96741 | 123721 | 128765 | 131431 | 6.7 |
| Cap. of solar collectors (MW _{th}) ¹ | 15747 | 32513 | 67720 | 86608 | 90138 | 92002 | 6.7 |

1. Converted at 0.7 kW_{th}/m² of solar collector area, as estimated by the IEA Solar Heating & Cooling Programme.

OECD TOTAL

Table 3. Capacity factors (%)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 |
|--|----------------|----------------|----------------|----------------|----------------|----------------|
| Total plants¹ | 39.42 e | 39.16 e | 33.70 e | 31.71 e | 30.80 e | 30.43 e |
| Hydro | 37.26 e | 37.89 e | 35.54 | 35.22 | 34.07 | 34.46 |
| <i>of which: <1MW</i> | 18.20 e | 41.81 | 41.29 | 40.94 | 36.86 | 37.30 |
| <i>of which: 1-10MW</i> | 27.32 e | 37.88 | 41.17 | 39.79 | 36.09 | 35.35 |
| <i>of which: 10+MW</i> | 56.21 e | 41.11 | 44.60 | 44.48 | 43.18 | 43.58 |
| <i>of which: pure pumped storage²</i> | x | x | x | x | x | x |
| Geothermal | 73.19 | 69.80 | 81.74 | 82.48 | 81.58 | 80.60 |
| Solar photovoltaic | 49.16 e | 11.08 e | 9.23 e | 12.47 e | 12.81 e | 13.26 e |
| Solar thermal | 22.33 | 14.33 | 15.50 | 23.41 | 25.68 | 26.08 |
| Tide, wave and ocean | 23.21 | 26.31 e | 23.88 | 22.35 | 22.67 | 22.75 |
| Wind | 18.53 | 21.16 e | 22.93 | 26.10 | 26.65 | 26.19 |
| Industrial waste | 87.77 e | 81.77 e | 39.66 | 57.36 | 84.12 | x |
| Municipal waste | 58.96 e | 55.94 e | 62.09 e | 61.69 e | 59.19 e | 56.48 e |
| Solid biofuels | 87.77 e | 72.69 e | 62.10 | 63.85 | 63.58 | 63.10 e |
| Biogases | 67.66 e | 62.31 e | 56.83 | 63.31 | 63.77 | 63.01 e |
| Biodiesels | - | - | - | 16.25 | 19.95 | 21.76 |
| Other liquid biofuels | - | - | 43.56 | 27.69 | 33.42 | 33.96 |

1. The capacity factor is defined as: the annual gross electricity generation divided by the reported net capacity times 365 (days/year) times 24 (hours/day).

2. In case a country has at least one mixed hydro plants, it is impossible to calculate capacity factor thus it is shown as 'not applicable'.

OECD TOTAL

Table 4. Gross electricity production from renewable and waste sources (GWh)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|---------------------------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|---|
| Total electricity¹ | 1386314 | 1619881 | 2023461 | 2483011 | 2584817 | 2717098 | 2854231 | 3.4 |
| Hydro | 1230467 | 1413658 | 1422765 | 1464599 | 1442697 | 1476426 | 1466049 | 0.2 |
| <i>of which: pumped storage</i> | 47162 | 72457 | 65285 | 60655 | 59262 | 63960 | 67924 | -0.4 |
| Geothermal | 28614 | 32976 | 43457 | 48436 | 50460 | 51193 | 51982 | 2.7 |
| Solar photovoltaic | 85 | 735 | 30700 | 146335 | 181341 | 220418 | 268764 | 41.5 |
| Solar thermal | 663 | 526 | 1643 | 8146 | 9141 | 9284 | 11323 | 19.8 |
| Tide, wave, ocean | 529 | 539 | 506 | 991 | 998 | 1015 | 909 | 3.1 |
| Wind | 3845 | 28528 | 268758 | 487999 | 556874 | 605454 | 696886 | 20.7 |
| Industrial waste | 7665 | 12730 | 8558 | 13234 | 16299 | 22623 | 22325 | 3.4 |
| Municipal waste renew. | 8228 | 16482 | 30364 | 32747 | 33724 | 33072 | 33324 | 4.2 |
| Municipal waste non-renew. | 8078 | 16019 | 27038 | 31474 | 32335 | 32249 | 32190 | 4.2 |
| Solid biofuels | 94488 | 84566 | 139549 | 167205 | 174690 | 177616 | 183547 | 4.7 |
| Biogases | 3652 | 13122 | 45056 | 76251 | 79288 | 80884 | 81249 | 11.3 |
| Liquid biofuels | - | - | 5067 | 5594 | 6970 | 6864 | 5683 | - |
| <i>of which:</i> | | | | | | | | |
| <i>Electricity only plants</i> | 1309753 | 1549600 | 1892447 | 2316520 | 2416456 | 2544468 | .. | - |
| Hydro | 1230467 | 1413658 | 1422765 | 1464599 | 1442697 | 1476426 | .. | c |
| <i>of which: pumped storage</i> | 47162 | 72457 | 65285 | 60655 | 59262 | 63960 | .. | - |
| Geothermal | 28557 | 32085 | 41933 | 43597 | 45873 | 46556 | .. | - |
| Solar photovoltaic | 85 | 735 | 30700 | 146335 | 181341 | 220418 | .. | - |
| Solar thermal | 663 | 526 | 1643 | 8146 | 9141 | 9284 | .. | - |
| Tide, wave, ocean | 529 | 539 | 506 | 991 | 998 | 1015 | .. | - |
| Wind | 3845 | 28528 | 268758 | 487999 | 556874 | 605454 | .. | c |
| Industrial waste | 3403 | 5448 | 3804 | 9146 | 12594 | 18577 | .. | - |
| Municipal waste renew. | 6719 | 12473 | 20067 | 19802 | 20731 | 19749 | .. | - |
| Municipal waste non-renew. | 6738 | 12214 | 18125 | 19764 | 20684 | 19681 | .. | - |
| Solid biofuels | 25758 | 33264 | 57064 | 75314 | 83628 | 84581 | .. | - |
| Biogases | 2989 | 10130 | 24691 | 37137 | 37114 | 37914 | .. | - |
| Liquid biofuels | - | - | 2391 | 3690 | 4781 | 4813 | .. | .. |
| <i>CHP plants</i> | 76561 | 70281 | 131014 | 166491 | 168361 | 172630 | .. | - |
| Geothermal | 57 | 891 | 1524 | 4839 | 4587 | 4637 | .. | - |
| Industrial waste | 4262 | 7282 | 4754 | 4088 | 3705 | 4046 | .. | - |
| Municipal waste renew. | 1509 | 4009 | 10297 | 12945 | 12993 | 13323 | .. | - |
| Municipal waste non-renew. | 1340 | 3805 | 8913 | 11710 | 11651 | 12568 | .. | - |
| Solid biofuels | 68730 | 51302 | 82485 | 91891 | 91062 | 93035 | .. | - |
| Biogases | 663 | 2992 | 20365 | 39114 | 42174 | 42970 | .. | - |
| Liquid biofuels | - | - | 2676 | 1904 | 2189 | 2051 | .. | - |

1. **Total electricity** includes the electricity produced from industrial waste, non-renewable municipal waste and pumped storage. Electricity from renewable sources does *not* include the electricity produced from industrial waste, non-renewable municipal waste and pumped storage production.

OECD TOTAL

Table 5A. Heat production¹ from renewable and waste sources in the transformation sector (TJ)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|----------------------------|------|---------------|---------------|---------------|---------------|---------------|---------------|-------------------------------------|
| Total heat | - | 300102 | 635321 | 763519 | 784842 | 863279 | 877065 | 6.5 |
| Geothermal | - | 18314 | 26006 | 29225 | 33758 | 43200 | 44732 | 5.4 |
| Solar thermal | - | 24 | 192 | 820 | 1038 | 1564 | 1771 | 28.8 |
| Industrial waste | - | 6432 | 19491 | 27925 | 23380 | 32151 | 29449 | 9.4 |
| Municipal waste renew. | - | 63641 | 118361 | 138932 | 147033 | 148926 | 154429 | 5.4 |
| Municipal waste non-renew. | - | 61500 | 105495 | 129724 | 135741 | 144942 | 149923 | 5.4 |
| Solid biofuels | - | 145221 | 343898 | 403219 | 407366 | 451586 | 456708 | 7.0 |
| Biogases | - | 4931 | 12180 | 29037 | 32035 | 35938 | 35917 | 12.4 |
| Liquid biofuels | - | 39 | 9698 | 4637 | 4491 | 4972 | 4136 | 31.6 |
| <i>of which:</i> | | | | | | | | |
| CHP plants | .. | 192074 | 401043 | 506622 | 521400 | 577886 | .. | - |
| Geothermal | .. | 5046 | 5750 | 5835 | 6869 | 14945 | .. | - |
| Solar thermal | .. | - | - | - | - | - | - | - |
| Industrial waste | .. | 3249 | 13396 | 15838 | 15762 | 20199 | .. | - |
| Municipal waste renew. | .. | 46676 | 76227 | 101200 | 106668 | 109673 | .. | - |
| Municipal waste non-renew. | .. | 45275 | 67031 | 90130 | 94492 | 104812 | .. | - |
| Solid biofuels | .. | 87941 | 227997 | 267820 | 269495 | 296025 | .. | - |
| Biogases | .. | 3887 | 7859 | 23623 | 25810 | 29777 | .. | - |
| Liquid biofuels | .. | - | 2783 | 2176 | 2304 | 2455 | .. | .. |
| Heat only plants | .. | 108028 | 234278 | 256897 | 263442 | 285393 | .. | - |
| Geothermal | .. | 13268 | 20256 | 23390 | 26889 | 28255 | .. | - |
| Solar thermal | .. | 24 | 192 | 820 | 1038 | 1564 | .. | - |
| Industrial waste | .. | 3183 | 6095 | 12087 | 7618 | 11952 | .. | - |
| Municipal waste renew. | .. | 16965 | 42134 | 37732 | 40365 | 39253 | .. | - |
| Municipal waste non-renew. | .. | 16225 | 38464 | 39594 | 41249 | 40130 | .. | - |
| Solid biofuels | .. | 57280 | 115901 | 135399 | 137871 | 155561 | .. | - |
| Biogases | .. | 1044 | 4321 | 5414 | 6225 | 6161 | .. | - |
| Liquid biofuels | .. | 39 | 6915 | 2461 | 2187 | 2517 | .. | - |

1. Waste heat and heat production from heat pumps are not included and are reported separately in Table 5B.

Table 5B. Heat production from heat pumps and waste heat (TJ)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|----------------------------|------|--------------|--------------|--------------|--------------|--------------|--------------|-------------------------------------|
| Total heat | - | 28642 | 35627 | 42102 | 46548 | 53896 | 55309 | 3.9 |
| Heat pumps ¹ | - | 21781 | 18987 | 19127 | 20993 | 20296 | 15594 | -1.9 |
| (-) Input to heat pumps | - | 6561 | 5465 | 6329 | 7988 | 8721 | 4621 | -2.0 |
| Other sources ² | - | 13422 | 22104 | 29304 | 33543 | 42321 | 44336 | 7.3 |

1. Installations producing heat for own use are not included.

2. Refers to production from hydrogen, purchased steam from industry, and waste heat.

Source: IEA/OECD *Electricity Statistics*.

OECD TOTAL

Table 6. Renewable and waste balance for 2016

| thousand tonnes of oil equivalent | Hydro ¹ | Wind | Tide wave ocean | Solar PV | Geo- thermal | Solar thermal | Industrial waste | Mun. waste renew. |
|------------------------------------|--------------------|---------------|--------------------|---------------|-----------------|------------------|---------------------|-------------------------|
| Production | 121450 | 52060 | 87 | 18953 | 36070 | 9146 | 14082 | 15265 |
| Imports | - | - | - | - | - | - | 60 | 343 |
| Exports | - | - | - | - | - | - | - | -34 |
| Stock changes | - | - | - | - | - | - | - | - |
| TPES | 121450 | 52060 | 87 | 18953 | 36070 | 9146 | 14142 | 15575 |
| Statistical differences | - | - | - | - | 90 | - | -72 | - |
| Main activity electricity plants | -117458 | -50109 | -87 | -11446 | -28757 | -2940 | -3099 | -4700 |
| Autoproducer electricity plants | -3992 | -1951 | - | -7507 | -146 | - | -1079 | -1958 |
| Main activity CHP plants | - | - | - | - | -2481 | - | -817 | -3555 |
| Autoproducer CHP plants | - | - | - | - | -41 | - | -514 | -2774 |
| Main heat plants | - | - | - | - | -1056 | -38 | -84 | -962 |
| Autoproducer heat plants | - | - | - | - | -52 | - | -305 | -262 |
| Charcoal production plants | - | - | - | - | - | - | - | - |
| Other transformation | - | - | - | - | - | - | -116 | - |
| Energy Industry own use | - | - | - | - | - | - | -85 | -34 |
| Losses | - | - | - | - | -9 | - | - | - |
| TFC | - | - | - | - | 3619 | 6169 | 7972 | 1328 |
| Industry | - | - | - | - | 155 | 317 | 6696 | 646 |
| Iron and steel | - | - | - | - | - | - | 46 | - |
| Chemical and petrochemical | - | - | - | - | - | - | 1383 | 24 |
| Non-ferrous metals | - | - | - | - | - | - | 45 | - |
| Non-metallurgical minerals | - | - | - | - | - | - | 3392 | 418 |
| Transport equipment | - | - | - | - | - | - | - | - |
| Machinery | - | - | - | - | - | - | 4 | 1 |
| Mining and quarrying | - | - | - | - | - | - | - | - |
| Food and tobacco | - | - | - | - | 1 | 1 | 46 | 1 |
| Paper, pulp and print | - | - | - | - | 108 | - | 954 | 119 |
| Wood and wood products | - | - | - | - | - | - | 43 | 1 |
| Construction | - | - | - | - | - | - | 7 | 8 |
| Textile and leather | - | - | - | - | - | - | 66 | - |
| Non-specified | - | - | - | - | 46 | 315 | 710 | 74 |
| Transport | - | - | - | - | - | - | - | - |
| Road | - | - | - | - | - | - | - | - |
| Other | - | - | - | - | - | - | - | - |
| Other | - | - | - | - | 3464 | 5852 | 1276 | 682 |
| Residential | - | - | - | - | 2037 | 3631 | - | - |
| Commercial and public services | - | - | - | - | 540 | 2136 | 433 | 682 |
| Agriculture/forestry | - | - | - | - | 834 | 9 | 1 | - |
| Fishing | - | - | - | - | 54 | - | - | - |
| Non-specified | - | - | - | - | - | 75 | 841 | - |
| Electricity generated - GWh | 1412467 | 605454 | 1015 | 220418 | 51193 | 9284 | 22622 | 33072 |
| <i>Electricity plants</i> | 1412467 | 605454 | 1015 | 220418 | 46556 | 9284 | 18577 | 19749 |
| <i>CHP plants</i> | - | - | - | - | 4637 | - | 4045 | 13323 |
| Heat generated - TJ | - | - | - | - | 43200 | 1564 | 32151 | 148926 |
| <i>CHP plants</i> | - | - | - | - | 14945 | - | 20199 | 109673 |
| <i>Heat plants</i> | - | - | - | - | 28255 | 1564 | 11952 | 39253 |

1. Hydro does not include pumped hydro.

Source: IEA/OECD *World Energy Balances*.

OECD TOTAL

Table 6. Renewable and waste balance for 2016 (continued)

| Mun. waste non-ren. | Wood/wood waste | Charcoal | Bio-gases | Bio-gasoline | Bio-diesel | Other liquid biofuels | Total renew. & waste sources ² | Share in total energy sources ³ |
|---------------------|-----------------|------------|--------------|--------------|--------------|-----------------------|---|--|
| 15323 | 182786 | - | 21985 | 37819 | 16672 | 1408 | 543106 | 13.4% |
| 309 | 8470 | 166 | - | 2427 | 9619 | 437 | 21831 | 0.7% |
| -29 | -4181 | -19 | - | -3653 | -6149 | - | -14065 | 0.8% |
| 3 | -5 | - | - | 148 | -320 | - | -174 | x |
| 15607 | 187070 | 147 | 21985 | 36741 | 19822 | 1844 | 550699 | 10.4% |
| - | 474 | 7 | 6 | -8 | 111 | - | 608 | x |
| -4649 | -14048 | - | -6988 | - | -30 | -971 | -245282 | x |
| -1980 | -8351 | - | -2900 | - | - | -26 | -29890 | x |
| -3383 | -12734 | - | -5912 | - | -4 | -342 | -29228 | x |
| -2650 | -13231 | - | -1803 | - | -2 | -54 | -21069 | x |
| -929 | -4259 | - | -191 | - | - | -71 | -7590 | x |
| -310 | -230 | - | -45 | - | - | -1 | -1205 | x |
| - | -315 | 103 | - | - | - | - | -212 | x |
| - | -3 | - | -256 | - | - | - | -375 | x |
| -45 | -12 | - | -641 | - | -139 | -54 | -1010 | x |
| - | -10 | - | -39 | - | - | - | -58 | x |
| 1662 | 134350 | 257 | 3215 | 36733 | 19759 | 326 | 215390 | 5.9% |
| 880 | 64633 | 16 | 604 | - | 374 | 297 | 74618 | 9.4% |
| - | 10 | 1 | 2 | - | 2 | - | 61 | 0.1% |
| 24 | 441 | - | 86 | - | 43 | 8 | 2009 | 1.3% |
| - | 47 | - | 1 | - | 1 | - | 94 | 0.2% |
| 595 | 1710 | 3 | 31 | - | 17 | 8 | 6174 | 7.6% |
| - | 19 | - | 1 | - | 3 | 1 | 24 | 0.1% |
| 1 | 150 | - | 11 | - | 10 | 3 | 180 | 0.3% |
| - | 54 | - | 10 | - | 62 | 1 | 127 | 0.5% |
| - | 4439 | 7 | 193 | - | 13 | 2 | 4703 | 6.1% |
| 90 | 48130 | - | 171 | - | 2 | 269 | 49843 | 47.2% |
| - | 7878 | - | 2 | - | 11 | 1 | 7936 | 45.1% |
| 12 | 125 | - | 1 | - | 199 | - | 352 | 1.3% |
| 1 | 37 | 1 | 5 | - | - | - | 110 | 0.8% |
| 156 | 1593 | 5 | 92 | - | 11 | 4 | 3006 | 3.6% |
| - | - | - | 143 | 36721 | 18537 | 5 | 55406 | 4.5% |
| - | - | - | 143 | 36720 | 18145 | 5 | 55013 | 5.0% |
| - | - | - | 1 | 1 | 392 | - | 394 | 0.3% |
| 782 | 69717 | 241 | 2468 | 11 | 849 | 25 | 85367 | 6.7% |
| - | 62657 | 194 | 71 | 6 | 226 | - | 68822 | 10.1% |
| 782 | 4347 | 25 | 1960 | 1 | 355 | 25 | 11286 | 2.3% |
| - | 2496 | - | 436 | 1 | 262 | - | 4039 | 6.0% |
| - | - | - | - | 1 | 4 | - | 59 | 1.3% |
| - | 217 | 21 | 1 | 4 | 2 | - | 1161 | 4.5% |
| 32249 | 177613 | - | 80885 | - | 28 | 6836 | 2653136 | 24.3% |
| 19681 | 84580 | - | 37915 | - | 3 | 4810 | 2480509 | 25.3% |
| 12568 | 93033 | - | 42970 | - | 25 | 2026 | 172627 | 15.4% |
| 144942 | 451586 | - | 35938 | - | 27 | 4945 | 863279 | 26.9% |
| 104812 | 296025 | - | 29777 | - | 27 | 2428 | 577886 | 23.9% |
| 40130 | 155561 | - | 6161 | - | - | 2517 | 285393 | 36.0% |

2. Total includes non-renewable waste.

3. Share of renewables on TFC excludes electricity and heat generated from renewable sources.

Source: IEA/OECD *World Energy Balances*.

OECD TOTAL

Table 7. Aggregated renewables and waste statistics

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|--|---------|---------|---------|---------|---------|---------|---------|--|
| Geothermal (TJ) | | | | | | | | |
| Production | 1109795 | 1274762 | 1238245 | 1395426 | 1461496 | 1510185 | 1547850 | 1.1 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 1109795 | 1274762 | 1238245 | 1395426 | 1461496 | 1510185 | 1547850 | 1.1 |
| Statistical differences | -1144 | -634 | 93 | -1668 | -990 | 3785 | .. | .. |
| Transformation processes | 1045998 | 1182850 | 1119841 | 1267330 | 1314047 | 1362094 | .. | 0.9 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | 232 | 311 | 363 | 361 | 359 | 359 | .. | .. |
| Final energy consumption | 62421 | 90967 | 118134 | 126067 | 146100 | 151517 | .. | 3.2 |
| <i>Industry</i> | 5190 | 11097 | 7205 | 5695 | 5985 | 6477 | .. | -3.3 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 57231 | 79870 | 110929 | 120372 | 140115 | 145040 | .. | 3.8 |
| Solar thermal (TJ) | | | | | | | | |
| Production | 78043 | 159483 | 260986 | 372489 | 392356 | 382945 | 441171 | 5.6 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 78043 | 159483 | 260986 | 372489 | 392356 | 382945 | 441171 | 5.6 |
| Statistical differences | 4847 | - | -1 | 2 | -1 | 1 | .. | .. |
| Transformation processes | 7239 | 5593 | 20466 | 113818 | 123188 | 124657 | .. | 21.4 |
| Energy industry own use | - | - | 4 | 3 | 3 | 4 | .. | - |
| Losses | - | - | - | - | - | - | .. | .. |
| Final energy consumption | 75651 | 153890 | 240515 | 258670 | 269164 | 258285 | .. | 3.3 |
| <i>Industry</i> | 372 | 4163 | 6063 | 12739 | 12995 | 13285 | .. | 7.5 |
| <i>Transport</i> | - | - | - | 3 | - | - | .. | - |
| <i>Other</i> | 75279 | 149727 | 234452 | 245928 | 256169 | 245000 | .. | 3.1 |
| Industrial waste (TJ) | | | | | | | | |
| Production | 185155 | 337812 | 390534 | 459777 | 498515 | 589588 | 582772 | 3.5 |
| Net imports ¹ | - | - | 41 | 1257 | 2492 | 2529 | 2091 | - |
| Stock changes | - | -29 | -3 | -10 | 4 | 1 | .. | .. |
| Gross consumption | 185155 | 337783 | 390572 | 461024 | 501011 | 592118 | 584863 | 3.6 |
| Statistical differences | -65 | -646 | -996 | -148 | 157 | -3007 | .. | .. |
| Transformation processes | 113741 | 137359 | 113436 | 169575 | 191087 | 251799 | .. | 3.9 |
| Energy industry own use | 5222 | 229 | 2326 | 2705 | 3110 | 3556 | .. | 18.7 |
| Losses | - | - | 53 | 7 | - | - | .. | .. |
| Final energy consumption | 66127 | 199549 | 273761 | 288589 | 306971 | 333756 | .. | 3.3 |
| <i>Industry</i> | 63028 | 194957 | 220387 | 237049 | 254264 | 280350 | .. | 2.3 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 3099 | 4592 | 53374 | 51540 | 52707 | 53406 | .. | 16.6 |
| Municipal waste - renewables (TJ) | | | | | | | | |
| Production | 191125 | 358709 | 575032 | 614855 | 631440 | 639127 | 647241 | 3.7 |
| Net imports ¹ | - | - | - | 9317 | 11011 | 12950 | 14156 | - |
| Stock changes | - | 4 | -7 | - | - | - | - | - |
| Gross consumption | 191125 | 358713 | 575025 | 624172 | 642451 | 652077 | 661397 | 3.8 |
| Statistical differences | 2 | -2896 | 2223 | - | 1 | - | .. | .. |
| Transformation processes | 189050 | 298228 | 538971 | 574651 | 587687 | 595020 | .. | 4.4 |
| Energy industry own use | 34 | 4 | 426 | 1796 | 1540 | 1443 | .. | 44.5 |
| Losses | - | - | - | - | - | - | .. | .. |
| Final energy consumption | 2043 | 57585 | 37851 | 47725 | 53225 | 55614 | .. | -0.2 |
| <i>Industry</i> | 16 | 25051 | 9368 | 23332 | 25779 | 27063 | .. | 0.5 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 2027 | 32534 | 28483 | 24393 | 27446 | 28551 | .. | -0.8 |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

OECD TOTAL

Table 7. Aggregated renewables and waste statistics (continued)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|--|---------|---------|---------|---------|---------|---------|---------|--|
| Municipal waste - non-renewables (TJ) | | | | | | | | |
| Production | 186916 | 349930 | 524725 | 606168 | 619047 | 641561 | 645954 | 3.9 |
| Net imports ¹ | - | - | 761 | 9735 | 10670 | 11750 | 13160 | - |
| Stock changes | - | 4 | -19 | 160 | 14 | 143 | -19 | - |
| Gross consumption | 186916 | 349934 | 525467 | 616063 | 629731 | 653454 | 659095 | 4.0 |
| Statistical differences | - | -3065 | 1617 | -23 | -32 | 1 | .. | .. |
| Transformation processes | 185480 | 291238 | 483153 | 553652 | 562741 | 581977 | .. | 4.4 |
| Energy industry own use | 34 | 4 | 426 | 2492 | 2083 | 1902 | .. | 47.0 |
| Losses | - | - | 4 | - | - | - | .. | .. |
| Final energy consumption | 1402 | 55627 | 43501 | 59896 | 64875 | 69576 | .. | 1.4 |
| <i>Industry</i> | 13 | 24493 | 14276 | 31397 | 32344 | 36824 | .. | 2.6 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 1389 | 31134 | 29225 | 28499 | 32531 | 32752 | .. | 0.3 |
| Solid Biofuel excluding charcoal (TJ) | | | | | | | | |
| Production | 5643301 | 6275302 | 7350761 | 7676457 | 7680359 | 7652867 | 7793625 | 1.2 |
| Net imports ¹ | 8018 | 15350 | 110509 | 180725 | 175672 | 179566 | 184825 | 16.6 |
| Stock changes | 7938 | -417 | 2247 | -2038 | -1948 | -193 | 3815 | - |
| Gross consumption | 5659257 | 6290235 | 7463517 | 7855144 | 7854083 | 7832240 | 7982265 | 1.4 |
| Statistical differences | 5952 | 4204 | 1344 | 15736 | 2738 | 19853 | .. | .. |
| Transformation processes | 1680562 | 1065622 | 1687676 | 2141467 | 2173602 | 2226201 | .. | 4.7 |
| Energy industry own use | 31 | 136 | 10896 | 11785 | 1287 | 508 | .. | 8.6 |
| Losses | 80 | 12 | 127 | 11 | 74 | 422 | .. | .. |
| Final energy consumption | 3984536 | 5228669 | 5766162 | 5717617 | 5681858 | 5624962 | .. | 0.5 |
| <i>Industry</i> | 1459106 | 2631900 | 2551665 | 2681897 | 2692289 | 2706042 | .. | 0.2 |
| <i>Transport</i> | 1 | - | - | - | - | - | .. | - |
| <i>Other</i> | 2525429 | 2596769 | 3214497 | 3035720 | 2989569 | 2918920 | .. | 0.7 |
| Charcoal (kt) | | | | | | | | |
| Production | 330 | 362 | 325 | 153 | 152 | 147 | 157 | -5.5 |
| Net imports ¹ | 11 | 56 | 192 | 193 | 200 | 202 | 199 | 8.3 |
| Stock changes | - | - | 1 | - | -2 | - | 1 | - |
| Gross consumption | 341 | 418 | 518 | 346 | 350 | 349 | 357 | -1.1 |
| Statistical differences | - | - | - | -1 | - | 10 | .. | .. |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | .. |
| Final energy consumption | 341 | 418 | 518 | 345 | 350 | 359 | .. | -0.9 |
| <i>Industry</i> | - | 28 | 10 | 14 | 11 | 23 | .. | -1.2 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 341 | 390 | 508 | 331 | 339 | 336 | .. | -0.9 |
| Biogases (TJ) | | | | | | | | |
| Production | 63970 | 236257 | 527010 | 877712 | 906015 | 920448 | 931967 | 8.9 |
| Net imports ¹ | - | - | - | - | - | - | -42 | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 63970 | 236257 | 527010 | 877712 | 906015 | 920448 | 931925 | 8.9 |
| Statistical differences | 1 | -23 | -92 | 357 | 486 | 258 | .. | .. |
| Transformation processes | 48322 | 154748 | 437020 | 718749 | 743834 | 757619 | .. | 10.4 |
| Energy industry own use | - | 68 | 19885 | 22875 | 22031 | 26852 | .. | 45.3 |
| Losses | - | - | 918 | 907 | 964 | 1641 | .. | .. |
| Final energy consumption | 15649 | 81418 | 69095 | 135538 | 139672 | 134594 | .. | 3.2 |
| <i>Industry</i> | 9154 | 67112 | 15347 | 37817 | 39051 | 25286 | .. | -5.9 |
| <i>Transport</i> | - | 7 | 1498 | 5699 | 5826 | 5994 | .. | 52.5 |
| <i>Other</i> | 6495 | 14299 | 52250 | 92022 | 94795 | 103314 | .. | 13.2 |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

OECD TOTAL

Table 7. Aggregated renewables and waste statistics (continued)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|-----------------------------------|------|------|-------|-------|-------|-------|-------|---|
| Biogasoline (kt) | | | | | | | | |
| Production | - | 4735 | 43155 | 47216 | 48416 | 50232 | 51891 | 15.9 |
| Net imports ¹ | - | 79 | 912 | -386 | -14 | -1283 | -1690 | - |
| Stock changes | - | 77 | -167 | -258 | -385 | 185 | -437 | - |
| Gross consumption | - | 4891 | 43900 | 46572 | 48017 | 49134 | 49764 | 15.5 |
| Statistical differences | - | 365 | -2502 | 19 | 7 | -13 | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | 5256 | 41398 | 46591 | 48024 | 49121 | .. | 15.0 |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | 5256 | 41392 | 46578 | 48012 | 49104 | .. | 15.0 |
| <i>Other</i> | - | - | 6 | 13 | 12 | 17 | .. | - |
| Biodiesel (kt) | | | | | | | | |
| Production | 7 | 738 | 11168 | 17438 | 17058 | 17949 | 19317 | 22.1 |
| Net imports ¹ | - | 11 | 2188 | 1636 | 2311 | 3516 | 2381 | 43.4 |
| Stock changes | - | -5 | 44 | 52 | -87 | -296 | 538 | - |
| Gross consumption | 7 | 744 | 13400 | 19014 | 19119 | 21169 | 22236 | 23.3 |
| Statistical differences | 1 | - | -92 | -25 | -33 | 124 | .. | - |
| Transformation processes | - | - | - | 50 | 45 | 36 | .. | - |
| Energy industry own use | - | - | - | 100 | 134 | 138 | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 8 | 744 | 13308 | 18839 | 18907 | 21119 | .. | 23.3 |
| <i>Industry</i> | - | - | 35 | 276 | 368 | 379 | .. | - |
| <i>Transport</i> | 7 | 742 | 13087 | 17857 | 17690 | 19875 | .. | 22.8 |
| <i>Other</i> | 1 | 2 | 186 | 706 | 849 | 865 | .. | 46.1 |
| Other liquid biofuels (kt) | | | | | | | | |
| Production | - | 17 | 1405 | 1145 | 1381 | 1929 | 1707 | 34.4 |
| Net imports ¹ | - | - | 729 | 877 | 918 | 499 | 470 | - |
| Stock changes | - | - | - | - | - | - | 2 | - |
| Gross consumption | - | 17 | 2134 | 2022 | 2299 | 2428 | 2179 | 36.4 |
| Statistical differences | - | - | 3 | - | -1 | - | .. | - |
| Transformation processes | - | 1 | 1536 | 1479 | 1740 | 1752 | .. | 59.5 |
| Energy industry own use | - | - | 16 | 33 | 32 | 57 | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | 16 | 585 | 510 | 526 | 619 | .. | 25.7 |
| <i>Industry</i> | - | - | 321 | 461 | 481 | 567 | .. | - |
| <i>Transport</i> | - | 16 | 66 | 11 | 6 | 7 | .. | -5.0 |
| <i>Other</i> | - | - | 198 | 38 | 39 | 45 | .. | - |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Figure 1. Contribution of renewables in 1990

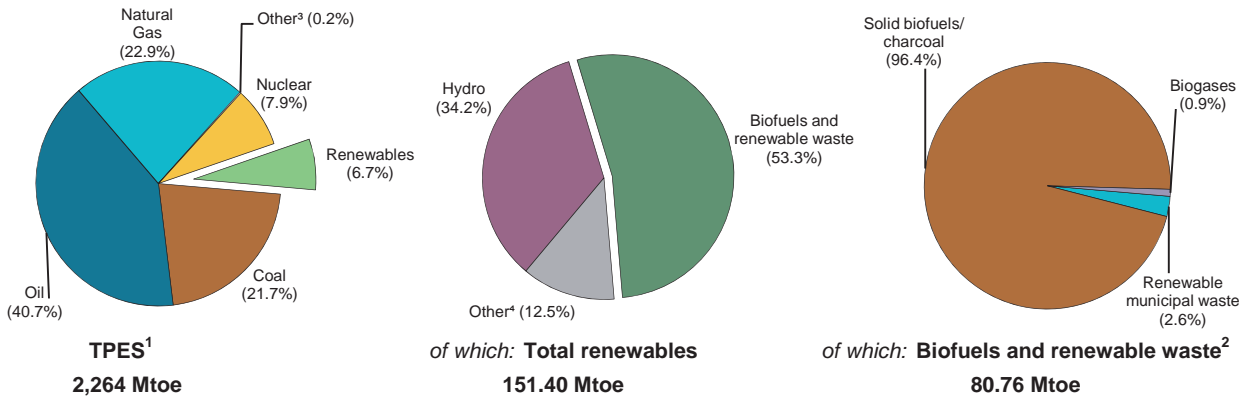


Figure 2. Contribution of renewables in 2017 provisional

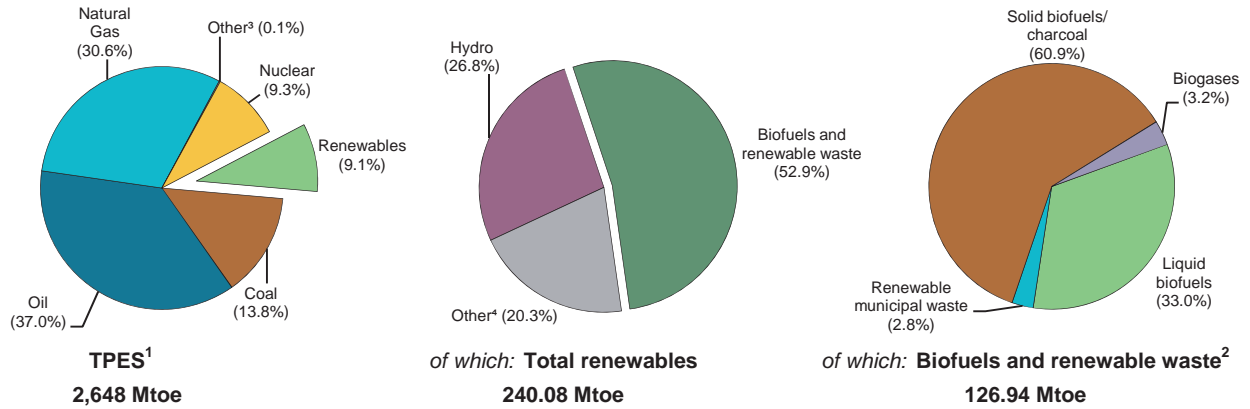
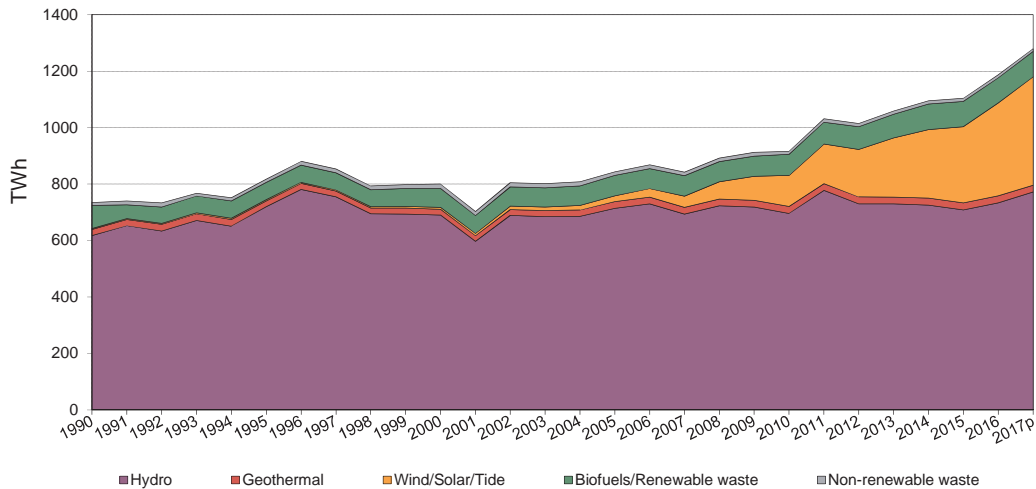


Figure 3. Electricity production by renewables and waste energy source



1. Total primary energy supply includes electricity trade.
2. Biofuels and renewable waste include solid biofuels, liquid biofuels, biogases, and renewable municipal waste.
3. Includes non-renewable municipal waste, industrial waste, peat, shale oil, electricity trade, and other sources of primary energy. (In the case of negative values, the net exports of electricity are greater than the other products in this category).
4. Includes geothermal, solar, wind and tide.

Note: Totals may not sum due to rounding.
Source: IEA/OECD World Energy Balances.

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Table 1. Energy supply, GDP and population

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|---|----------|----------|----------|----------|----------|----------|----------|--|
| TPES (Mtoe) | 2264.00 | 2703.34 | 2689.34 | 2713.28 | 2688.84 | 2669.68 | 2648.44 | -0.1 |
| of which: Renewables (Mtoe) ¹ | 151.40 | 169.78 | 191.86 | 227.08 | 225.01 | 230.88 | 240.08 | 2.1 |
| Renewables/TPES(%) | 6.7 | 6.3 | 7.1 | 8.4 | 8.4 | 8.6 | 9.1 | 2.2 |
| GDP (billion 2010 US dollars) | 10797.16 | 15115.53 | 17854.17 | 19436.76 | 19963.15 | 20275.27 | 20745.27 | 1.9 |
| TPES/GDP ² | 0.21 | 0.18 | 0.15 | 0.14 | 0.13 | 0.13 | 0.13 | -2.0 |
| TPES/GDP (year 2010 = 100) | 139 | 119 | 100 | 93 | 89 | 87 | 85 | -2.0 |
| Population (millions) | 378.12 | 429.38 | 475.16 | 491.97 | 496.06 | 500.21 | 504.45 | 1.0 |
| TPES/population (toe per capita) | 5.99 | 6.30 | 5.66 | 5.52 | 5.42 | 5.34 | 5.25 | -1.1 |
| Electricity generation (TWh) ³ | 3819.1 | 4877.2 | 5294.6 | 5354.1 | 5351.2 | 5366.6 | 5307.1 | 0.5 |
| of which: Renewables (TWh) ^{1,3} | 708.43 | 757.55 | 881.47 | 1063.57 | 1073.01 | 1153.93 | 1246.76 | 3.0 |
| Renew./Total Elec.(%) ^{1,4} | 18.5 | 15.5 | 16.6 | 19.9 | 20.1 | 21.5 | 23.5 | 2.5 |
| Road energy consumption (Mtoe) | 454.2 | 569.0 | 621.6 | 613.0 | 630.9 | 637.1 | .. | .. |
| of which: Liquid biofuels (Mtoe) | - | 3.32 | 24.44 | 36.36 | 37.36 | 40.02 | .. | .. |
| Liq. biofuels/road tr.(%) ⁵ | - | 0.6 | 3.9 | 5.9 | 5.9 | 6.3 | - | - |

1. Renewables do not include industrial waste, non-renewable municipal waste and pumped storage production.

2. In units of toe per thousand 2010 US dollars.

3. Electricity generation = gross production - amount of electricity produced in pumped storage plants.

4. Electricity share generated from renewables over the total electricity production.

5. Energy from liquid biofuels consumed in road transport over the total energy consumed in road transport.

Source: IEA/OECD *World Energy Balances* and OECD *Main Economic Indicators*.

Table 2. Net generating capacity of renewable and waste sources (MWe)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | Average annual percent change 00-16 |
|---|--------|---------------|---------------|---------------|---------------|---------------|--|
| Total capacity | .. | 199111 | 258556 | 314753 | 336484 | 360813 | .. |
| Hydro | 162257 | 180371 | 193166 | 196608 | 200381 | 202202 | 0.7 |
| Hydro <1MW | 1 | 637 | 72 | 72 | 81 | 77 | -12.4 |
| Hydro 1-10MW | 48 | 5769 | 3914 | 4373 | 4379 | 4482 | -1.6 |
| Hydro 10+MW | 10467 | 87036 | 158183 | 160874 | 164543 | 166064 | 4.1 |
| Mixed plants | - | - | 12308 | 12339 | 12339 | 12378 | - |
| Pure pumped storage | .. | 19699 | 18688 | 18950 | 19040 | 19201 | .. |
| Geothermal | 3369 | 3648 | 3370 | 3327 | 3448 | 3443 | -0.4 |
| Solar photovoltaic | .. | 197 | 3159 | 18164 | 24950 | 36943 | .. |
| Solar thermal | 339 | 419 | 473 | 1667 | 1758 | 1758 | 9.4 |
| Tide, wave, ocean | 20 | 20 | 20 | 20 | 20 | 20 | - |
| Wind | 1915 | 2486 | 43784 | 77231 | 87968 | 98350 | 25.8 |
| Industrial waste | .. | 638 | 529 | 627 | 222 | 291 | .. |
| Municipal waste | .. | 2641 | 2255 | 2307 | 2325 | 2325 | .. |
| Solid biofuels | .. | 7699 | 9824 | 12058 | 12684 | 12737 | .. |
| Biogases | .. | 992 | 1793 | 2589 | 2573 | 2589 | .. |
| Liquid biofuels | - | - | 183 | 155 | 155 | 155 | - |
| Solar collectors surface (1000 m ²) | 18530 | 19768 | 28297 | 34291 | 35766 | 36190 | 3.9 |
| Cap. of solar collectors (MW _{th}) ¹ | 12971 | 13838 | 19807 | 24004 | 25037 | 25333 | 3.9 |

1. Converted at 0.7 kW_{th}/m² of solar collector area, as estimated by the IEA Solar Heating & Cooling Programme.

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Table 3. Capacity factors (%)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 |
|--|----------------|----------------|----------------|----------------|----------------|----------------|
| Total plants¹ | 46.66 e | 45.87 e | 40.47 e | 39.71 e | 37.45 e | 37.55 e |
| Hydro | 43.49 | 43.69 e | 41.17 | 42.16 | 40.34 | 41.40 |
| <i>of which: <1MW</i> | - | 43.17 | 52.59 | 39.47 | 33.37 | 44.29 |
| <i>of which: 1-10MW</i> | 33.30 | 24.84 | 37.45 | 30.88 | 29.36 | 30.80 |
| <i>of which: 10+MW</i> | 35.19 | 38.02 | 47.58 | 49.24 | 46.93 | 48.01 |
| <i>of which: pure pumped storage²</i> | x | 15.58 e | x | x | x | x |
| Geothermal | 71.62 | 64.22 | 81.96 | 84.78 | 82.96 | 82.00 |
| Solar photovoltaic | 9.13 | 11.91 e | 12.10 e | 16.28 e | 16.70 e | 16.24 e |
| Solar thermal | 22.33 | 14.33 | 21.20 | 18.41 | 23.01 | 24.03 |
| Tide, wave and ocean | 14.84 | 18.26 e | 15.96 | 8.93 | 7.39 | 10.38 |
| Wind | 18.28 | 27.24 e | 27.49 | 31.68 | 29.89 | 31.69 |
| Industrial waste | 99.94 e | x | 77.57 | 52.74 | x | 78.95 |
| Municipal waste | 60.79 e | 72.96 | 85.22 | 83.41 | 82.43 | 83.36 |
| Solid biofuels | 94.36 e | 77.91 e | 63.74 | 62.89 | 59.46 | 58.80 |
| Biogases | 86.03 e | 68.53 e | 68.24 | 65.09 | 65.74 | 64.41 |
| Biodiesels | - | - | - | - | - | - |
| Other liquid biofuels | - | - | 5.89 | 15.29 | 16.45 | 15.41 |

1. The capacity factor is defined as: the annual gross electricity generation divided by the reported net capacity times 365 (days/year) times 24 (hours/day).

2. In case a country has at least one mixed hydro plants, it is impossible to calculate capacity factor thus it is shown as 'not applicable'.

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Table 4. Gross electricity production from renewable and waste sources (GWh)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|---------------------------------------|----------------------|----------------------|----------------------|-----------------------|-----------------------|-----------------------|------------------|---|
| Total electricity¹ | 734404 | 800026 | 916630 | 1094859 | 1103750 | 1186779 | 1279450 | 2.8 |
| Hydro | 618214 | 690255 | 696642 | 726093 | 708118 | 733293 | 771771 | 0.7 |
| <i>of which: pumped storage</i> | <i>15919</i> | <i>26893</i> | <i>24178</i> | <i>20165</i> | <i>20222</i> | <i>22554</i> | <i>22863</i> | <i>-1.0</i> |
| Geothermal | 21136 | 20522 | 24195 | 24710 | 25058 | 24732 | 24131 | 1.0 |
| Solar photovoltaic | 4 | 206 | 3349 | 25897 | 36493 | 52555 | 75995 | 41.6 |
| Solar thermal | 663 | 526 | 879 | 2688 | 3544 | 3701 | 5432 | 14.7 |
| Tide, wave, ocean | 26 | 32 | 28 | 16 | 13 | 18 | 6 | -9.4 |
| Wind | 3067 | 5933 | 105443 | 214299 | 230298 | 273064 | 302521 | 26.0 |
| Industrial waste | 4710 | 7170 | 3595 | 2898 | 2331 | 2013 | 1858 | -7.6 |
| Municipal waste renew. | 5382 | 8463 | 9446 | 8633 | 8599 | 8696 | 8379 | -0.1 |
| Municipal waste non-renew. | 5348 | 8417 | 7389 | 8223 | 8189 | 8283 | 7966 | -0.3 |
| Solid biofuels | 73337 | 52547 | 54855 | 66432 | 66065 | 65606 | 67311 | 1.5 |
| Biogases | 2517 | 5955 | 10715 | 14762 | 14819 | 14608 | 13856 | 5.1 |
| Liquid biofuels | - | - | 94 | 208 | 223 | 210 | 224 | - |
| <i>of which:</i> | | | | | | | | |
| <i>Electricity only plants</i> | <i>671437</i> | <i>757120</i> | <i>876956</i> | <i>1050160</i> | <i>1059465</i> | <i>1142187</i> | <i>..</i> | <i>-</i> |
| Hydro | 618214 | 690255 | 696642 | 726093 | 708118 | 733293 | .. | - |
| <i>of which: pumped storage</i> | <i>15919</i> | <i>26893</i> | <i>24178</i> | <i>20165</i> | <i>20222</i> | <i>22554</i> | <i>..</i> | <i>-</i> |
| Geothermal | 21136 | 20522 | 24195 | 24710 | 25058 | 24732 | .. | - |
| Solar photovoltaic | 4 | 206 | 3349 | 25897 | 36493 | 52555 | .. | - |
| Solar thermal | 663 | 526 | 879 | 2688 | 3544 | 3701 | .. | - |
| Tide, wave, ocean | 26 | 32 | 28 | 16 | 13 | 18 | .. | - |
| Wind | 3067 | 5933 | 105443 | 214299 | 230298 | 273064 | .. | - |
| Industrial waste | 749 | 923 | 870 | 805 | 764 | 618 | .. | - |
| Municipal waste renew. | 4846 | 7286 | 8399 | 7665 | 7617 | 7740 | .. | - |
| Municipal waste non-renew. | 4847 | 7275 | 6586 | 7327 | 7281 | 7399 | .. | - |
| Solid biofuels | 15368 | 19532 | 21245 | 27578 | 27114 | 26164 | .. | - |
| Biogases | 2517 | 4630 | 9311 | 13032 | 13101 | 12858 | .. | - |
| Liquid biofuels | - | - | 9 | 50 | 64 | 45 | .. | - |
| <i>CHP plants</i> | <i>62967</i> | <i>42906</i> | <i>39674</i> | <i>44699</i> | <i>44285</i> | <i>44592</i> | <i>..</i> | <i>-</i> |
| Geothermal | - | - | - | - | - | - | - | - |
| Industrial waste | 3961 | 6247 | 2725 | 2093 | 1567 | 1395 | .. | - |
| Municipal waste renew. | 536 | 1177 | 1047 | 968 | 982 | 956 | .. | - |
| Municipal waste non-renew. | 501 | 1142 | 803 | 896 | 908 | 884 | .. | - |
| Solid biofuels | 57969 | 33015 | 33610 | 38854 | 38951 | 39442 | .. | - |
| Biogases | - | 1325 | 1404 | 1730 | 1718 | 1750 | .. | - |
| Liquid biofuels | - | - | 85 | 158 | 159 | 165 | .. | - |

1. **Total electricity** includes the electricity produced from industrial waste, non-renewable municipal waste and pumped storage. Electricity from renewable sources does *not* include the electricity produced from industrial waste, non-renewable municipal waste and pumped storage production.

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Table 5A. Heat production¹ from renewable and waste sources in the transformation sector (TJ)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|----------------------------|------|-------|-------|-------|-------|-------|-------|--|
| Total heat | - | 29132 | 48700 | 51708 | 48991 | 63419 | 64508 | 4.8 |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | 187 | 3807 | 4938 | 4300 | 6815 | 6050 | 22.7 |
| Municipal waste renew. | - | 8935 | 7736 | 7384 | 7442 | 9217 | 8792 | -0.1 |
| Municipal waste non-renew. | - | 8330 | 5738 | 6265 | 6321 | 8026 | 7618 | -0.5 |
| Solid biofuels | - | 9489 | 26954 | 29987 | 27400 | 34314 | 36517 | 8.3 |
| Biogases | - | 2191 | 4465 | 3134 | 3528 | 5047 | 5531 | 5.6 |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| <i>of which:</i> | | | | | | | | |
| CHP plants | .. | 27751 | 44745 | 47409 | 44692 | 59120 | .. | - |
| Geothermal | .. | - | - | - | - | - | - | - |
| Solar thermal | .. | - | - | - | - | - | - | - |
| Industrial waste | .. | 187 | 3807 | 4938 | 4300 | 6815 | .. | - |
| Municipal waste renew. | .. | 8037 | 6819 | 5884 | 5942 | 7717 | .. | - |
| Municipal waste non-renew. | .. | 7847 | 5244 | 5458 | 5514 | 7219 | .. | - |
| Solid biofuels | .. | 9489 | 26954 | 29987 | 27400 | 34314 | .. | - |
| Biogases | .. | 2191 | 1921 | 1142 | 1536 | 3055 | .. | - |
| Liquid biofuels | .. | - | - | - | - | - | - | - |
| Heat only plants | .. | 1381 | 3955 | 4299 | 4299 | 4299 | .. | - |
| Geothermal | .. | - | - | - | - | - | - | - |
| Solar thermal | .. | - | - | - | - | - | - | - |
| Industrial waste | .. | - | - | - | - | - | - | - |
| Municipal waste renew. | .. | 898 | 917 | 1500 | 1500 | 1500 | .. | - |
| Municipal waste non-renew. | .. | 483 | 494 | 807 | 807 | 807 | .. | - |
| Solid biofuels | .. | - | - | - | - | - | - | - |
| Biogases | .. | - | 2544 | 1992 | 1992 | 1992 | .. | - |
| Liquid biofuels | .. | - | - | - | - | - | - | - |

1. Waste heat and heat production from heat pumps are not included and are reported separately in Table 5B.

Table 5B. Heat production from heat pumps and waste heat (TJ)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|----------------------------|------|------|------|------|------|------|-------|--|
| Total heat | - | - | - | - | - | - | - | - |
| Heat pumps ¹ | - | - | - | - | - | - | - | - |
| (-) Input to heat pumps | - | - | - | - | - | - | - | - |
| Other sources ² | - | - | - | - | - | - | - | - |

1. Installations producing heat for own use are not included.

2. Refers to production from hydrogen, purchased steam from industry, and waste heat.

Source: IEA/OECD *Electricity Statistics*.

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Table 6. Renewable and waste balance for 2016

| thousand tonnes of oil equivalent | Hydro ¹ | Wind | Tide wave ocean | Solar PV | Geo-thermal | Solar thermal | Industrial waste | Mun. waste renew. |
|------------------------------------|--------------------|---------------|-----------------|--------------|--------------|---------------|------------------|-------------------|
| Production | 61113 | 23479 | 2 | 4519 | 12327 | 3036 | 1231 | 3810 |
| Imports | - | - | - | - | - | - | - | - |
| Exports | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| TPES | 61113 | 23479 | 2 | 4519 | 12327 | 3036 | 1231 | 3810 |
| Statistical differences | - | - | - | - | - | - | - | - |
| Main activity electricity plants | -58232 | -22684 | -2 | -3317 | -11985 | -748 | -152 | -2684 |
| Autoproducer electricity plants | -2880 | -795 | - | -1202 | -59 | - | -143 | -392 |
| Main activity CHP plants | - | - | - | - | - | - | -238 | -297 |
| Autoproducer CHP plants | - | - | - | - | - | - | -124 | -99 |
| Main heat plants | - | - | - | - | - | - | - | -66 |
| Autoproducer heat plants | - | - | - | - | - | - | - | - |
| Charcoal production plants | - | - | - | - | - | - | - | - |
| Other transformation | - | - | - | - | - | - | - | - |
| Energy Industry own use | - | - | - | - | - | - | - | - |
| Losses | - | - | - | - | - | - | - | - |
| TFC | - | - | - | - | 283 | 2288 | 574 | 272 |
| Industry | - | - | - | - | - | 12 | 574 | 41 |
| Iron and steel | - | - | - | - | - | - | - | - |
| Chemical and petrochemical | - | - | - | - | - | - | 197 | - |
| Non-ferrous metals | - | - | - | - | - | - | - | - |
| Non-metallc minerals | - | - | - | - | - | - | 144 | - |
| Transport equipment | - | - | - | - | - | - | - | - |
| Machinery | - | - | - | - | - | - | - | - |
| Mining and quarrying | - | - | - | - | - | - | - | - |
| Food and tobacco | - | - | - | - | - | - | 7 | - |
| Paper, pulp and print | - | - | - | - | - | - | 226 | - |
| Wood and wood products | - | - | - | - | - | - | - | - |
| Construction | - | - | - | - | - | - | - | - |
| Textile and leather | - | - | - | - | - | - | - | - |
| Non-specified | - | - | - | - | - | 12 | - | 41 |
| Transport | - | - | - | - | - | - | - | - |
| Road | - | - | - | - | - | - | - | - |
| Other | - | - | - | - | - | - | - | - |
| Other | - | - | - | - | 283 | 2276 | - | 231 |
| Residential | - | - | - | - | 283 | 387 | - | - |
| Commercial and public services | - | - | - | - | - | 1814 | - | 231 |
| Agriculture/forestry | - | - | - | - | - | - | - | - |
| Fishing | - | - | - | - | - | - | - | - |
| Non-specified | - | - | - | - | - | 75 | - | - |
| Electricity generated - GWh | 710739 | 273064 | 18 | 52555 | 24732 | 3701 | 2013 | 8696 |
| <i>Electricity plants</i> | 710739 | 273064 | 18 | 52555 | 24732 | 3701 | 618 | 7740 |
| <i>CHP plants</i> | - | - | - | - | - | - | 1395 | 956 |
| Heat generated - TJ | - | - | - | - | - | - | 6815 | 9217 |
| <i>CHP plants</i> | - | - | - | - | - | - | 6815 | 7717 |
| <i>Heat plants</i> | - | - | - | - | - | - | - | 1500 |

1. Hydro does not include pumped hydro.

Source: IEA/OECD *World Energy Balances*.

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Table 6. Renewable and waste balance for 2016 (continued)

| Mun. waste non-ren. | Wood/wood waste | Charcoal | Bio-gases | Bio-gasoline | Bio-diesel | Other liquid biofuels | Total renew. & waste sources ² | Share in total energy sources ³ |
|---------------------|-----------------|-----------|--------------|--------------|-------------|-----------------------|---|--|
| 3611 | 77352 | - | 4240 | 35462 | 5594 | 305 | 236081 | 9.1% |
| - | 111 | 1 | - | 639 | 3417 | - | 4168 | 0.5% |
| - | -913 | - | - | -2675 | -623 | - | -4211 | 0.6% |
| - | -11 | - | - | 179 | -480 | - | -312 | x |
| 3611 | 76539 | 1 | 4240 | 33605 | 7908 | 305 | 235726 | 8.8% |
| - | 219 | 7 | - | 1 | -1 | -1 | 225 | x |
| -2566 | -4637 | - | -3189 | - | -28 | -8 | -110232 | x |
| -376 | -4045 | - | -294 | - | - | - | -10186 | x |
| -276 | -2310 | - | -257 | - | -1 | - | -3379 | x |
| -95 | -7592 | - | -214 | - | - | -29 | -8153 | x |
| -35 | - | - | -52 | - | - | - | -153 | x |
| - | - | - | -36 | - | - | - | -36 | x |
| - | -110 | 44 | - | - | - | - | -66 | x |
| - | - | - | - | - | - | - | - | - |
| - | - | - | -2 | - | -139 | - | -141 | x |
| - | -10 | - | -16 | - | - | - | -26 | x |
| 262 | 58055 | 51 | 179 | 33605 | 7739 | 267 | 103575 | 5.6% |
| 40 | 36144 | 7 | 75 | - | 311 | 267 | 37471 | 10.7% |
| - | - | - | 1 | - | 2 | - | 3 | 0.0% |
| - | 51 | - | 6 | - | 42 | - | 296 | 0.4% |
| - | - | - | - | - | 1 | - | 1 | 0.0% |
| - | 415 | 3 | - | - | 15 | 2 | 579 | 2.2% |
| - | - | - | 1 | - | 2 | - | 3 | 0.0% |
| - | - | - | - | - | 10 | - | 10 | 0.1% |
| - | - | - | - | - | 55 | - | 55 | 0.3% |
| - | 1322 | - | 3 | - | 9 | - | 1341 | 4.0% |
| - | 32478 | - | 61 | - | 2 | 265 | 33032 | 56.1% |
| - | 1233 | - | - | - | 11 | - | 1244 | 20.7% |
| - | - | - | - | - | 152 | - | 152 | 0.9% |
| - | - | - | - | - | - | - | - | - |
| 40 | 645 | 5 | 4 | - | 9 | - | 756 | 1.5% |
| - | - | - | - | 33605 | 6761 | - | 40366 | 5.4% |
| - | - | - | - | 33605 | 6410 | - | 40015 | 6.3% |
| - | - | - | - | - | 351 | - | 351 | 0.3% |
| 222 | 21911 | 44 | 104 | - | 667 | - | 25738 | 4.4% |
| - | 19655 | 41 | - | - | 225 | - | 20591 | 6.8% |
| 222 | 1325 | 3 | 103 | - | 212 | - | 3910 | 1.6% |
| - | 930 | - | 1 | - | 231 | - | 1162 | 3.7% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | 75 | 0.4% |
| 8283 | 65606 | - | 14608 | - | - | 210 | 1164225 | 21.7% |
| 7399 | 26164 | - | 12858 | - | - | 45 | 1119633 | 22.3% |
| 884 | 39442 | - | 1750 | - | - | 165 | 44592 | 12.7% |
| 8026 | 34314 | - | 5047 | - | - | - | 63419 | 11.9% |
| 7219 | 34314 | - | 3055 | - | - | - | 59120 | 11.2% |
| 807 | - | - | 1992 | - | - | - | 4299 | 99.7% |

2. Total includes non-renewable waste.

3. Share of renewables on TFC excludes electricity and heat generated from renewable sources.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|--|--------|--------|--------|--------|--------|--------|--------|--|
| Geothermal (TJ) | | | | | | | | |
| Production | 774965 | 760527 | 505376 | 505754 | 511050 | 516120 | 501723 | -2.4 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 774965 | 760527 | 505376 | 505754 | 511050 | 516120 | 501723 | -2.4 |
| Statistical differences | - | - | - | - | - | -1 | .. | .. |
| Transformation processes | 760896 | 738792 | 494624 | 494785 | 499770 | 504291 | .. | -2.4 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | .. |
| Final energy consumption | 14069 | 21735 | 10752 | 10969 | 11280 | 11828 | .. | -3.7 |
| <i>Industry</i> | - | 4642 | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 14069 | 17093 | 10752 | 10969 | 11280 | 11828 | .. | -2.3 |
| Solar thermal (TJ) | | | | | | | | |
| Production | 3114 | 67693 | 93724 | 127052 | 138125 | 127117 | 176311 | 4.0 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 3114 | 67693 | 93724 | 127052 | 138125 | 127117 | 176311 | 4.0 |
| Statistical differences | 4846 | - | - | - | - | -1 | .. | .. |
| Transformation processes | 7233 | 5569 | 7719 | 23271 | 30141 | 31310 | .. | 11.4 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | .. |
| Final energy consumption | 727 | 62124 | 86005 | 103781 | 107984 | 95806 | .. | 2.7 |
| <i>Industry</i> | 34 | 85 | 218 | 415 | 462 | 519 | .. | 12.0 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 693 | 62039 | 85787 | 103366 | 107522 | 95287 | .. | 2.7 |
| Industrial waste (TJ) | | | | | | | | |
| Production | 82284 | 175354 | 85870 | 64987 | 56942 | 51550 | 40338 | -7.4 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 82284 | 175354 | 85870 | 64987 | 56942 | 51550 | 40338 | -7.4 |
| Statistical differences | - | - | -1 | - | - | - | .. | .. |
| Transformation processes | 80721 | 69406 | 42274 | 39428 | 33948 | 27512 | .. | -5.6 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | .. |
| Final energy consumption | 1563 | 105948 | 43595 | 25559 | 22994 | 24038 | .. | -8.9 |
| <i>Industry</i> | 1563 | 105293 | 43457 | 25559 | 22994 | 24038 | .. | -8.8 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | 655 | 138 | - | - | - | .. | - |
| Municipal waste - renewables (TJ) | | | | | | | | |
| Production | 89439 | 174721 | 166232 | 155500 | 155047 | 159534 | 150828 | -0.6 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 89439 | 174721 | 166232 | 155500 | 155047 | 159534 | 150828 | -0.6 |
| Statistical differences | - | - | -1 | - | 1 | - | .. | .. |
| Transformation processes | 89439 | 131946 | 154734 | 144833 | 143594 | 148126 | .. | 0.7 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | .. |
| Final energy consumption | - | 42775 | 11497 | 10667 | 11454 | 11408 | .. | -7.9 |
| <i>Industry</i> | - | 23850 | 1140 | 1601 | 1679 | 1721 | .. | -15.2 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | 18925 | 10357 | 9066 | 9775 | 9687 | .. | -4.1 |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics (continued)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|--|---------|---------|---------|---------|---------|---------|---------|---|
| Municipal waste - non-renewables (TJ) | | | | | | | | |
| Production | 88273 | 173229 | 129764 | 147328 | 146893 | 151204 | 142839 | -0.8 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 88273 | 173229 | 129764 | 147328 | 146893 | 151204 | 142839 | -0.8 |
| Statistical differences | - | - | 1 | - | - | - | .. | - |
| Transformation processes | 88273 | 130454 | 120731 | 137079 | 135888 | 140243 | .. | 0.5 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | 42775 | 9034 | 10249 | 11005 | 10961 | .. | -8.2 |
| <i>Industry</i> | - | 23850 | 896 | 1538 | 1614 | 1654 | .. | -15.4 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | 18925 | 8138 | 8711 | 9391 | 9307 | .. | -4.3 |
| Solid Biofuel excluding charcoal (TJ) | | | | | | | | |
| Production | 3260675 | 3436578 | 3240344 | 3547325 | 3358053 | 3238592 | 3268929 | -0.4 |
| Net imports ¹ | -515 | -3127 | -18311 | -21515 | -20948 | -33571 | -29970 | 16.0 |
| Stock changes | - | - | - | - | - | -467 | - | - |
| Gross consumption | 3260160 | 3433451 | 3222033 | 3525810 | 3337105 | 3204554 | 3238959 | -0.4 |
| Statistical differences | 1 | 2 | -2 | 5707 | -6988 | 9165 | .. | - |
| Transformation processes | 1435508 | 637703 | 564294 | 812290 | 795807 | 782647 | .. | 1.3 |
| Energy industry own use | 25 | - | - | 90 | 90 | - | .. | - |
| Losses | - | - | - | - | 46 | 422 | .. | - |
| Final energy consumption | 1824628 | 2795750 | 2657737 | 2719137 | 2534174 | 2430650 | .. | -0.9 |
| <i>Industry</i> | 725591 | 1726726 | 1485962 | 1571891 | 1542836 | 1513286 | .. | -0.8 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 1099037 | 1069024 | 1171775 | 1147246 | 991338 | 917364 | .. | -1.0 |
| Charcoal (kt) | | | | | | | | |
| Production | 249 | 253 | 248 | 72 | 73 | 65 | 65 | -8.1 |
| Net imports ¹ | - | - | 37 | - | - | 1 | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 249 | 253 | 285 | 72 | 73 | 66 | 65 | -8.1 |
| Statistical differences | - | - | - | -1 | - | 10 | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 249 | 253 | 285 | 71 | 73 | 76 | .. | -7.2 |
| <i>Industry</i> | - | - | - | 3 | - | 11 | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 249 | 253 | 285 | 68 | 73 | 65 | .. | -8.1 |
| Biogases (TJ) | | | | | | | | |
| Production | 31687 | 132324 | 132578 | 204351 | 200450 | 177500 | 172594 | 1.9 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 31687 | 132324 | 132578 | 204351 | 200450 | 177500 | 172594 | 1.9 |
| Statistical differences | - | - | -1 | 85 | -144 | -1 | .. | - |
| Transformation processes | 31687 | 71680 | 128980 | 180546 | 178312 | 169227 | .. | 5.5 |
| Energy industry own use | - | - | 38 | 78 | 78 | 78 | .. | - |
| Losses | - | - | - | - | - | 687 | .. | - |
| Final energy consumption | - | 60644 | 3559 | 23812 | 21916 | 7507 | .. | -12.2 |
| <i>Industry</i> | - | 57399 | 1657 | 21601 | 18795 | 3152 | .. | -16.6 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | 3245 | 1902 | 2211 | 3121 | 4355 | .. | 1.9 |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics (continued)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|-----------------------------------|------|------|-------|-------|-------|-------|-------|---|
| Biogasoline (kt) | | | | | | | | |
| Production | - | 4642 | 40164 | 43432 | 44818 | 46586 | 47971 | 15.5 |
| Net imports ¹ | - | 79 | -754 | -1322 | -1301 | -2521 | -2799 | - |
| Stock changes | - | 79 | -166 | -291 | -356 | 234 | -415 | - |
| Gross consumption | - | 4800 | 39244 | 41819 | 43161 | 44299 | 44757 | 14.9 |
| Statistical differences | - | 365 | -2551 | -1 | 2 | 1 | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | 5165 | 36693 | 41818 | 43163 | 44300 | .. | 14.4 |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | 5165 | 36693 | 41818 | 43163 | 44300 | .. | 14.4 |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Biodiesel (kt) | | | | | | | | |
| Production | - | 21 | 964 | 4526 | 4478 | 5601 | 5665 | 41.8 |
| Net imports ¹ | - | - | 154 | 970 | 1756 | 2768 | 1627 | - |
| Stock changes | - | - | 9 | 126 | -235 | -476 | 437 | - |
| Gross consumption | - | 21 | 1127 | 5510 | 5836 | 7893 | 7729 | 44.9 |
| Statistical differences | - | - | -1 | - | -1 | -1 | .. | - |
| Transformation processes | - | - | - | 44 | 38 | 29 | .. | - |
| Energy industry own use | - | - | - | 100 | 134 | 138 | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | 21 | 1126 | 5366 | 5663 | 7725 | .. | 44.7 |
| <i>Industry</i> | - | - | - | 206 | 292 | 309 | .. | - |
| <i>Transport</i> | - | 21 | 1126 | 4659 | 4724 | 6754 | .. | 43.5 |
| <i>Other</i> | - | - | - | 501 | 647 | 662 | .. | - |
| Other liquid biofuels (kt) | | | | | | | | |
| Production | - | - | 194 | 525 | 563 | 592 | 363 | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | 194 | 525 | 563 | 592 | 363 | - |
| Statistical differences | - | - | - | 1 | 1 | -1 | .. | - |
| Transformation processes | - | - | 29 | 116 | 124 | 73 | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | 165 | 410 | 440 | 518 | .. | - |
| <i>Industry</i> | - | - | 165 | 410 | 440 | 518 | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Figure 1. Contribution of renewables in 1990

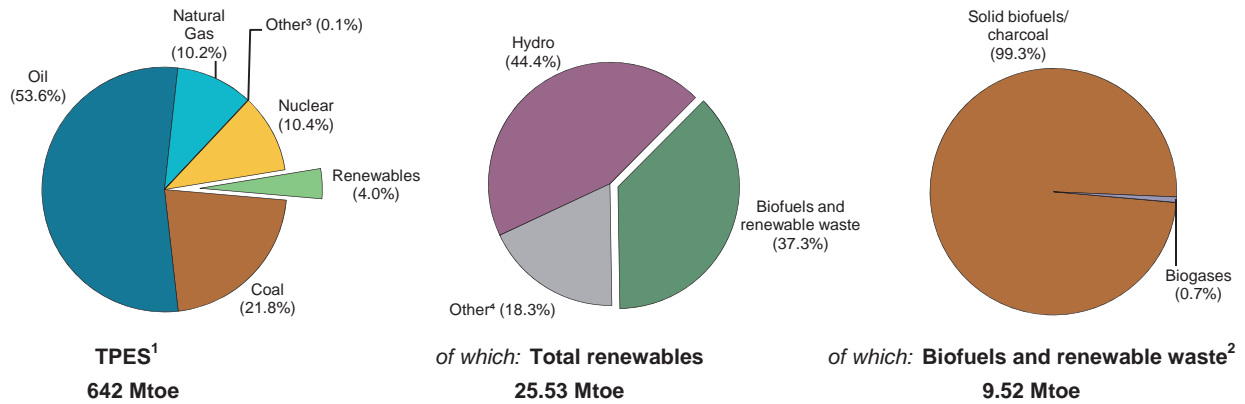


Figure 2. Contribution of renewables in 2017 provisional

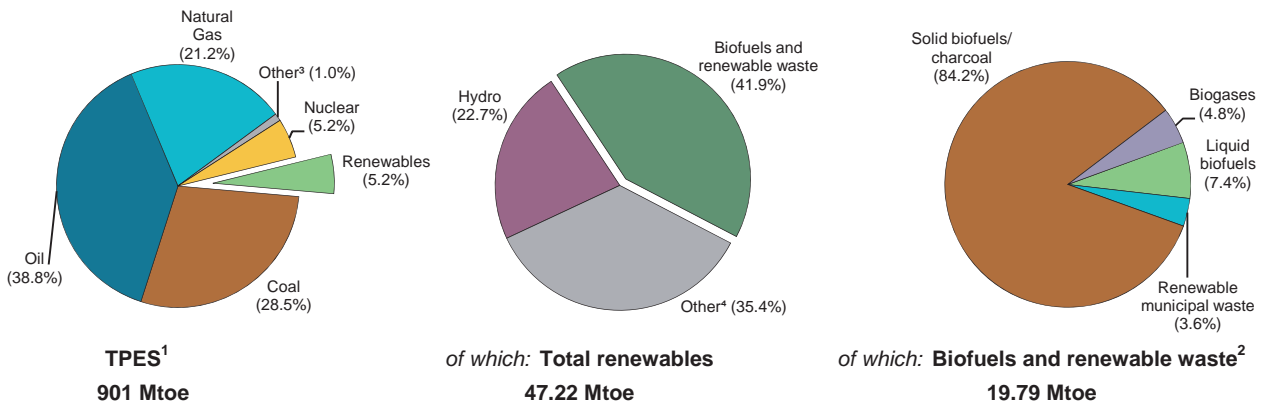
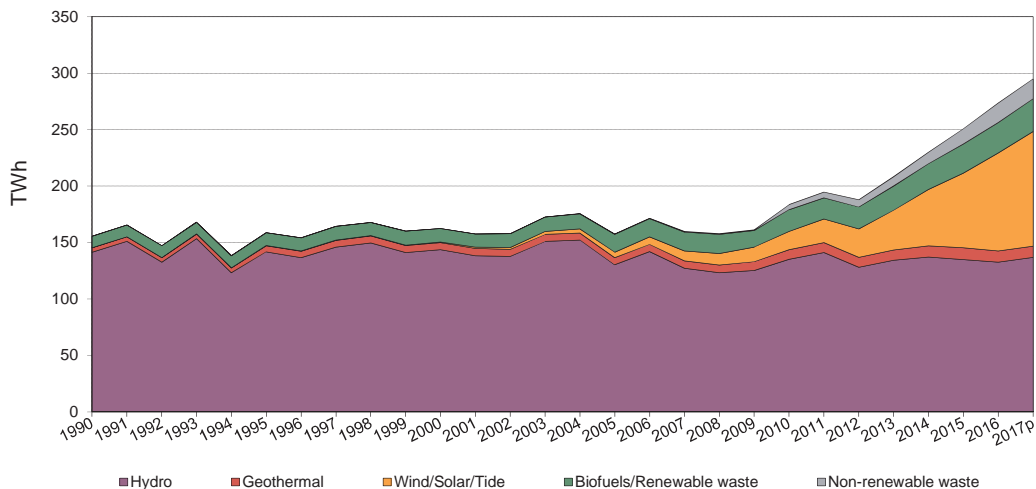


Figure 3. Electricity production by renewables and waste energy source



1. Total primary energy supply includes electricity trade.
 2. Biofuels and renewable waste include solid biofuels, liquid biofuels, biogases, and renewable municipal waste.
 3. Includes non-renewable municipal waste, industrial waste, peat, shale oil, electricity trade, and other sources of primary energy. (In the case of negative values, the net exports of electricity are greater than the other products in this category).
 4. Includes geothermal, solar, wind and tide.

Note: Totals may not sum due to rounding.
Source: IEA/OECD World Energy Balances.

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Table 1. Energy supply, GDP and population

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|---|---------|---------|---------|---------|---------|---------|---------|-------------------------------------|
| TPES (Mtoe) | 641.57 | 849.13 | 917.96 | 873.07 | 871.64 | 881.73 | 901.05 | 0.3 |
| of which: Renewables (Mtoe) ¹ | 25.53 | 28.79 | 35.13 | 40.47 | 42.72 | 44.14 | 47.22 | 3.0 |
| Renewables/TPES(%) | 4.0 | 3.4 | 3.8 | 4.6 | 4.9 | 5.0 | 5.2 | 2.6 |
| GDP (billion 2010 US dollars) | 5919.88 | 7299.09 | 8472.05 | 9036.57 | 9206.51 | 9346.09 | 9539.36 | 1.6 |
| TPES/GDP ² | 0.11 | 0.12 | 0.11 | 0.10 | 0.09 | 0.09 | 0.09 | -1.2 |
| TPES/GDP (year 2010 = 100) | 100 | 107 | 100 | 89 | 87 | 87 | 87 | -1.2 |
| Population (millions) | 191.80 | 203.28 | 211.92 | 214.55 | 215.26 | 215.99 | 216.62 | 0.4 |
| TPES/population (toe per capita) | 3.35 | 4.18 | 4.33 | 4.07 | 4.05 | 4.08 | 4.16 | -0.0 |
| Electricity generation (TWh) ³ | 1173.4 | 1638.2 | 1973.1 | 1946.6 | 1951.4 | 1976.9 | 2009.5 | 1.2 |
| of which: Renewables (TWh) ^{1,3} | 145.88 | 148.15 | 169.54 | 211.30 | 229.28 | 246.03 | 265.02 | 3.5 |
| Renew./Total Elec.(%) ^{1,4} | 12.4 | 9.0 | 8.6 | 10.9 | 11.7 | 12.4 | 13.2 | 2.2 |
| Road energy consumption (Mtoe) | 94.6 | 128.1 | 131.2 | 130.4 | 132.8 | 133.6 | .. | .. |
| of which: Liquid biofuels (Mtoe) | - | - | 0.70 | 0.91 | 1.01 | 1.05 | .. | .. |
| Liq. biofuels/road tr.(%) ⁵ | - | - | 0.5 | 0.7 | 0.8 | 0.8 | - | - |

1. Renewables do not include industrial waste, non-renewable municipal waste and pumped storage production.

2. In units of toe per thousand 2010 US dollars.

3. Electricity generation = gross production - amount of electricity produced in pumped storage plants.

4. Electricity share generated from renewables over the total electricity production.

5. Energy from liquid biofuels consumed in road transport over the total energy consumed in road transport.

Source: IEA/OECD *World Energy Balances* and OECD *Main Economic Indicators*.

Table 2. Net generating capacity of renewable and waste sources (MWe)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | Average annual percent change 00-16 |
|---|--------------|--------------|--------------|---------------|---------------|---------------|-------------------------------------|
| Total capacity | 54051 | 67095 | 83040 | 114619 | 128646 | 139188 | 4.7 |
| Hydro | 53110 | 63867 | 67971 | 70124 | 70576 | 70693 | 0.6 |
| Hydro <1MW | 1 | 10 | 38 | 32 | 29 | 47 | 10.2 |
| Hydro 1-10MW | 1427 | 1671 | 4726 | 4551 | 4609 | 1028 | -3.0 |
| Hydro 10+MW | 26778 | 34791 | 32517 | 32076 | 32273 | 35952 | 0.2 |
| Mixed plants | - | - | 5625 | 5625 | 5625 | 5625 | - |
| Pure pumped storage | 18945 | 27395 | 25065 | 27840 | 28040 | 28040 | 0.1 |
| Geothermal | 531 | 951 | 1268 | 1487 | 1502 | 1497 | 2.9 |
| Solar photovoltaic | 2 | 359 | 4740 | 30524 | 42900 | 52164 | 36.5 |
| Solar thermal | - | - | 3 | 3 | 3 | 3 | - |
| Tide, wave, ocean | - | - | 2 | 256 | 256 | 256 | - |
| Wind | - | 160 | 5070 | 7851 | 8578 | 9355 | 29.0 |
| Industrial waste | - | .. | 47 | 100 | 130 | 199 | .. |
| Municipal waste | - | 1203 | 1739 | 2006 | 2096 | 2060 | 3.4 |
| Solid biofuels | 389 | 448 | 1820 | 1488 | 1813 | 2154 | 10.3 |
| Biogases | 19 | 107 | 380 | 424 | 431 | 447 | 9.3 |
| Liquid biofuels | - | - | - | 356 | 361 | 360 | - |
| Solar collectors surface (1000 m ²) | - | 7500 | 20888 | 23771 | 25170 | 25293 | 7.9 |
| Cap. of solar collectors (MW _{th}) ¹ | - | 5250 | 14622 | 16641 | 17619 | 17706 | 7.9 |

1. Converted at 0.7 kW_{th}/m² of solar collector area, as estimated by the IEA Solar Heating & Cooling Programme.

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Table 3. Capacity factors (%)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 |
|--|--------------|----------------|--------------|--------------|--------------|--------------|
| Total plants¹ | 32.85 | 27.66 e | 25.23 | 22.91 | 22.25 | 22.44 |
| Hydro | 30.41 | 25.67 | 22.71 | 22.35 | 21.82 | 21.44 |
| <i>of which: <1MW</i> | 21.88 | 26.67 | 41.75 | 44.15 | 49.24 | 36.14 |
| <i>of which: 1-10MW</i> | 57.45 | 52.45 | 42.21 | 45.30 | 43.87 | 51.91 |
| <i>of which: 10+MW</i> | 42.52 | 31.88 | 37.89 | 39.38 | 38.64 | 37.46 |
| <i>of which: pure pumped storage²</i> | 6.84 | 5.96 | x | x | x | x |
| Geothermal | 83.25 | 75.26 | 76.76 | 76.03 | 79.43 | 75.75 |
| Solar photovoltaic | x | 12.71 e | 11.50 e | 11.36 e | 11.96 e | 13.98 e |
| Solar thermal | - | - | 11.88 | 12.30 | 14.16 | 16.16 |
| Tide, wave and ocean | - | - | - | 21.95 | 22.13 | 22.10 |
| Wind | - | 21.59 | 25.84 | 27.39 | 27.62 | 27.01 |
| Industrial waste | - | x | x | x | x | x |
| Municipal waste | - | 0.34 e | 38.28 e | 37.29 e | 36.69 e | 22.80 e |
| Solid biofuels | x | x | 91.15 | x | x | x |
| Biogases | 84.07 | 60.81 | 54.01 | 70.66 | 64.21 | 60.06 e |
| Biodiesels | - | - | - | - | - | - |
| Other liquid biofuels | - | - | - | 17.21 | 39.00 | 43.06 |

1. The capacity factor is defined as: the annual gross electricity generation divided by the reported net capacity times 365 (days/year) times 24 (hours/day).

2. In case a country has at least one mixed hydro plants, it is impossible to calculate capacity factor thus it is shown as 'not applicable'.

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Table 4. Gross electricity production from renewable and waste sources (GWh)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|--------------------------------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---|
| Total electricity¹ | 155553 | 162564 | 183566 | 230026 | 250740 | 273590 | 294912 | 3.6 |
| Hydro | 141460 | 143611 | 135215 | 137319 | 134890 | 132765 | 136793 | -0.3 |
| <i>of which: pumped storage</i> | <i>11349</i> | <i>14309</i> | <i>9718</i> | <i>8513</i> | <i>7886</i> | <i>10212</i> | <i>12350</i> | <i>-0.9</i> |
| Geothermal | 3872 | 6270 | 8527 | 9904 | 10451 | 9934 | 9953 | 2.8 |
| Solar photovoltaic | 68 | 400 | 4775 | 30373 | 44945 | 63876 | 77931 | 36.4 |
| Solar thermal | - | - | 3 | 3 | 4 | 4 | 6 | - |
| Tide, wave, ocean | - | - | - | 492 | 496 | 496 | 489 | - |
| Wind | - | 303 | 11476 | 18835 | 20753 | 22136 | 23033 | 29.0 |
| Industrial waste | - | 94 | 1408 | 6898 | 10159 | 15250 | 15571 | 35.1 |
| Municipal waste renew. | - | 22 | 2933 | 3240 | 3319 | 2012 | 1881 | 29.9 |
| Municipal waste non-renew. | - | 14 | 2900 | 3313 | 3418 | 2104 | 1975 | 33.8 |
| Solid biofuels | 10013 | 11281 | 14530 | 16487 | 18647 | 21303 | 24144 | 4.6 |
| Biogases | 140 | 569 | 1799 | 2625 | 2425 | 2352 | 2682 | 9.5 |
| Liquid biofuels | - | - | - | 537 | 1233 | 1358 | 454 | - |
| of which: | | | | | | | | |
| Electricity only plants | 154273 | 160841 | 180682 | 226523 | 247453 | 270004 | .. | - |
| Hydro | 141460 | 143611 | 135215 | 137319 | 134890 | 132765 | .. | c |
| <i>of which: pumped storage</i> | <i>11349</i> | <i>14309</i> | <i>9718</i> | <i>8513</i> | <i>7886</i> | <i>10212</i> | .. | - |
| Geothermal | 3815 | 6228 | 8473 | 9833 | 10380 | 9867 | .. | - |
| Solar photovoltaic | 68 | 400 | 4775 | 30373 | 44945 | 63876 | .. | - |
| Solar thermal | - | - | 3 | 3 | 4 | 4 | .. | - |
| Tide, wave, ocean | - | - | - | 492 | 496 | 496 | .. | - |
| Wind | - | 303 | 11476 | 18835 | 20753 | 22136 | .. | c |
| Industrial waste | - | 94 | 1407 | 6790 | 10101 | 15037 | .. | - |
| Municipal waste renew. | - | - | 2813 | 3146 | 3256 | 1959 | .. | - |
| Municipal waste non-renew. | - | - | 2813 | 3172 | 3323 | 2025 | .. | - |
| Solid biofuels | 8903 | 10118 | 12560 | 14318 | 16423 | 18799 | .. | - |
| Biogases | 27 | 87 | 1147 | 1705 | 1649 | 1682 | .. | - |
| Liquid biofuels | - | - | - | 537 | 1233 | 1358 | .. | - |
| CHP plants | 1280 | 1723 | 2884 | 3503 | 3287 | 3586 | .. | - |
| Geothermal | 57 | 42 | 54 | 71 | 71 | 67 | .. | - |
| Industrial waste | - | - | 1 | 108 | 58 | 213 | .. | - |
| Municipal waste renew. | - | 22 | 120 | 94 | 63 | 53 | .. | - |
| Municipal waste non-renew. | - | 14 | 87 | 141 | 95 | 79 | .. | - |
| Solid biofuels | 1110 | 1163 | 1970 | 2169 | 2224 | 2504 | .. | - |
| Biogases | 113 | 482 | 652 | 920 | 776 | 670 | .. | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |

1. **Total electricity** includes the electricity produced from industrial waste, non-renewable municipal waste and pumped storage. Electricity from renewable sources does *not* include the electricity produced from industrial waste, non-renewable municipal waste and pumped storage production.

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Table 5A. Heat production¹ from renewable and waste sources in the transformation sector (TJ)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|----------------------------|-----------|-------------|--------------|--------------|--------------|--------------|--------------|-------------------------------------|
| Total heat | 52 | 3488 | 20124 | 34920 | 22199 | 24278 | 24219 | 12.1 |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | 52 | 135 | 2088 | 10756 | 5123 | 10072 | 10083 | 28.9 |
| Municipal waste renew. | - | 2012 | 9553 | 6713 | 5139 | 3993 | 4180 | 4.4 |
| Municipal waste non-renew. | - | 1341 | 6891 | 10069 | 7708 | 5990 | 6271 | 9.5 |
| Solid biofuels | - | - | 1077 | 6805 | 3861 | 3770 | 3315 | - |
| Biogases | - | - | 515 | 577 | 368 | 453 | 370 | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| <i>of which:</i> | | | | | | | | |
| CHP plants | - | - | 3896 | 5660 | 5463 | 5608 | .. | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | 9 | 941 | 439 | 831 | .. | - |
| Municipal waste renew. | - | - | 1331 | 743 | 568 | 539 | .. | - |
| Municipal waste non-renew. | - | - | 964 | 1115 | 851 | 809 | .. | - |
| Solid biofuels | - | - | 1077 | 2313 | 3237 | 2976 | .. | - |
| Biogases | - | - | 515 | 548 | 368 | 453 | .. | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| Heat only plants | 52 | 3488 | 16228 | 29260 | 16736 | 18670 | .. | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | 52 | 135 | 2079 | 9815 | 4684 | 9241 | .. | - |
| Municipal waste renew. | - | 2012 | 8222 | 5970 | 4571 | 3454 | .. | - |
| Municipal waste non-renew. | - | 1341 | 5927 | 8954 | 6857 | 5181 | .. | - |
| Solid biofuels | - | - | - | 4492 | 624 | 794 | .. | - |
| Biogases | - | - | - | 29 | - | - | - | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |

1. Waste heat and heat production from heat pumps are not included and are reported separately in Table 5B.

Table 5B. Heat production from heat pumps and waste heat (TJ)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|----------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------------------------------|
| Total heat | 3084 | 8363 | 7921 | 6573 | 6366 | 6427 | 6439 | -1.5 |
| Heat pumps ¹ | - | - | - | - | - | - | - | - |
| (-) Input to heat pumps | - | - | - | - | - | - | - | - |
| Other sources ² | 3084 | 8363 | 7921 | 6573 | 6366 | 6427 | 6439 | -1.5 |

1. Installations producing heat for own use are not included.

2. Refers to production from hydrogen, purchased steam from industry, and waste heat.

Source: IEA/OECD *Electricity Statistics*.

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Table 6. Renewable and waste balance for 2016

| thousand tonnes of oil equivalent | Hydro ¹ | Wind | Tide wave ocean | Solar PV | Geo-thermal | Solar thermal | Industrial waste | Mun. waste renew. |
|------------------------------------|--------------------|--------------|-----------------|--------------|-------------|---------------|------------------|-------------------|
| Production | 10538 | 1903 | 43 | 5492 | 7320 | 1021 | 8142 | 742 |
| Imports | - | - | - | - | - | - | - | - |
| Exports | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| TPES | 10538 | 1903 | 43 | 5492 | 7320 | 1021 | 8142 | 742 |
| Statistical differences | - | - | - | - | - | - | -72 | - |
| Main activity electricity plants | -10255 | -1506 | -43 | -987 | -6668 | -1 | -2656 | - |
| Autoproducer electricity plants | -282 | -397 | - | -4505 | -87 | - | -480 | -398 |
| Main activity CHP plants | - | - | - | - | - | - | - | - |
| Autoproducer CHP plants | - | - | - | - | -41 | - | -45 | -31 |
| Main heat plants | - | - | - | - | - | - | - | - |
| Autoproducer heat plants | - | - | - | - | - | - | -280 | -90 |
| Charcoal production plants | - | - | - | - | - | - | - | - |
| Other transformation | - | - | - | - | - | - | -116 | - |
| Energy Industry own use | - | - | - | - | - | - | - | - |
| Losses | - | - | - | - | - | - | - | - |
| TFC | - | - | - | - | 525 | 1020 | 4493 | 223 |
| Industry | - | - | - | - | 111 | 1 | 3245 | 35 |
| Iron and steel | - | - | - | - | - | - | 42 | - |
| Chemical and petrochemical | - | - | - | - | - | - | 545 | - |
| Non-ferrous metals | - | - | - | - | - | - | 34 | - |
| Non-metallc minerals | - | - | - | - | - | - | 1181 | - |
| Transport equipment | - | - | - | - | - | - | - | - |
| Machinery | - | - | - | - | - | - | - | - |
| Mining and quarrying | - | - | - | - | - | - | - | - |
| Food and tobacco | - | - | - | - | - | - | 35 | - |
| Paper, pulp and print | - | - | - | - | 108 | - | 666 | 6 |
| Wood and wood products | - | - | - | - | - | - | 7 | - |
| Construction | - | - | - | - | - | - | 7 | 7 |
| Textile and leather | - | - | - | - | - | - | 66 | - |
| Non-specified | - | - | - | - | 4 | 1 | 663 | 21 |
| Transport | - | - | - | - | - | - | - | - |
| Road | - | - | - | - | - | - | - | - |
| Other | - | - | - | - | - | - | - | - |
| Other | - | - | - | - | 413 | 1019 | 1248 | 189 |
| Residential | - | - | - | - | 34 | 974 | - | - |
| Commercial and public services | - | - | - | - | 264 | 45 | 407 | 188 |
| Agriculture/forestry | - | - | - | - | 116 | - | - | - |
| Fishing | - | - | - | - | - | - | - | - |
| Non-specified | - | - | - | - | - | - | 841 | - |
| Electricity generated - GWh | 122553 | 22136 | 496 | 63876 | 9934 | 4 | 15250 | 2012 |
| <i>Electricity plants</i> | 122553 | 22136 | 496 | 63876 | 9867 | 4 | 15037 | 1959 |
| <i>CHP plants</i> | - | - | - | - | 67 | - | 213 | 53 |
| Heat generated - TJ | - | - | - | - | - | - | 10072 | 3993 |
| <i>CHP plants</i> | - | - | - | - | - | - | 831 | 539 |
| <i>Heat plants</i> | - | - | - | - | - | - | 9241 | 3454 |

1. Hydro does not include pumped hydro.

Source: IEA/OECD *World Energy Balances*.

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Table 6. Renewable and waste balance for 2016 (continued)

| Mun. waste non-ren. | Wood/wood waste | Charcoal | Bio-gases | Bio-gasoline | Bio-diesel | Other liquid biofuels | Total renew. & waste sources ² | Share in total energy sources ³ |
|---------------------|-----------------|-----------|-------------|--------------|------------|-----------------------|---|--|
| 931 | 14297 | - | 816 | 118 | 554 | 347 | 52264 | 10.4% |
| - | 549 | 21 | - | 374 | 1 | - | 945 | 0.1% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| 931 | 14846 | 21 | 816 | 493 | 555 | 347 | 53210 | 6.0% |
| - | 247 | - | 1 | - | - | - | 176 | x |
| - | -1924 | - | -296 | - | - | -347 | -24683 | x |
| -415 | -2595 | - | -111 | - | - | - | -9270 | x |
| - | -21 | - | -21 | - | - | - | -42 | x |
| -46 | -681 | - | -161 | - | - | - | -1005 | x |
| - | - | - | - | - | - | - | - | - |
| -135 | -35 | - | - | - | - | - | -540 | x |
| - | -21 | 8 | - | - | - | - | -13 | x |
| - | -3 | - | -3 | - | - | - | -122 | x |
| - | - | - | -97 | - | - | - | -97 | x |
| - | - | - | - | - | - | - | - | - |
| 335 | 9814 | 30 | 128 | 493 | 555 | - | 17616 | 3.0% |
| 52 | 7312 | - | 47 | - | - | - | 10803 | 6.8% |
| - | - | - | - | - | - | - | 42 | 0.1% |
| - | 17 | - | 5 | - | - | - | 567 | 2.0% |
| - | 46 | - | - | - | - | - | 80 | 0.7% |
| - | 192 | - | 7 | - | - | - | 1380 | 8.5% |
| - | 3 | - | - | - | - | - | 3 | 0.1% |
| - | 5 | - | - | - | - | - | 5 | 0.0% |
| - | - | - | - | - | - | - | - | - |
| - | 2211 | - | 28 | - | - | - | 2274 | 18.6% |
| 9 | 2969 | - | 2 | - | - | - | 3760 | 31.7% |
| - | 1803 | - | - | - | - | - | 1810 | 62.0% |
| 11 | - | - | - | - | - | - | 25 | 0.7% |
| 1 | 24 | - | 1 | - | - | - | 92 | 3.0% |
| 31 | 42 | - | 4 | - | - | - | 766 | 6.9% |
| - | - | - | - | 493 | 555 | - | 1048 | 0.7% |
| - | - | - | - | 493 | 555 | - | 1048 | 0.8% |
| - | - | - | - | - | - | - | - | - |
| 283 | 2502 | 30 | 81 | - | - | - | 5765 | 3.2% |
| - | 1514 | 8 | - | - | - | - | 2530 | 3.2% |
| 283 | 708 | - | 81 | - | - | - | 1976 | 2.3% |
| - | 63 | - | - | - | - | - | 179 | 2.1% |
| - | - | - | - | - | - | - | - | - |
| - | 217 | 21 | - | - | - | - | 1079 | 39.6% |
| 2104 | 21304 | - | 2352 | - | - | 1358 | 263379 | 13.3% |
| 2025 | 18800 | - | 1682 | - | - | 1358 | 259793 | 13.7% |
| 79 | 2504 | - | 670 | - | - | - | 3586 | 4.8% |
| 5990 | 3770 | - | 453 | - | - | - | 24278 | 9.9% |
| 809 | 2976 | - | 453 | - | - | - | 5608 | 2.8% |
| 5181 | 794 | - | - | - | - | - | 18670 | 42.4% |

2. Total includes non-renewable waste.

3. Share of renewables on TFC excludes electricity and heat generated from renewable sources.

Source: IEA/OECD *World Energy Balances*.

OECD ASIA OCEANIA

Table 7. Aggregated renewables and waste statistics

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|--|--------|--------|--------|--------|--------|--------|--------|---|
| Geothermal (TJ) | | | | | | | | |
| Production | 127797 | 211413 | 256343 | 302551 | 310061 | 306481 | 291334 | 2.3 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 127797 | 211413 | 256343 | 302551 | 310061 | 306481 | 291334 | 2.3 |
| Statistical differences | 1 | 1 | 1 | 2 | - | 1 | .. | .. |
| Transformation processes | 117393 | 194038 | 238268 | 283436 | 289904 | 284514 | .. | 2.4 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 10405 | 17376 | 18076 | 19117 | 20157 | 21968 | .. | 1.5 |
| <i>Industry</i> | 4632 | 5712 | 5787 | 4052 | 4207 | 4667 | .. | -1.3 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 5773 | 11664 | 12289 | 15065 | 15950 | 17301 | .. | 2.5 |
| Solar thermal (TJ) | | | | | | | | |
| Production | 67710 | 63935 | 76252 | 42744 | 43501 | 42749 | 43910 | -2.5 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 67710 | 63935 | 76252 | 42744 | 43501 | 42749 | 43910 | -2.5 |
| Statistical differences | 1 | - | -1 | 1 | - | - | .. | .. |
| Transformation processes | - | - | 34 | 35 | 41 | 46 | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 67711 | 63935 | 76217 | 42710 | 43460 | 42703 | .. | -2.5 |
| <i>Industry</i> | - | - | 18 | - | 47 | 44 | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 67711 | 63935 | 76199 | 42710 | 43413 | 42659 | .. | -2.5 |
| Industrial waste (TJ) | | | | | | | | |
| Production | 20529 | 55535 | 151468 | 227551 | 267035 | 340891 | 345940 | 12.0 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 20529 | 55535 | 151468 | 227551 | 267035 | 340891 | 345940 | 12.0 |
| Statistical differences | -65 | -175 | -673 | -149 | 150 | -3007 | .. | .. |
| Transformation processes | 80 | 1018 | 14626 | 73522 | 94965 | 149765 | .. | 36.6 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 20384 | 54342 | 136169 | 153880 | 172220 | 188119 | .. | 8.1 |
| <i>Industry</i> | 19193 | 52684 | 83507 | 103294 | 120718 | 135866 | .. | 6.1 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 1191 | 1658 | 52662 | 50586 | 51502 | 52253 | .. | 24.1 |
| Municipal waste - renewables (TJ) | | | | | | | | |
| Production | 160 | 4579 | 41485 | 40799 | 42317 | 31079 | 30114 | 12.7 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 160 | 4579 | 41485 | 40799 | 42317 | 31079 | 30114 | 12.7 |
| Statistical differences | - | 504 | 2054 | -1 | - | - | .. | .. |
| Transformation processes | - | 2721 | 38458 | 36520 | 34170 | 21734 | .. | 13.9 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 160 | 2362 | 5081 | 4278 | 8147 | 9345 | .. | 9.0 |
| <i>Industry</i> | - | - | - | 50 | 661 | 1446 | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 160 | 2362 | 5081 | 4228 | 7486 | 7899 | .. | 7.8 |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics (continued)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|--|--------|--------|--------|--------|--------|--------|--------|--|
| Municipal waste - non-renewables (TJ) | | | | | | | | |
| Production | 107 | 3053 | 40565 | 48190 | 50459 | 38972 | 38167 | 17.3 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 107 | 3053 | 40565 | 48190 | 50459 | 38972 | 38167 | 17.3 |
| Statistical differences | - | 335 | 1482 | -1 | - | - | .. | .. |
| Transformation processes | - | 1814 | 34431 | 41771 | 38237 | 24955 | .. | 17.8 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | .. |
| Final energy consumption | 107 | 1574 | 7616 | 6418 | 12222 | 14017 | .. | 14.6 |
| <i>Industry</i> | - | - | - | 76 | 991 | 2168 | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 107 | 1574 | 7616 | 6342 | 11231 | 11849 | .. | 13.4 |
| Solid Biofuel excluding charcoal (TJ) | | | | | | | | |
| Production | 393782 | 443178 | 524980 | 579148 | 596426 | 598585 | 666804 | 1.9 |
| Net imports ¹ | 1993 | 5661 | 7142 | 11805 | 16681 | 23003 | 29903 | 9.2 |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 395775 | 448839 | 532122 | 590953 | 613107 | 621588 | 696707 | 2.1 |
| Statistical differences | 5951 | 4203 | 1211 | 9912 | 9563 | 10335 | .. | .. |
| Transformation processes | 120227 | 121936 | 150434 | 172979 | 192470 | 221050 | .. | 3.8 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | .. |
| Final energy consumption | 281499 | 331106 | 382899 | 427886 | 430200 | 410873 | .. | 1.4 |
| <i>Industry</i> | 177797 | 237281 | 283229 | 306345 | 299855 | 306125 | .. | 1.6 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 103702 | 93825 | 99670 | 121541 | 130345 | 104748 | .. | 0.7 |
| Charcoal (kt) | | | | | | | | |
| Production | 35 | 25 | 14 | 12 | 12 | 12 | 12 | -4.5 |
| Net imports ¹ | - | 4 | 16 | 23 | 22 | 29 | 29 | 13.2 |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 35 | 29 | 30 | 35 | 34 | 41 | 41 | 2.2 |
| Statistical differences | - | - | - | - | - | - | .. | .. |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | .. |
| Final energy consumption | 35 | 29 | 30 | 35 | 34 | 41 | .. | 2.2 |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 35 | 29 | 30 | 35 | 34 | 41 | .. | 2.2 |
| Biogases (TJ) | | | | | | | | |
| Production | 2821 | 8647 | 24466 | 29438 | 28160 | 34162 | 39397 | 9.0 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 2821 | 8647 | 24466 | 29438 | 28160 | 34162 | 39397 | 9.0 |
| Statistical differences | 1 | - | -183 | 39 | 423 | 34 | .. | .. |
| Transformation processes | 2008 | 7113 | 19624 | 23157 | 24119 | 24771 | .. | 8.1 |
| Energy industry own use | - | - | - | - | - | 4055 | .. | - |
| Losses | - | - | - | - | - | - | .. | .. |
| Final energy consumption | 814 | 1534 | 4659 | 6320 | 4464 | 5370 | .. | 8.1 |
| <i>Industry</i> | 540 | 860 | 602 | 1972 | 2444 | 1973 | .. | 5.3 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 274 | 674 | 4057 | 4348 | 2020 | 3397 | .. | 10.6 |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics (continued)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|-----------------------------------|------|------|------|------|------|------|-------|---|
| Biogasoline (kt) | | | | | | | | |
| Production | - | - | 198 | 234 | 201 | 184 | 153 | - |
| Net imports ¹ | - | - | 284 | 405 | 515 | 585 | 638 | - |
| Stock changes | - | - | 1 | - | - | - | - | - |
| Gross consumption | - | - | 483 | 639 | 716 | 769 | 791 | - |
| Statistical differences | - | - | -1 | -1 | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | 482 | 638 | 716 | 769 | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | 482 | 638 | 716 | 769 | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Biodiesel (kt) | | | | | | | | |
| Production | - | - | 399 | 512 | 564 | 556 | 545 | - |
| Net imports ¹ | - | - | - | 1 | 11 | 1 | 1 | - |
| Stock changes | - | - | - | -16 | 16 | - | - | - |
| Gross consumption | - | - | 399 | 497 | 591 | 557 | 546 | - |
| Statistical differences | - | - | - | 16 | -26 | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | 399 | 513 | 565 | 557 | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | 399 | 513 | 565 | 557 | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Other liquid biofuels (kt) | | | | | | | | |
| Production | - | - | - | 192 | 317 | 395 | 465 | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | 192 | 317 | 395 | 465 | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | 192 | 317 | 395 | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Figure 1. Contribution of renewables in 1990

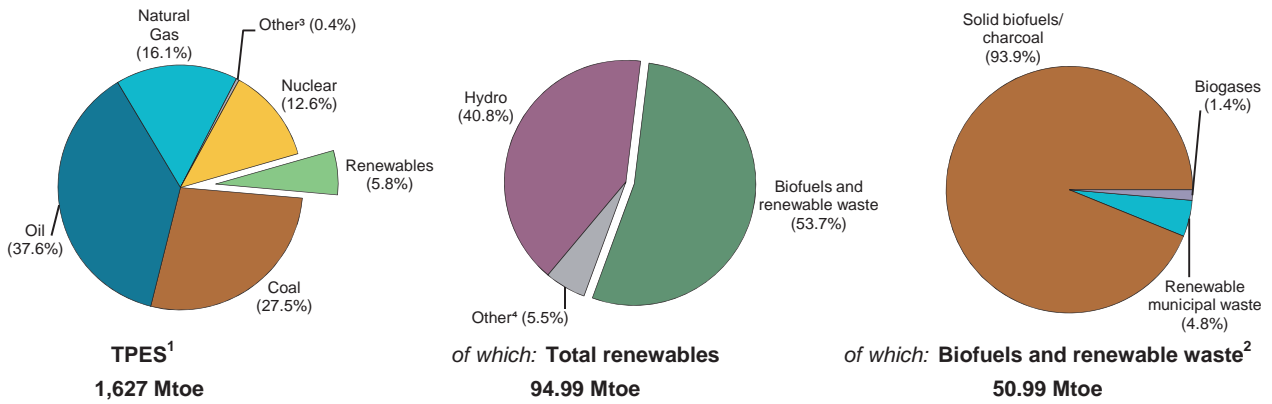


Figure 2. Contribution of renewables in 2017 provisional

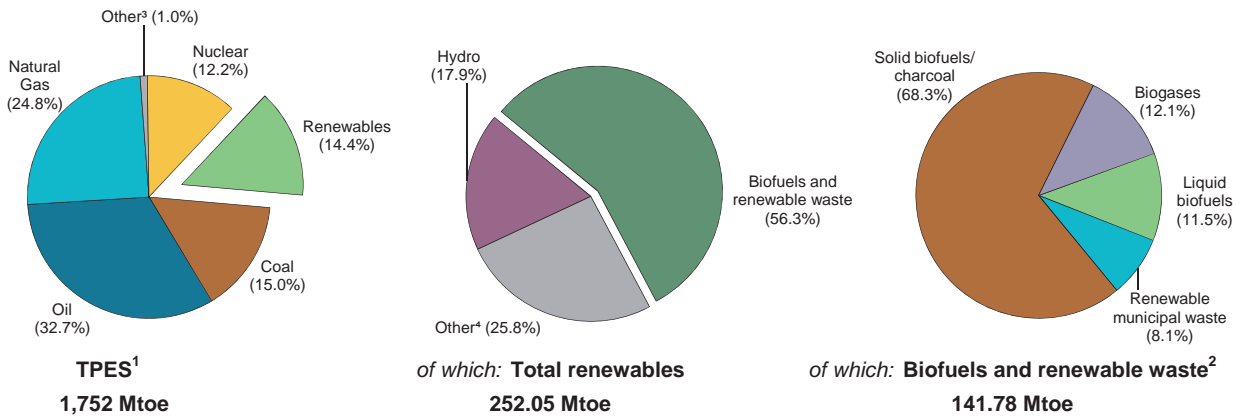
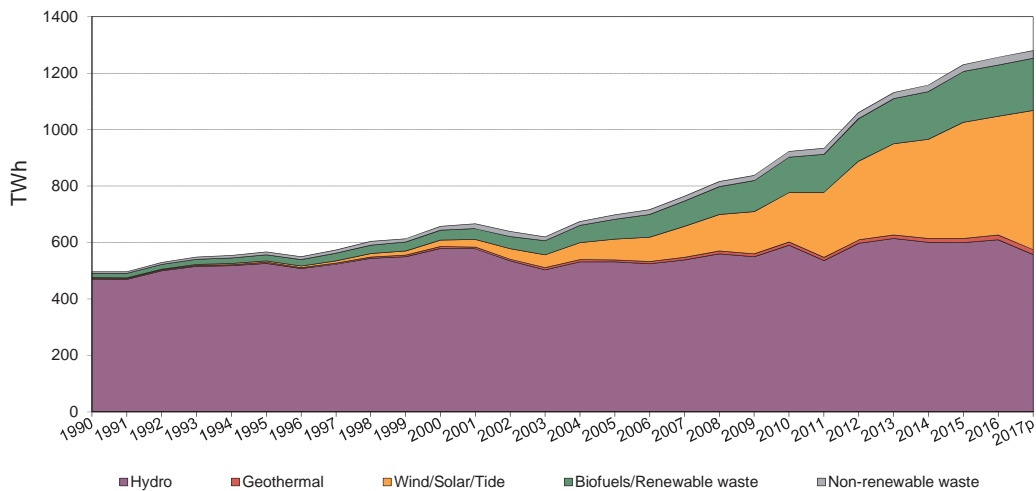


Figure 3. Electricity production by renewables and waste energy source



1. Total primary energy supply includes electricity trade.
 2. Biofuels and renewable waste include solid biofuels, liquid biofuels, biogases, and renewable municipal waste.
 3. Includes non-renewable municipal waste, industrial waste, peat, shale oil, electricity trade, and other sources of primary energy. (In the case of negative values, the net exports of electricity are greater than the other products in this category).
 4. Includes geothermal, solar, wind and tide.

Note: Totals may not sum due to rounding.
Source: IEA/OECD World Energy Balances.

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Table 1. Energy supply, GDP and population

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|---|----------|----------|----------|----------|----------|----------|----------|--|
| TPES (Mtoe) | 1627.50 | 1752.64 | 1823.76 | 1680.89 | 1708.30 | 1723.37 | 1751.94 | -0.0 |
| of which: Renewables (Mtoe) ¹ | 94.99 | 121.86 | 197.79 | 227.95 | 239.55 | 245.93 | 252.05 | 4.4 |
| Renewables/TPES(%) | 5.8 | 7.0 | 10.8 | 13.6 | 14.0 | 14.3 | 14.4 | 4.4 |
| GDP (billion 2010 US dollars) | 12682.28 | 15932.94 | 18441.22 | 19306.26 | 19779.61 | 20165.57 | 20690.60 | 1.5 |
| TPES/GDP ² | 0.13 | 0.11 | 0.10 | 0.09 | 0.09 | 0.09 | 0.08 | -1.5 |
| TPES/GDP (year 2010 = 100) | 130 | 111 | 100 | 88 | 87 | 86 | 86 | -1.5 |
| Population (millions) | 503.04 | 523.79 | 553.34 | 562.91 | 565.54 | 568.29 | 570.65 | 0.5 |
| TPES/population (toe per capita) | 3.24 | 3.35 | 3.30 | 2.99 | 3.02 | 3.03 | 3.07 | -0.5 |
| Electricity generation (TWh) ³ | 2668.4 | 3226.8 | 3619.2 | 3505.3 | 3559.1 | 3599.4 | 3648.1 | 0.7 |
| of which: Renewables (TWh) ^{1,3} | 470.78 | 612.98 | 871.57 | 1102.77 | 1174.64 | 1198.31 | 1220.01 | 4.1 |
| Renew./Total Elec.(%) ^{1,4} | 17.6 | 19.0 | 24.1 | 31.5 | 33.0 | 33.3 | 33.4 | 3.4 |
| Road energy consumption (Mtoe) | 244.3 | 292.8 | 309.5 | 304.0 | 312.0 | 320.1 | .. | .. |
| of which: Liquid biofuels (Mtoe) | 0.01 | 0.71 | 13.09 | 14.13 | 13.87 | 13.95 | .. | .. |
| Liq. biofuels/road tr.(%) ⁵ | 0.0 | 0.2 | 4.2 | 4.6 | 4.4 | 4.4 | - | - |

1. Renewables do not include industrial waste, non-renewable municipal waste and pumped storage production.

2. In units of toe per thousand 2010 US dollars.

3. Electricity generation = gross production - amount of electricity produced in pumped storage plants.

4. Electricity share generated from renewables over the total electricity production.

5. Energy from liquid biofuels consumed in road transport over the total energy consumed in road transport.

Source: IEA/OECD *World Energy Balances* and OECD *Main Economic Indicators*.

Table 2. Net generating capacity of renewable and waste sources (MWe)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | Average annual percent change 00-16 |
|---|---------------|---------------|---------------|---------------|---------------|---------------|--|
| Total capacity | 167755 | 205996 | 343789 | 464379 | 492900 | 519244 | 5.9 |
| Hydro | 161593 | 181676 | 195918 | 208018 | 212447 | 216238 | 1.1 |
| Hydro <1MW | 966 | 2502 | 3171 | 3491 | 3567 | 3740 | 2.5 |
| Hydro 1-10MW | 4129 | 9366 | 11616 | 13077 | 13764 | 14034 | 2.6 |
| Hydro 10+MW | 66707 | 125429 | 135057 | 144414 | 146804 | 148855 | 1.1 |
| Mixed plants | 19791 | 21507 | 23543 | 24220 | 24646 | 25955 | 1.2 |
| Pure pumped storage | 18345 | 21187 | 22531 | 22816 | 23666 | 23654 | 0.7 |
| Geothermal | 563 | 794 | 1431 | 1890 | 2111 | 2310 | 6.9 |
| Solar photovoltaic | 13 | 201 | 30081 | 85233 | 93699 | 100606 | 47.5 |
| Solar thermal | - | - | 734 | 2302 | 2302 | 2302 | - |
| Tide, wave, ocean | 240 | 214 | 220 | 230 | 227 | 233 | 0.5 |
| Wind | 454 | 12746 | 84925 | 128343 | 142008 | 156163 | 17.0 |
| Industrial waste | 459 | 1139 | 1888 | 1907 | 1860 | 1916 | 3.3 |
| Municipal waste | 1142 | 2788 | 6559 | 7570 | 8318 | 8817 | 7.5 |
| Solid biofuels | 3028 | 5133 | 14010 | 16346 | 16869 | 17243 | 7.9 |
| Biogases | 263 | 1305 | 6878 | 10737 | 11188 | 11618 | 14.6 |
| Liquid biofuels | - | - | 1145 | 1803 | 1871 | 1798 | - |
| Solar collectors surface (1000 m ²) | 3963 | 19177 | 47556 | 65659 | 67829 | 69948 | 8.4 |
| Cap. of solar collectors (MW _{th}) ¹ | 2776 | 13425 | 33291 | 45963 | 47482 | 48963 | 8.4 |

1. Converted at 0.7 kW_{th}/m² of solar collector area, as estimated by the IEA Solar Heating & Cooling Programme.

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Table 3. Capacity factors (%)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 |
|--|----------------|----------------|----------------|----------------|----------------|----------------|
| Total plants¹ | 33.78 e | 36.42 e | 30.66 e | 28.47 e | 28.49 e | 27.63 e |
| Hydro | 33.26 e | 36.43 e | 34.43 | 32.99 | 32.22 | 32.22 |
| <i>of which: <1MW</i> | 18.21 e | 41.53 | 41.03 | 40.94 | 36.83 | 37.17 |
| <i>of which: 1-10MW</i> | 16.84 e | 43.31 | 42.01 | 40.86 | 35.63 | 35.59 |
| <i>of which: 10+MW</i> | 65.01 e | 45.81 | 42.72 | 40.30 | 39.97 | 40.13 |
| <i>of which: pure pumped storage²</i> | x | x | x | x | x | x |
| Geothermal | 73.12 | 88.91 | 85.64 | 83.49 | 80.85 | 81.66 |
| Solar photovoltaic | 12.18 e | 7.35 e | 8.57 e | 12.06 e | 12.17 e | 11.80 e |
| Solar thermal | - | - | 11.84 | 27.05 | 27.74 | 27.67 |
| Tide, wave and ocean | 23.91 | 27.06 e | 24.82 | 23.96 | 24.61 | 24.52 |
| Wind | 19.58 | 19.97 e | 20.41 | 22.67 | 24.58 | 22.68 |
| Industrial waste | 73.50 e | 54.77 e | 21.51 | 20.59 | 23.37 | 31.95 e |
| Municipal waste | 55.74 e | 63.80 e | 60.44 e | 61.54 e | 58.37 e | 57.26 e |
| Solid biofuels | 41.99 e | 46.12 e | 57.17 | 58.86 | 60.89 | 60.05 e |
| Biogases | 43.15 e | 57.71 e | 54.02 | 62.59 | 63.30 | 62.81 e |
| Biodiesels | - | - | - | 16.25 | 19.95 | 21.76 |
| Other liquid biofuels | - | - | 49.57 | 30.85 | 33.75 | 33.73 |

1. The capacity factor is defined as: the annual gross electricity generation divided by the reported net capacity times 365 (days/year) times 24 (hours/day).

2. In case a country has at least one mixed hydro plants, it is impossible to calculate capacity factor thus it is shown as 'not applicable'.

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Table 4. Gross electricity production from renewable and waste sources (GWh)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|---------------------------------------|----------------------|----------------------|----------------------|-----------------------|-----------------------|-----------------------|------------------|---|
| Total electricity¹ | 496357 | 657291 | 923265 | 1158126 | 1230327 | 1256729 | 1279869 | 4.0 |
| Hydro | 470793 | 579792 | 590908 | 601187 | 599689 | 610368 | 557485 | -0.2 |
| <i>of which: pumped storage</i> | <i>19894</i> | <i>31255</i> | <i>31389</i> | <i>31977</i> | <i>31154</i> | <i>31194</i> | <i>32711</i> | <i>0.3</i> |
| Geothermal | 3606 | 6184 | 10735 | 13822 | 14951 | 16527 | 17898 | 6.5 |
| Solar photovoltaic | 13 | 129 | 22576 | 90065 | 99903 | 103987 | 114838 | 49.1 |
| Solar thermal | - | - | 761 | 5455 | 5593 | 5579 | 5885 | - |
| Tide, wave, ocean | 503 | 507 | 478 | 483 | 489 | 501 | 414 | -1.2 |
| Wind | 778 | 22292 | 151839 | 254865 | 305823 | 310254 | 371332 | 18.0 |
| Industrial waste | 2955 | 5466 | 3555 | 3438 | 3809 | 5360 | 4896 | -0.6 |
| Municipal waste renew. | 2846 | 7997 | 17985 | 20874 | 21806 | 22364 | 23064 | 6.4 |
| Municipal waste non-renew. | 2730 | 7588 | 16749 | 19938 | 20728 | 21862 | 22249 | 6.5 |
| Solid biofuels | 11138 | 20738 | 70164 | 84286 | 89978 | 90707 | 92092 | 9.2 |
| Biogases | 995 | 6598 | 32542 | 58864 | 62044 | 63924 | 64711 | 14.4 |
| Liquid biofuels | - | - | 4973 | 4849 | 5514 | 5296 | 5005 | - |
| <i>of which:</i> | | | | | | | | |
| <i>Electricity only plants</i> | <i>484043</i> | <i>631639</i> | <i>834809</i> | <i>1039837</i> | <i>1109538</i> | <i>1132277</i> | <i>..</i> | <i>-</i> |
| Hydro | 470793 | 579792 | 590908 | 601187 | 599689 | 610368 | .. | c |
| <i>of which: pumped storage</i> | <i>19894</i> | <i>31255</i> | <i>31389</i> | <i>31977</i> | <i>31154</i> | <i>31194</i> | <i>..</i> | <i>-</i> |
| Geothermal | 3606 | 5335 | 9265 | 9054 | 10435 | 11957 | .. | - |
| Solar photovoltaic | 13 | 129 | 22576 | 90065 | 99903 | 103987 | .. | - |
| Solar thermal | - | - | 761 | 5455 | 5593 | 5579 | .. | - |
| Tide, wave, ocean | 503 | 507 | 478 | 483 | 489 | 501 | .. | - |
| Wind | 778 | 22292 | 151839 | 254865 | 305823 | 310254 | .. | c |
| Industrial waste | 2654 | 4431 | 1527 | 1551 | 1729 | 2922 | .. | - |
| Municipal waste renew. | 1873 | 5187 | 8855 | 8991 | 9858 | 10050 | .. | - |
| Municipal waste non-renew. | 1891 | 4939 | 8726 | 9265 | 10080 | 10257 | .. | - |
| Solid biofuels | 1487 | 3614 | 23259 | 33418 | 40091 | 39618 | .. | - |
| Biogases | 445 | 5413 | 14233 | 22400 | 22364 | 23374 | .. | - |
| Liquid biofuels | - | - | 2382 | 3103 | 3484 | 3410 | .. | .. |
| <i>CHP plants</i> | <i>12314</i> | <i>25652</i> | <i>88456</i> | <i>118289</i> | <i>120789</i> | <i>124452</i> | <i>..</i> | <i>-</i> |
| Geothermal | - | 849 | 1470 | 4768 | 4516 | 4570 | .. | - |
| Industrial waste | 301 | 1035 | 2028 | 1887 | 2080 | 2438 | .. | - |
| Municipal waste renew. | 973 | 2810 | 9130 | 11883 | 11948 | 12314 | .. | - |
| Municipal waste non-renew. | 839 | 2649 | 8023 | 10673 | 10648 | 11605 | .. | - |
| Solid biofuels | 9651 | 17124 | 46905 | 50868 | 49887 | 51089 | .. | - |
| Biogases | 550 | 1185 | 18309 | 36464 | 39680 | 40550 | .. | - |
| Liquid biofuels | - | - | 2591 | 1746 | 2030 | 1886 | .. | - |

1. **Total electricity** includes the electricity produced from industrial waste, non-renewable municipal waste and pumped storage. Electricity from renewable sources does *not* include the electricity produced from industrial waste, non-renewable municipal waste and pumped storage production.

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Table 5A. Heat production¹ from renewable and waste sources in the transformation sector (TJ)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|----------------------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|--|
| Total heat | 136832 | 267482 | 566497 | 676891 | 713652 | 775582 | 788338 | 6.6 |
| Geothermal | 15403 | 18314 | 26006 | 29225 | 33758 | 43200 | 44732 | 5.4 |
| Solar thermal | 6 | 24 | 192 | 820 | 1038 | 1564 | 1771 | 28.8 |
| Industrial waste | 3896 | 6110 | 13596 | 12231 | 13957 | 15264 | 13316 | 4.7 |
| Municipal waste renew. | 40549 | 52694 | 101072 | 124835 | 134452 | 135716 | 141457 | 6.0 |
| Municipal waste non-renew. | 39298 | 51829 | 92866 | 113390 | 121712 | 130926 | 136034 | 5.8 |
| Solid biofuels | 37521 | 135732 | 315867 | 366427 | 376105 | 413502 | 416876 | 6.8 |
| Biogases | 159 | 2740 | 7200 | 25326 | 28139 | 30438 | 30016 | 15.1 |
| Liquid biofuels | - | 39 | 9698 | 4637 | 4491 | 4972 | 4136 | 31.6 |
| <i>of which:</i> | | | | | | | | |
| CHP plants | 58520 | 164323 | 352402 | 453553 | 471245 | 513158 | .. | - |
| Geothermal | 4474 | 5046 | 5750 | 5835 | 6869 | 14945 | .. | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | 3757 | 3062 | 9580 | 9959 | 11023 | 12553 | .. | - |
| Municipal waste renew. | 18823 | 38639 | 68077 | 94573 | 100158 | 101417 | .. | - |
| Municipal waste non-renew. | 17553 | 37428 | 60823 | 83557 | 88127 | 96784 | .. | - |
| Solid biofuels | 13788 | 78452 | 199966 | 235520 | 238858 | 258735 | .. | - |
| Biogases | 125 | 1696 | 5423 | 21933 | 23906 | 26269 | .. | - |
| Liquid biofuels | - | - | 2783 | 2176 | 2304 | 2455 | .. | .. |
| Heat only plants | 78312 | 103159 | 214095 | 223338 | 242407 | 262424 | .. | - |
| Geothermal | 10929 | 13268 | 20256 | 23390 | 26889 | 28255 | .. | - |
| Solar thermal | 6 | 24 | 192 | 820 | 1038 | 1564 | .. | - |
| Industrial waste | 139 | 3048 | 4016 | 2272 | 2934 | 2711 | .. | - |
| Municipal waste renew. | 21726 | 14055 | 32995 | 30262 | 34294 | 34299 | .. | - |
| Municipal waste non-renew. | 21745 | 14401 | 32043 | 29833 | 33585 | 34142 | .. | - |
| Solid biofuels | 23733 | 57280 | 115901 | 130907 | 137247 | 154767 | .. | - |
| Biogases | 34 | 1044 | 1777 | 3393 | 4233 | 4169 | .. | - |
| Liquid biofuels | - | 39 | 6915 | 2461 | 2187 | 2517 | .. | - |

1. Waste heat and heat production from heat pumps are not included and are reported separately in Table 5B.

Table 5B. Heat production from heat pumps and waste heat (TJ)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|----------------------------|-------------|--------------|--------------|--------------|--------------|--------------|--------------|--|
| Total heat | 2198 | 20279 | 27706 | 35529 | 40182 | 47469 | 48870 | 5.3 |
| Heat pumps ¹ | 56 | 21781 | 18987 | 19127 | 20993 | 20296 | 15594 | -1.9 |
| (-) Input to heat pumps | 25 | 6561 | 5465 | 6329 | 7988 | 8721 | 4621 | -2.0 |
| Other sources ² | 2167 | 5059 | 14183 | 22731 | 27177 | 35894 | 37897 | 12.6 |

1. Installations producing heat for own use are not included.

2. Refers to production from hydrogen, purchased steam from industry, and waste heat.

Source: IEA/OECD *Electricity Statistics*.

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Table 6. Renewable and waste balance for 2016

| thousand tonnes of oil equivalent | Hydro ¹ | Wind | Tide wave ocean | Solar PV | Geo-thermal | Solar thermal | Industrial waste | Mun. waste renew. |
|------------------------------------|--------------------|---------------|-----------------|---------------|--------------|---------------|------------------|-------------------|
| Production | 49800 | 26677 | 43 | 8941 | 16423 | 5089 | 4709 | 10713 |
| Imports | - | - | - | - | - | - | 60 | 343 |
| Exports | - | - | - | - | - | - | - | -34 |
| Stock changes | - | - | - | - | - | - | - | - |
| TPES | 49800 | 26677 | 43 | 8941 | 16423 | 5089 | 4769 | 11022 |
| Statistical differences | - | - | - | - | 90 | - | - | - |
| Main activity electricity plants | -48970 | -25919 | -43 | -7142 | -10103 | -2191 | -291 | -2017 |
| Autoproducer electricity plants | -830 | -758 | - | -1800 | - | - | -456 | -1168 |
| Main activity CHP plants | - | - | - | - | -2481 | - | -579 | -3258 |
| Autoproducer CHP plants | - | - | - | - | - | - | -345 | -2644 |
| Main heat plants | - | - | - | - | -1056 | -38 | -84 | -897 |
| Autoproducer heat plants | - | - | - | - | -52 | - | -25 | -172 |
| Charcoal production plants | - | - | - | - | - | - | - | - |
| Other transformation | - | - | - | - | - | - | - | - |
| Energy Industry own use | - | - | - | - | - | - | -85 | -34 |
| Losses | - | - | - | - | -9 | - | - | - |
| TFC | - | - | - | - | 2812 | 2861 | 2904 | 833 |
| Industry | - | - | - | - | 43 | 304 | 2877 | 571 |
| Iron and steel | - | - | - | - | - | - | 4 | - |
| Chemical and petrochemical | - | - | - | - | - | - | 641 | 24 |
| Non-ferrous metals | - | - | - | - | - | - | 11 | - |
| Non-metallc minerals | - | - | - | - | - | - | 2067 | 418 |
| Transport equipment | - | - | - | - | - | - | - | - |
| Machinery | - | - | - | - | - | - | 4 | 1 |
| Mining and quarrying | - | - | - | - | - | - | - | - |
| Food and tobacco | - | - | - | - | 1 | 1 | 3 | 1 |
| Paper, pulp and print | - | - | - | - | - | - | 62 | 114 |
| Wood and wood products | - | - | - | - | - | - | 36 | 1 |
| Construction | - | - | - | - | - | - | 1 | 1 |
| Textile and leather | - | - | - | - | - | - | - | - |
| Non-specified | - | - | - | - | 42 | 302 | 47 | 12 |
| Transport | - | - | - | - | - | - | - | - |
| Road | - | - | - | - | - | - | - | - |
| Other | - | - | - | - | - | - | - | - |
| Other | - | - | - | - | 2768 | 2557 | 28 | 262 |
| Residential | - | - | - | - | 1721 | 2270 | - | - |
| Commercial and public services | - | - | - | - | 276 | 278 | 27 | 262 |
| Agriculture/forestry | - | - | - | - | 718 | 9 | 1 | - |
| Fishing | - | - | - | - | 54 | - | - | - |
| Non-specified | - | - | - | - | - | - | - | - |
| Electricity generated - GWh | 579175 | 310254 | 501 | 103987 | 16527 | 5579 | 5359 | 22364 |
| <i>Electricity plants</i> | 579175 | 310254 | 501 | 103987 | 11957 | 5579 | 2922 | 10050 |
| <i>CHP plants</i> | - | - | - | - | 4570 | - | 2437 | 12314 |
| Heat generated - TJ | - | - | - | - | 43200 | 1564 | 15264 | 135716 |
| <i>CHP plants</i> | - | - | - | - | 14945 | - | 12553 | 101417 |
| <i>Heat plants</i> | - | - | - | - | 28255 | 1564 | 2711 | 34299 |

1. Hydro does not include pumped hydro.

Source: IEA/OECD *World Energy Balances*.

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Table 6. Renewable and waste balance for 2016 (continued)

| Mun. waste non-ren. | Wood/wood waste | Charcoal | Bio-gases | Bio-gasoline | Bio-diesel | Other liquid biofuels | Total renew. & waste sources ² | Share in total energy sources ³ |
|---------------------|-----------------|------------|--------------|--------------|--------------|-----------------------|---|--|
| 10781 | 91136 | - | 16929 | 2239 | 10525 | 755 | 254760 | 26.1% |
| 309 | 7809 | 144 | - | 1414 | 6201 | 437 | 16717 | 1.1% |
| -29 | -3268 | -19 | - | -978 | -5526 | - | -9854 | 1.3% |
| 3 | 7 | - | - | -31 | 160 | - | 139 | x |
| 11065 | 95684 | 125 | 16929 | 2644 | 11359 | 1192 | 261762 | 15.2% |
| - | 8 | - | 5 | -9 | 112 | 1 | 207 | x |
| -2083 | -7488 | - | -3503 | - | -2 | -615 | -110367 | x |
| -1189 | -1711 | - | -2495 | - | - | -26 | -10433 | x |
| -3106 | -10403 | - | -5634 | - | -3 | -342 | -25806 | x |
| -2508 | -4958 | - | -1429 | - | -2 | -24 | -11910 | x |
| -893 | -4259 | - | -140 | - | - | -71 | -7438 | x |
| -175 | -195 | - | -8 | - | - | -1 | -628 | x |
| - | -185 | 51 | - | - | - | - | -134 | x |
| - | - | - | -253 | - | - | - | -253 | x |
| -45 | -12 | - | -543 | - | - | -54 | -773 | x |
| - | - | - | -23 | - | - | - | -32 | x |
| 1065 | 66481 | 176 | 2907 | 2635 | 11465 | 59 | 94198 | 7.7% |
| 788 | 21177 | 9 | 482 | - | 62 | 30 | 26343 | 9.3% |
| - | 10 | 1 | 1 | - | - | - | 16 | 0.1% |
| 24 | 373 | - | 75 | - | 1 | 8 | 1146 | 2.1% |
| - | 1 | - | 1 | - | - | - | 13 | 0.1% |
| 595 | 1103 | - | 24 | - | 2 | 7 | 4216 | 11.0% |
| - | 17 | - | - | - | 1 | 1 | 19 | 0.2% |
| 1 | 145 | - | 11 | - | - | 3 | 165 | 0.8% |
| - | 54 | - | 10 | - | 6 | 1 | 71 | 1.8% |
| - | 906 | 7 | 162 | - | 4 | 2 | 1087 | 3.4% |
| 81 | 12683 | - | 108 | - | - | 4 | 13052 | 37.4% |
| - | 4843 | - | 2 | - | - | 1 | 4883 | 56.4% |
| 1 | 125 | - | 1 | - | 47 | - | 176 | 2.2% |
| - | 13 | 1 | 4 | - | - | - | 18 | 0.3% |
| 86 | 906 | - | 84 | - | 2 | 4 | 1485 | 6.7% |
| - | - | - | 143 | 2623 | 11221 | 5 | 13992 | 4.1% |
| - | - | - | 143 | 2622 | 11180 | 5 | 13950 | 4.4% |
| - | - | - | 1 | 1 | 41 | - | 43 | 0.2% |
| 277 | 45304 | 168 | 2282 | 11 | 182 | 25 | 53864 | 10.8% |
| - | 41488 | 145 | 71 | 6 | 1 | - | 45702 | 15.1% |
| 277 | 2314 | 23 | 1776 | 1 | 143 | 25 | 5402 | 3.3% |
| - | 1502 | - | 435 | 1 | 31 | - | 2697 | 10.0% |
| - | - | - | - | 1 | 4 | - | 59 | 3.2% |
| - | - | - | 1 | 4 | 2 | - | 7 | 0.2% |
| 21862 | 90703 | - | 63925 | - | 28 | 5268 | 1225532 | 34.1% |
| 10257 | 39616 | - | 23375 | - | 3 | 3407 | 1101083 | 37.9% |
| 11605 | 51087 | - | 40550 | - | 25 | 1861 | 124449 | 17.8% |
| 130926 | 413502 | - | 30438 | - | 27 | 4945 | 775582 | 31.9% |
| 96784 | 258735 | - | 26269 | - | 27 | 2428 | 513158 | 30.5% |
| 34142 | 154767 | - | 4169 | - | - | 2517 | 262424 | 35.2% |

2. Total includes non-renewable waste.

3. Share of renewables on TFC excludes electricity and heat generated from renewable sources.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|--|--------|--------|--------|--------|--------|--------|--------|---|
| Geothermal (TJ) | | | | | | | | |
| Production | 207033 | 302822 | 476526 | 587121 | 640385 | 687584 | 754793 | 5.3 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 207033 | 302822 | 476526 | 587121 | 640385 | 687584 | 754793 | 5.3 |
| Statistical differences | -1145 | -635 | 92 | -1670 | -990 | 3785 | .. | .. |
| Transformation processes | 167709 | 250020 | 386949 | 489109 | 524373 | 573289 | .. | 5.3 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | 232 | 311 | 363 | 361 | 359 | 359 | .. | .. |
| Final energy consumption | 37947 | 51856 | 89306 | 95981 | 114663 | 117721 | .. | 5.3 |
| <i>Industry</i> | 558 | 743 | 1418 | 1643 | 1778 | 1810 | .. | 5.7 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 37389 | 51113 | 87888 | 94338 | 112885 | 115911 | .. | 5.3 |
| Solar thermal (TJ) | | | | | | | | |
| Production | 7219 | 27855 | 91010 | 202693 | 210730 | 213079 | 220950 | 13.6 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 7219 | 27855 | 91010 | 202693 | 210730 | 213079 | 220950 | 13.6 |
| Statistical differences | - | - | - | 1 | -1 | 2 | .. | .. |
| Transformation processes | 6 | 24 | 12713 | 90512 | 93006 | 93301 | .. | 67.6 |
| Energy industry own use | - | - | 4 | 3 | 3 | 4 | .. | - |
| Losses | - | - | - | - | - | - | .. | .. |
| Final energy consumption | 7213 | 27831 | 78293 | 112179 | 117720 | 119776 | .. | 9.6 |
| <i>Industry</i> | 338 | 4078 | 5827 | 12324 | 12486 | 12722 | .. | 7.4 |
| <i>Transport</i> | - | - | - | 3 | - | - | .. | - |
| <i>Other</i> | 6875 | 23753 | 72466 | 99852 | 105234 | 107054 | .. | 9.9 |
| Industrial waste (TJ) | | | | | | | | |
| Production | 82342 | 106923 | 153196 | 167239 | 174538 | 197147 | 196494 | 3.9 |
| Net imports ¹ | - | - | 41 | 1257 | 2492 | 2529 | 2091 | - |
| Stock changes | - | -29 | -3 | -10 | 4 | 1 | .. | .. |
| Gross consumption | 82342 | 106894 | 153234 | 168486 | 177034 | 199677 | 198585 | 4.0 |
| Statistical differences | - | -471 | -322 | 1 | 7 | - | .. | .. |
| Transformation processes | 32940 | 66935 | 56536 | 56625 | 62174 | 74522 | .. | 0.7 |
| Energy industry own use | 5222 | 229 | 2326 | 2705 | 3110 | 3556 | .. | 18.7 |
| Losses | - | - | 53 | 7 | - | - | .. | .. |
| Final energy consumption | 44180 | 39259 | 93997 | 109150 | 111757 | 121599 | .. | 7.3 |
| <i>Industry</i> | 42272 | 36980 | 93423 | 108196 | 110552 | 120446 | .. | 7.7 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 1908 | 2279 | 574 | 954 | 1205 | 1153 | .. | -4.2 |
| Municipal waste - renewables (TJ) | | | | | | | | |
| Production | 101526 | 179409 | 367315 | 418556 | 434076 | 448514 | 466299 | 5.9 |
| Net imports ¹ | - | - | - | 9317 | 11011 | 12950 | 14156 | - |
| Stock changes | - | 4 | -7 | - | - | - | - | - |
| Gross consumption | 101526 | 179413 | 367308 | 427873 | 445087 | 461464 | 480455 | 6.1 |
| Statistical differences | 2 | -3400 | 170 | 1 | - | - | .. | .. |
| Transformation processes | 99611 | 163561 | 345779 | 393298 | 409923 | 425160 | .. | 6.2 |
| Energy industry own use | 34 | 4 | 426 | 1796 | 1540 | 1443 | .. | 44.5 |
| Losses | - | - | - | - | - | - | .. | .. |
| Final energy consumption | 1883 | 12448 | 21273 | 32780 | 33624 | 34861 | .. | 6.6 |
| <i>Industry</i> | 16 | 1201 | 8228 | 21681 | 23439 | 23896 | .. | 20.6 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 1867 | 11247 | 13045 | 11099 | 10185 | 10965 | .. | -0.2 |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics (continued)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|--|---------|---------|---------|---------|---------|---------|---------|-------------------------------------|
| Municipal waste - non-renewables (TJ) | | | | | | | | |
| Production | 98536 | 173648 | 354396 | 410650 | 421695 | 451385 | 464948 | 6.2 |
| Net imports ¹ | - | - | 761 | 9735 | 10670 | 11750 | 13160 | - |
| Stock changes | - | 4 | -19 | 160 | 14 | 143 | -19 | - |
| Gross consumption | 98536 | 173652 | 355138 | 420545 | 432379 | 463278 | 478089 | 6.3 |
| Statistical differences | - | -3400 | 134 | -22 | -32 | 1 | .. | .. |
| Transformation processes | 97207 | 158970 | 327991 | 374802 | 388616 | 416779 | .. | 6.2 |
| Energy industry own use | 34 | 4 | 426 | 2492 | 2083 | 1902 | .. | 47.0 |
| Losses | - | - | 4 | - | - | - | .. | .. |
| Final energy consumption | 1295 | 11278 | 26851 | 43229 | 41648 | 44598 | .. | 9.0 |
| <i>Industry</i> | 13 | 643 | 13380 | 29783 | 29739 | 33002 | .. | 27.9 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 1282 | 10635 | 13471 | 13446 | 11909 | 11596 | .. | 0.5 |
| Solid Biofuel excluding charcoal (TJ) | | | | | | | | |
| Production | 1988844 | 2395546 | 3585437 | 3549984 | 3725880 | 3815690 | 3857892 | 3.0 |
| Net imports ¹ | 6540 | 12816 | 121678 | 190435 | 179939 | 190134 | 184892 | 18.4 |
| Stock changes | 7938 | -417 | 2247 | -2038 | -1948 | 274 | 3815 | - |
| Gross consumption | 2003322 | 2407945 | 3709362 | 3738381 | 3903871 | 4006098 | 4046599 | 3.2 |
| Statistical differences | - | -1 | 135 | 117 | 163 | 353 | .. | .. |
| Transformation processes | 124827 | 305983 | 972948 | 1156198 | 1185325 | 1222504 | .. | 9.0 |
| Energy industry own use | 6 | 136 | 10896 | 11695 | 1197 | 508 | .. | 8.6 |
| Losses | 80 | 12 | 127 | 11 | 28 | - | .. | .. |
| Final energy consumption | 1878409 | 2101813 | 2725526 | 2570594 | 2717484 | 2783439 | .. | 1.8 |
| <i>Industry</i> | 555718 | 667893 | 782474 | 803661 | 849598 | 886631 | .. | 1.8 |
| <i>Transport</i> | 1 | - | - | - | - | - | .. | - |
| <i>Other</i> | 1322690 | 1433920 | 1943052 | 1766933 | 1867886 | 1896808 | .. | 1.8 |
| Charcoal (kt) | | | | | | | | |
| Production | 46 | 84 | 63 | 69 | 67 | 70 | 80 | -1.1 |
| Net imports ¹ | 11 | 52 | 139 | 170 | 178 | 172 | 170 | 7.8 |
| Stock changes | - | - | 1 | - | -2 | - | 1 | - |
| Gross consumption | 57 | 136 | 203 | 239 | 243 | 242 | 251 | 3.7 |
| Statistical differences | - | - | - | - | - | - | .. | .. |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | .. |
| Final energy consumption | 57 | 136 | 203 | 239 | 243 | 242 | .. | 3.7 |
| <i>Industry</i> | - | 28 | 10 | 11 | 11 | 12 | .. | -5.2 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 57 | 108 | 193 | 228 | 232 | 230 | .. | 4.8 |
| Biogases (TJ) | | | | | | | | |
| Production | 29462 | 95286 | 369966 | 643923 | 677405 | 708786 | 719976 | 13.4 |
| Net imports ¹ | - | - | - | - | - | - | -42 | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 29462 | 95286 | 369966 | 643923 | 677405 | 708786 | 719934 | 13.4 |
| Statistical differences | - | -23 | 92 | 233 | 207 | 225 | .. | .. |
| Transformation processes | 14627 | 75955 | 288416 | 515046 | 541403 | 563621 | .. | 13.3 |
| Energy industry own use | - | 68 | 19847 | 22797 | 21953 | 22719 | .. | 43.8 |
| Losses | - | - | 918 | 907 | 964 | 954 | .. | .. |
| Final energy consumption | 14835 | 19240 | 60877 | 105406 | 113292 | 121717 | .. | 12.2 |
| <i>Industry</i> | 8614 | 8853 | 13088 | 14244 | 17812 | 20161 | .. | 5.3 |
| <i>Transport</i> | - | 7 | 1498 | 5699 | 5826 | 5994 | .. | 52.5 |
| <i>Other</i> | 6221 | 10380 | 46291 | 85463 | 89654 | 95562 | .. | 14.9 |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics (continued)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|-----------------------------------|------|------|-------|-------|-------|-------|-------|---|
| Biogasoline (kt) | | | | | | | | |
| Production | - | 93 | 2793 | 3550 | 3397 | 3462 | 3767 | 25.4 |
| Net imports ¹ | - | - | 1382 | 531 | 772 | 653 | 471 | - |
| Stock changes | - | -2 | -2 | 33 | -29 | -49 | -22 | - |
| Gross consumption | - | 91 | 4173 | 4114 | 4140 | 4066 | 4216 | 26.8 |
| Statistical differences | - | - | 50 | 21 | 5 | -14 | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | 91 | 4223 | 4135 | 4145 | 4052 | .. | 26.8 |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | 91 | 4217 | 4122 | 4133 | 4035 | .. | 26.7 |
| <i>Other</i> | - | - | 6 | 13 | 12 | 17 | .. | - |
| Biodiesel (kt) | | | | | | | | |
| Production | 7 | 717 | 9805 | 12400 | 12016 | 11792 | 13107 | 19.1 |
| Net imports ¹ | - | 11 | 2034 | 665 | 544 | 747 | 753 | 30.2 |
| Stock changes | - | -5 | 35 | -58 | 132 | 180 | 101 | - |
| Gross consumption | 7 | 723 | 11874 | 13007 | 12692 | 12719 | 13961 | 19.6 |
| Statistical differences | 1 | - | -91 | -41 | -6 | 125 | .. | - |
| Transformation processes | - | - | - | 6 | 7 | 7 | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 8 | 723 | 11783 | 12960 | 12679 | 12837 | .. | 19.7 |
| <i>Industry</i> | - | - | 35 | 70 | 76 | 70 | .. | - |
| <i>Transport</i> | 7 | 721 | 11562 | 12685 | 12401 | 12564 | .. | 19.6 |
| <i>Other</i> | 1 | 2 | 186 | 205 | 202 | 203 | .. | 33.5 |
| Other liquid biofuels (kt) | | | | | | | | |
| Production | - | 17 | 1211 | 428 | 501 | 942 | 879 | 28.5 |
| Net imports ¹ | - | - | 729 | 877 | 918 | 499 | 470 | - |
| Stock changes | - | - | - | - | - | - | 2 | - |
| Gross consumption | - | 17 | 1940 | 1305 | 1419 | 1441 | 1351 | 32.0 |
| Statistical differences | - | - | 3 | -1 | -2 | 1 | .. | - |
| Transformation processes | - | 1 | 1507 | 1171 | 1299 | 1284 | .. | 56.4 |
| Energy industry own use | - | - | 16 | 33 | 32 | 57 | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | 16 | 420 | 100 | 86 | 101 | .. | 12.2 |
| <i>Industry</i> | - | - | 156 | 51 | 41 | 49 | .. | - |
| <i>Transport</i> | - | 16 | 66 | 11 | 6 | 7 | .. | -5.0 |
| <i>Other</i> | - | - | 198 | 38 | 39 | 45 | .. | - |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

IEA TOTAL

Figure 1. Contribution of renewables in 1990

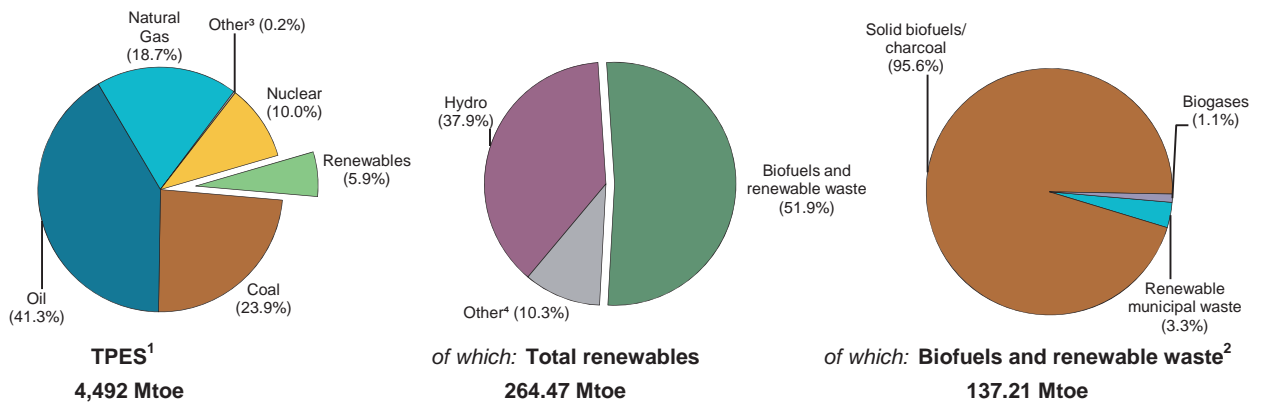


Figure 2. Contribution of renewables in 2017 provisional

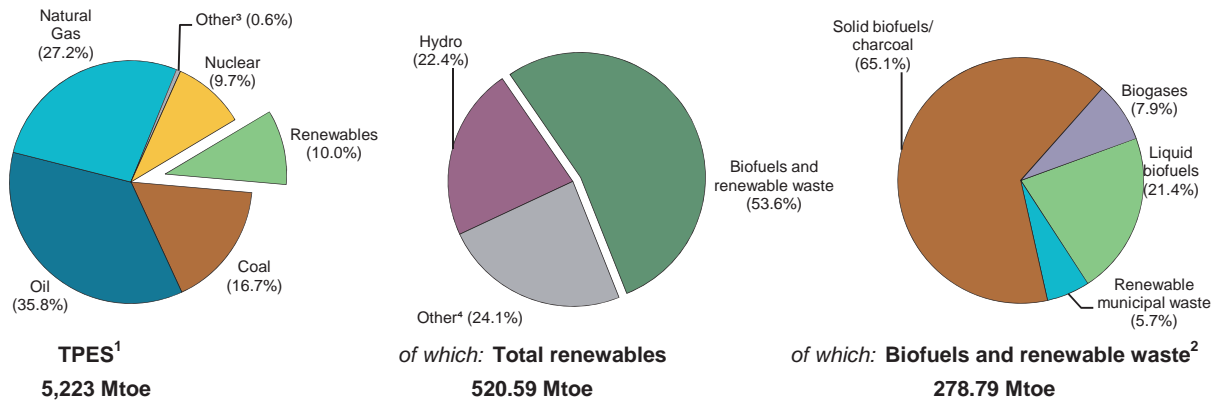
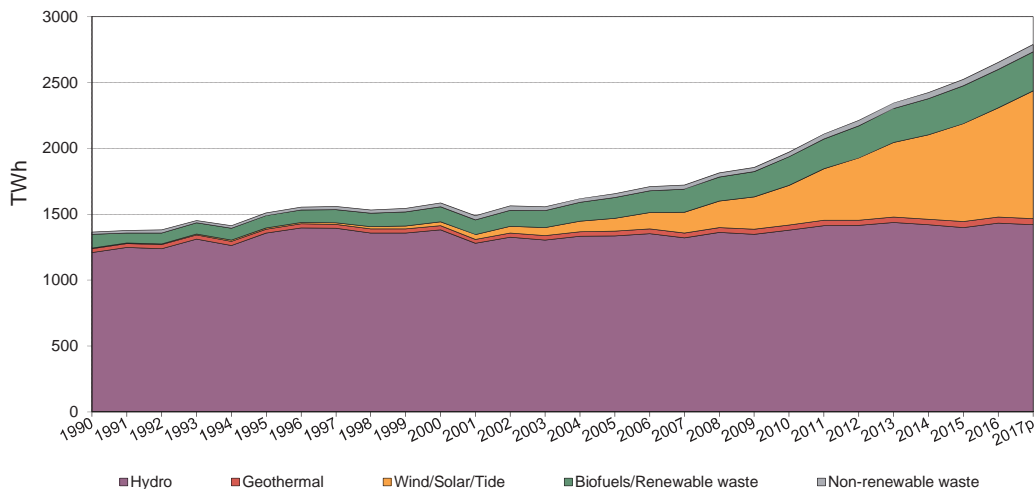


Figure 3. Electricity production by renewables and waste energy source



1. Total primary energy supply includes electricity trade.
 2. Biofuels and renewable waste include solid biofuels, liquid biofuels, biogases, and renewable municipal waste.
 3. Includes non-renewable municipal waste, industrial waste, peat, shale oil, electricity trade, and other sources of primary energy. (In the case of negative values, the net exports of electricity are greater than the other products in this category).
 4. Includes geothermal, solar, wind and tide.

Note: Totals may not sum due to rounding.
Source: IEA/OECD *World Energy Balances*.

IEA TOTAL

Table 1. Energy supply, GDP and population

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|---|----------|----------|----------|----------|----------|----------|----------|--|
| TPES (Mtoe) | 4491.72 | 5248.35 | 5359.76 | 5194.09 | 5194.18 | 5197.71 | 5222.55 | -0.0 |
| of which: Renewables (Mtoe) ¹ | 264.47 | 309.12 | 409.44 | 477.41 | 489.57 | 502.79 | 520.59 | 3.1 |
| Renewables/TPES(%) | 5.9 | 5.9 | 7.6 | 9.2 | 9.4 | 9.7 | 10.0 | 3.1 |
| GDP (billion 2010 US dollars) | 29189.75 | 37968.40 | 44230.21 | 47160.15 | 48314.23 | 49134.21 | 50304.45 | 1.7 |
| TPES/GDP ² | 0.15 | 0.14 | 0.12 | 0.11 | 0.11 | 0.11 | 0.10 | -1.7 |
| TPES/GDP (year 2010 = 100) | 127 | 114 | 100 | 91 | 89 | 87 | 86 | -1.7 |
| Population (millions) | 1050.19 | 1130.11 | 1211.24 | 1238.99 | 1246.06 | 1253.30 | 1260.15 | 0.6 |
| TPES/population (toe per capita) | 4.28 | 4.64 | 4.43 | 4.19 | 4.17 | 4.15 | 4.14 | -0.7 |
| Electricity generation (TWh) ³ | 7598.0 | 9634.0 | 10727.9 | 10634.0 | 10683.0 | 10755.5 | 10775.1 | 0.7 |
| of which: Renewables (TWh) ^{1,3} | 1303.24 | 1484.78 | 1872.68 | 2318.84 | 2416.91 | 2535.20 | 2665.94 | 3.5 |
| Renew./Total Elec.(%) ^{1,4} | 17.2 | 15.4 | 17.5 | 21.8 | 22.6 | 23.6 | 24.7 | 2.8 |
| Road energy consumption (Mtoe) | 786.0 | 978.4 | 1047.5 | 1031.9 | 1059.5 | 1074.0 | .. | .. |
| of which: Liquid biofuels (Mtoe) | 0.01 | 4.03 | 38.17 | 51.34 | 52.18 | 54.97 | .. | .. |
| Liq. biofuels/road tr.(%) ⁵ | 0.0 | 0.4 | 3.6 | 5.0 | 4.9 | 5.1 | - | - |

1. Renewables do not include industrial waste, non-renewable municipal waste and pumped storage production.

2. In units of toe per thousand 2010 US dollars.

3. Electricity generation = gross production - amount of electricity produced in pumped storage plants.

4. Electricity share generated from renewables over the total electricity production.

5. Energy from liquid biofuels consumed in road transport over the total energy consumed in road transport.

Source: IEA/OECD *World Energy Balances* and OECD *Main Economic Indicators*.

Table 2. Net generating capacity of renewable and waste sources (MWe)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | Average annual percent change 00-16 |
|---|---------------|---------------|---------------|---------------|---------------|----------------|--|
| Total capacity | 395748 | 464139 | 673741 | 878692 | 942761 | 1002998 | 4.9 |
| Hydro | 371284 | 418064 | 446868 | 463428 | 472027 | 477610 | 0.8 |
| Hydro <1MW | 967 | 3038 | 3123 | 3424 | 3501 | 3688 | 1.2 |
| Hydro 1-10MW | 5589 | 16704 | 20098 | 21655 | 22353 | 19100 | 0.8 |
| Hydro 10+MW | 99803 | 239619 | 316066 | 326739 | 332998 | 340148 | 2.2 |
| Mixed plants | 19791 | 21507 | 41476 | 42184 | 42610 | 43958 | 4.6 |
| Pure pumped storage | 37476 | 68281 | 66104 | 69426 | 70566 | 70715 | 0.2 |
| Geothermal | 4417 | 5221 | 5494 | 6039 | 6396 | 6585 | 1.5 |
| Solar photovoltaic | .. | 757 | 37898 | 132796 | 159993 | 187492 | .. |
| Solar thermal | 339 | 419 | 1210 | 3972 | 4063 | 4063 | 15.3 |
| Tide, wave, ocean | 260 | 234 | 242 | 506 | 503 | 509 | 5.0 |
| Wind | 2369 | 15390 | 133580 | 212607 | 237561 | 262724 | 19.4 |
| Industrial waste | .. | 1777 | 2462 | 2632 | 2210 | 2404 | .. |
| Municipal waste | .. | 6632 | 10553 | 11883 | 12739 | 13202 | .. |
| Solid biofuels | .. | 13243 | 25090 | 28915 | 30853 | 31613 | .. |
| Biogases | .. | 2402 | 9016 | 13601 | 14030 | 14484 | .. |
| Liquid biofuels | - | - | 1328 | 2313 | 2386 | 2312 | - |
| Solar collectors surface (1000 m ²) | 22493 | 42945 | 92356 | 118566 | 123555 | 126187 | 7.0 |
| Cap. of solar collectors (MW _{th}) ¹ | 15747 | 30063 | 64650 | 82999 | 86491 | 88331 | 7.0 |

1. Converted at 0.7 kW_{th}/m² of solar collector area, as estimated by the IEA Solar Heating & Cooling Programme.

IEA TOTAL

Table 3. Capacity factors (%)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 |
|--|----------------|----------------|----------------|----------------|----------------|----------------|
| Total plants¹ | 39.36 e | 39.01 e | 33.44 e | 31.49 e | 30.57 e | 30.20 e |
| Hydro | 37.20 e | 37.74 e | 35.26 | 34.98 | 33.83 | 34.24 |
| <i>of which: <1MW</i> | 18.17 e | 42.54 | 42.21 | 41.72 | 37.65 | 37.86 |
| <i>of which: 1-10MW</i> | 27.21 e | 37.79 | 41.08 | 39.99 | 36.31 | 35.62 |
| <i>of which: 10+MW</i> | 56.21 e | 40.95 | 44.47 | 44.42 | 43.11 | 43.53 |
| <i>of which: pure pumped storage²</i> | x | x | x | x | x | x |
| Geothermal | 73.18 | 69.21 | 81.02 | 81.66 | 81.13 | 79.96 |
| Solar photovoltaic | 49.16 e | 11.08 e | 9.22 e | 12.44 e | 12.75 e | 13.15 e |
| Solar thermal | 22.33 | 14.33 | 15.50 | 23.41 | 25.68 | 26.08 |
| Tide, wave and ocean | 23.21 | 26.31 e | 23.88 | 22.35 | 22.67 | 22.75 |
| Wind | 18.53 | 21.16 e | 22.93 | 26.12 | 26.65 | 26.19 |
| Industrial waste | 87.77 e | 81.77 e | 39.67 | 57.37 | 84.15 | x |
| Municipal waste | 58.96 e | 55.94 e | 62.09 e | 61.69 e | 59.19 e | 56.48 e |
| Solid biofuels | 86.88 e | 72.03 e | 62.40 | 63.75 | 62.37 | 61.79 e |
| Biogases | 67.66 e | 62.31 e | 56.82 | 63.51 | 64.02 | 63.22 e |
| Biodiesels | - | - | - | 14.60 | 18.16 | 20.83 |
| Other liquid biofuels | - | - | 43.56 | 27.69 | 33.42 | 33.96 |

1. The capacity factor is defined as: the annual gross electricity generation divided by the reported net capacity times 365 (days/year) times 24 (hours/day).

2. In case a country has at least one mixed hydro plants, it is impossible to calculate capacity factor thus it is shown as 'not applicable'.

IEA TOTAL

Table 4. Gross electricity production from renewable and waste sources (GWh)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|---------------------------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|---|
| Total electricity¹ | 1364470 | 1585987 | 1973365 | 2423925 | 2524515 | 2653746 | 2788097 | 3.4 |
| Hydro | 1209886 | 1382102 | 1380202 | 1420254 | 1399061 | 1432370 | 1421434 | 0.2 |
| <i>of which: pumped storage</i> | <i>47162</i> | <i>72457</i> | <i>65100</i> | <i>60381</i> | <i>58979</i> | <i>63681</i> | <i>67651</i> | <i>-0.4</i> |
| Geothermal | 28314 | 31653 | 38992 | 43197 | 45457 | 46125 | 46748 | 2.3 |
| Solar photovoltaic | 85 | 735 | 30617 | 144758 | 178691 | 215968 | 263027 | 41.3 |
| Solar thermal | 663 | 526 | 1643 | 8146 | 9141 | 9284 | 11323 | 19.8 |
| Tide, wave, ocean | 529 | 539 | 506 | 991 | 998 | 1015 | 909 | 3.1 |
| Wind | 3845 | 28524 | 268369 | 486397 | 554588 | 602862 | 693202 | 20.6 |
| Industrial waste | 7665 | 12730 | 8553 | 13227 | 16291 | 22614 | 22316 | 3.4 |
| Municipal waste renew. | 8228 | 16482 | 30364 | 32747 | 33724 | 33072 | 33324 | 4.2 |
| Municipal waste non-renew. | 8078 | 16019 | 27038 | 31474 | 32335 | 32249 | 32190 | 4.2 |
| Solid biofuels | 93525 | 83567 | 137144 | 161474 | 168578 | 171107 | 177359 | 4.5 |
| Biogases | 3652 | 13110 | 44870 | 75670 | 78685 | 80219 | 80587 | 11.3 |
| Liquid biofuels | - | - | 5067 | 5590 | 6966 | 6861 | 5678 | - |
| <i>of which:</i> | | | | | | | | |
| <i>Electricity only plants</i> | 1288872 | 1517566 | 1846341 | 2268457 | 2367326 | 2492756 | .. | - |
| Hydro | 1209886 | 1382102 | 1380202 | 1420254 | 1399061 | 1432370 | .. | - |
| <i>of which: pumped storage</i> | <i>47162</i> | <i>72457</i> | <i>65100</i> | <i>60381</i> | <i>58979</i> | <i>63681</i> | .. | - |
| Geothermal | 28257 | 31611 | 38938 | 43126 | 45386 | 46058 | .. | - |
| Solar photovoltaic | 85 | 735 | 30617 | 144758 | 178691 | 215968 | .. | - |
| Solar thermal | 663 | 526 | 1643 | 8146 | 9141 | 9284 | .. | - |
| Tide, wave, ocean | 529 | 539 | 506 | 991 | 998 | 1015 | .. | - |
| Wind | 3845 | 28524 | 268369 | 486397 | 554588 | 602862 | .. | - |
| Industrial waste | 3403 | 5448 | 3804 | 9146 | 12594 | 18577 | .. | - |
| Municipal waste renew. | 6719 | 12473 | 20067 | 19802 | 20731 | 19749 | .. | - |
| Municipal waste non-renew. | 6738 | 12214 | 18125 | 19764 | 20684 | 19681 | .. | - |
| Solid biofuels | 25758 | 33264 | 57033 | 75312 | 83628 | 84581 | .. | - |
| Biogases | 2989 | 10130 | 24646 | 37071 | 37043 | 37798 | .. | - |
| Liquid biofuels | - | - | 2391 | 3690 | 4781 | 4813 | .. | .. |
| <i>CHP plants</i> | 75598 | 68421 | 127024 | 155468 | 157189 | 160990 | .. | - |
| Geothermal | 57 | 42 | 54 | 71 | 71 | 67 | .. | - |
| Industrial waste | 4262 | 7282 | 4749 | 4081 | 3697 | 4037 | .. | - |
| Municipal waste renew. | 1509 | 4009 | 10297 | 12945 | 12993 | 13323 | .. | - |
| Municipal waste non-renew. | 1340 | 3805 | 8913 | 11710 | 11651 | 12568 | .. | - |
| Solid biofuels | 67767 | 50303 | 80111 | 86162 | 84950 | 86526 | .. | - |
| Biogases | 663 | 2980 | 20224 | 38599 | 41642 | 42421 | .. | - |
| Liquid biofuels | - | - | 2676 | 1900 | 2185 | 2048 | .. | - |

1. **Total electricity** includes the electricity produced from industrial waste, non-renewable municipal waste and pumped storage. Electricity from renewable sources does *not* include the electricity produced from industrial waste, non-renewable municipal waste and pumped storage production.

IEA TOTAL

Table 5A. Heat production¹ from renewable and waste sources in the transformation sector (TJ)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|----------------------------|------|---------------|---------------|---------------|---------------|---------------|---------------|--|
| Total heat | - | 278491 | 609175 | 731235 | 748088 | 816582 | 828046 | 6.6 |
| Geothermal | - | 716 | 5119 | 6763 | 7864 | 9578 | 10409 | 17.1 |
| Solar thermal | - | 24 | 192 | 820 | 1038 | 1564 | 1771 | 28.8 |
| Industrial waste | - | 6418 | 19491 | 27795 | 23260 | 32022 | 29320 | 9.3 |
| Municipal waste renew. | - | 63618 | 118347 | 138932 | 147033 | 148926 | 154429 | 5.4 |
| Municipal waste non-renew. | - | 61478 | 105481 | 129724 | 135741 | 144942 | 149923 | 5.4 |
| Solid biofuels | - | 141267 | 338914 | 394653 | 397835 | 439878 | 443381 | 7.0 |
| Biogases | - | 4931 | 11936 | 27923 | 30839 | 34709 | 34695 | 12.2 |
| Liquid biofuels | - | 39 | 9695 | 4625 | 4478 | 4963 | 4118 | 31.5 |
| <i>of which:</i> | | | | | | | | |
| CHP plants | .. | 187028 | 394105 | 495197 | 507983 | 555039 | .. | - |
| Geothermal | .. | - | - | - | - | - | - | - |
| Solar thermal | .. | - | - | - | - | - | - | - |
| Industrial waste | .. | 3249 | 13396 | 15708 | 15642 | 20070 | .. | - |
| Municipal waste renew. | .. | 46676 | 76227 | 101200 | 106668 | 109673 | .. | - |
| Municipal waste non-renew. | .. | 45275 | 67031 | 90130 | 94492 | 104812 | .. | - |
| Solid biofuels | .. | 87941 | 227056 | 263486 | 264276 | 289490 | .. | - |
| Biogases | .. | 3887 | 7615 | 22509 | 24614 | 28548 | .. | - |
| Liquid biofuels | .. | - | 2780 | 2164 | 2291 | 2446 | .. | .. |
| Heat only plants | .. | 91463 | 215070 | 236038 | 240105 | 261543 | .. | - |
| Geothermal | .. | 716 | 5119 | 6763 | 7864 | 9578 | .. | - |
| Solar thermal | .. | 24 | 192 | 820 | 1038 | 1564 | .. | - |
| Industrial waste | .. | 3169 | 6095 | 12087 | 7618 | 11952 | .. | - |
| Municipal waste renew. | .. | 16942 | 42120 | 37732 | 40365 | 39253 | .. | - |
| Municipal waste non-renew. | .. | 16203 | 38450 | 39594 | 41249 | 40130 | .. | - |
| Solid biofuels | .. | 53326 | 111858 | 131167 | 133559 | 150388 | .. | - |
| Biogases | .. | 1044 | 4321 | 5414 | 6225 | 6161 | .. | - |
| Liquid biofuels | .. | 39 | 6915 | 2461 | 2187 | 2517 | .. | - |

1. Waste heat and heat production from heat pumps are not included and are reported separately in Table 5B.

Table 5B. Heat production from heat pumps and waste heat (TJ)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|----------------------------|------|--------------|--------------|--------------|--------------|--------------|--------------|--|
| Total heat | - | 28642 | 35620 | 42102 | 46548 | 53896 | 55309 | 3.9 |
| Heat pumps ¹ | - | 21781 | 18987 | 19127 | 20993 | 20296 | 15594 | -1.9 |
| (-) Input to heat pumps | - | 6561 | 5465 | 6329 | 7988 | 8721 | 4621 | -2.0 |
| Other sources ² | - | 13422 | 22097 | 29304 | 33543 | 42321 | 44336 | 7.3 |

1. Installations producing heat for own use are not included.

2. Refers to production from hydrogen, purchased steam from industry, and waste heat.

Source: IEA/OECD *Electricity Statistics*.

IEA TOTAL

Table 6. Renewable and waste balance for 2016

| thousand tonnes of oil equivalent | Hydro ¹ | Wind | Tide wave ocean | Solar PV | Geo-thermal | Solar thermal | Industrial waste | Mun. waste renew. |
|------------------------------------|--------------------|---------------|-----------------|---------------|--------------|---------------|------------------|-------------------|
| Production | 117686 | 51837 | 87 | 18570 | 32592 | 8723 | 14035 | 15265 |
| Imports | - | - | - | - | - | - | 58 | 343 |
| Exports | - | - | - | - | - | - | - | -34 |
| Stock changes | - | - | - | - | - | - | - | - |
| TPES | 117686 | 51837 | 87 | 18570 | 32592 | 8723 | 14093 | 15575 |
| Statistical differences | - | - | - | - | - | - | -72 | - |
| Main activity electricity plants | -113727 | -49886 | -87 | -11218 | -28514 | -2940 | -3099 | -4700 |
| Autoproducer electricity plants | -3959 | -1951 | - | -7351 | -146 | - | -1079 | -1958 |
| Main activity CHP plants | - | - | - | - | - | - | -808 | -3555 |
| Autoproducer CHP plants | - | - | - | - | -41 | - | -514 | -2774 |
| Main heat plants | - | - | - | - | -345 | -38 | -84 | -962 |
| Autoproducer heat plants | - | - | - | - | -52 | - | -305 | -262 |
| Charcoal production plants | - | - | - | - | - | - | - | - |
| Other transformation | - | - | - | - | - | - | -116 | - |
| Energy Industry own use | - | - | - | - | - | - | -85 | -34 |
| Losses | - | - | - | - | - | - | - | - |
| TFC | - | - | - | - | 3494 | 5746 | 7931 | 1328 |
| Industry | - | - | - | - | 143 | 317 | 6655 | 646 |
| Iron and steel | - | - | - | - | - | - | 46 | - |
| Chemical and petrochemical | - | - | - | - | - | - | 1381 | 24 |
| Non-ferrous metals | - | - | - | - | - | - | 45 | - |
| Non-metallurgical minerals | - | - | - | - | - | - | 3352 | 418 |
| Transport equipment | - | - | - | - | - | - | - | - |
| Machinery | - | - | - | - | - | - | 4 | 1 |
| Mining and quarrying | - | - | - | - | - | - | - | - |
| Food and tobacco | - | - | - | - | 1 | 1 | 46 | 1 |
| Paper, pulp and print | - | - | - | - | 108 | - | 954 | 119 |
| Wood and wood products | - | - | - | - | - | - | 43 | 1 |
| Construction | - | - | - | - | - | - | 7 | 8 |
| Textile and leather | - | - | - | - | - | - | 66 | - |
| Non-specified | - | - | - | - | 34 | 315 | 710 | 74 |
| Transport | - | - | - | - | - | - | - | - |
| Road | - | - | - | - | - | - | - | - |
| Other | - | - | - | - | - | - | - | - |
| Other | - | - | - | - | 3351 | 5428 | 1276 | 682 |
| Residential | - | - | - | - | 1992 | 3241 | - | - |
| Commercial and public services | - | - | - | - | 493 | 2136 | 433 | 682 |
| Agriculture/forestry | - | - | - | - | 825 | 9 | 1 | - |
| Fishing | - | - | - | - | 40 | - | - | - |
| Non-specified | - | - | - | - | - | 42 | 841 | - |
| Electricity generated - GWh | 1368690 | 602862 | 1015 | 215968 | 46125 | 9284 | 22614 | 33072 |
| <i>Electricity plants</i> | 1368690 | 602862 | 1015 | 215968 | 46058 | 9284 | 18577 | 19749 |
| <i>CHP plants</i> | - | - | - | - | 67 | - | 4037 | 13323 |
| Heat generated - TJ | - | - | - | - | 9578 | 1564 | 32022 | 148926 |
| <i>CHP plants</i> | - | - | - | - | - | - | 20070 | 109673 |
| <i>Heat plants</i> | - | - | - | - | 9578 | 1564 | 11952 | 39253 |

1. Hydro does not include pumped hydro.

Source: IEA/OECD *World Energy Balances*.

IEA TOTAL

Table 6. Renewable and waste balance for 2016 (continued)

| Mun. waste non-ren. | Wood/wood waste | Charcoal | Bio-gases | Bio-gasoline | Bio-diesel | Other liquid biofuels | Total renew. & waste sources ² | Share in total energy sources ³ |
|---------------------|-----------------|------------|--------------|--------------|--------------|-----------------------|---|--|
| 15317 | 172403 | - | 21754 | 37816 | 16632 | 1408 | 524125 | 13.0% |
| 287 | 8344 | 138 | - | 2414 | 9586 | 437 | 21607 | 0.7% |
| -29 | -3275 | -6 | - | -3651 | -6107 | - | -13102 | 0.7% |
| - | 2 | - | - | 148 | -322 | - | -172 | x |
| 15576 | 177475 | 132 | 21754 | 36725 | 19790 | 1844 | 532459 | 10.2% |
| - | 255 | - | 6 | -9 | 112 | - | 292 | x |
| -4649 | -14048 | - | -6988 | - | -30 | -971 | -240857 | x |
| -1980 | -8351 | - | -2881 | - | - | -26 | -29682 | x |
| -3383 | -11472 | - | -5760 | - | -3 | -342 | -25323 | x |
| -2650 | -10081 | - | -1777 | - | -2 | -54 | -17893 | x |
| -929 | -4113 | - | -191 | - | - | -71 | -6733 | x |
| -310 | -199 | - | -45 | - | - | -1 | -1174 | x |
| - | -189 | 51 | - | - | - | - | -138 | x |
| - | -3 | - | -256 | - | - | - | -375 | x |
| -45 | -12 | - | -641 | - | -139 | -54 | -1010 | x |
| - | - | - | -23 | - | - | - | -23 | x |
| 1630 | 129261 | 183 | 3198 | 36717 | 19729 | 326 | 209543 | 5.8% |
| 848 | 62296 | 8 | 603 | - | 374 | 297 | 72187 | 9.3% |
| - | 9 | - | 2 | - | 2 | - | 59 | 0.1% |
| 24 | 414 | - | 85 | - | 43 | 8 | 1979 | 1.3% |
| - | 47 | - | 1 | - | 1 | - | 94 | 0.2% |
| 563 | 1701 | - | 31 | - | 17 | 8 | 6090 | 7.6% |
| - | 19 | - | 1 | - | 3 | 1 | 24 | 0.1% |
| 1 | 146 | - | 11 | - | 10 | 3 | 176 | 0.3% |
| - | 54 | - | 10 | - | 62 | 1 | 127 | 0.6% |
| - | 4429 | 7 | 193 | - | 13 | 2 | 4693 | 6.1% |
| 90 | 46623 | - | 171 | - | 2 | 269 | 48336 | 46.9% |
| - | 7537 | - | 2 | - | 11 | 1 | 7595 | 44.6% |
| 12 | 123 | - | 1 | - | 199 | - | 350 | 1.3% |
| 1 | 36 | 1 | 4 | - | - | - | 108 | 0.8% |
| 156 | 1158 | - | 92 | - | 11 | 4 | 2554 | 3.3% |
| - | - | - | 141 | 36705 | 18507 | 5 | 55358 | 4.5% |
| - | - | - | 141 | 36704 | 18119 | 5 | 54969 | 5.1% |
| - | - | - | 1 | 1 | 388 | - | 390 | 0.3% |
| 782 | 66965 | 175 | 2454 | 11 | 849 | 25 | 81998 | 6.5% |
| - | 60013 | 152 | 71 | 6 | 226 | - | 65701 | 9.8% |
| 782 | 4253 | 23 | 1951 | 1 | 355 | 25 | 11134 | 2.3% |
| - | 2483 | - | 431 | 1 | 262 | - | 4012 | 6.1% |
| - | - | - | - | 1 | 4 | - | 45 | 1.1% |
| - | 217 | - | 1 | 4 | 2 | - | 1107 | 4.4% |
| 32249 | 171105 | - | 80221 | - | 25 | 6836 | 2590066 | 24.1% |
| 19681 | 84580 | - | 37799 | - | 3 | 4810 | 2429076 | 25.2% |
| 12568 | 86525 | - | 42422 | - | 22 | 2026 | 160990 | 14.6% |
| 144942 | 439878 | - | 34709 | - | 18 | 4945 | 816582 | 26.0% |
| 104812 | 289490 | - | 28548 | - | 18 | 2428 | 555039 | 23.4% |
| 40130 | 150388 | - | 6161 | - | - | 2517 | 261543 | 34.2% |

2. Total includes non-renewable waste.

3. Share of renewables on TFC excludes electricity and heat generated from renewable sources.

Source: IEA/OECD *World Energy Balances*.

IEA TOTAL

Table 7. Aggregated renewables and waste statistics

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|--|---------|---------|---------|---------|---------|---------|---------|--|
| Geothermal (TJ) | | | | | | | | |
| Production | 1057103 | 1196644 | 1081888 | 1221673 | 1303690 | 1364579 | 1381176 | 0.8 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 1057103 | 1196644 | 1081888 | 1221673 | 1303690 | 1364579 | 1381176 | 0.8 |
| Statistical differences | 1 | 1 | 1 | -386 | -1 | - | .. | .. |
| Transformation processes | 997429 | 1109062 | 969062 | 1100240 | 1162584 | 1218304 | .. | 0.6 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | 3 | 27 | 4 | 9 | 9 | 9 | .. | .. |
| Final energy consumption | 59672 | 87556 | 112823 | 121038 | 141096 | 146266 | .. | 3.3 |
| <i>Industry</i> | 4838 | 10663 | 6736 | 5101 | 5391 | 5977 | .. | -3.6 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 54834 | 76893 | 106087 | 115937 | 135705 | 140289 | .. | 3.8 |
| Solar thermal (TJ) | | | | | | | | |
| Production | 63047 | 134534 | 213541 | 355029 | 374716 | 365215 | 423441 | 6.4 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 63047 | 134534 | 213541 | 355029 | 374716 | 365215 | 423441 | 6.4 |
| Statistical differences | 4847 | - | -1 | 2 | -1 | 1 | .. | .. |
| Transformation processes | 7239 | 5593 | 20466 | 113818 | 123188 | 124657 | .. | 21.4 |
| Energy industry own use | - | - | 4 | 3 | 3 | 4 | .. | - |
| Losses | - | - | - | - | - | - | .. | .. |
| Final energy consumption | 60655 | 128941 | 193070 | 241210 | 251524 | 240555 | .. | 4.0 |
| <i>Industry</i> | 372 | 4163 | 6063 | 12739 | 12995 | 13285 | .. | 7.5 |
| <i>Transport</i> | - | - | - | 3 | - | - | .. | - |
| <i>Other</i> | 60283 | 124778 | 187007 | 228468 | 238529 | 227270 | .. | 3.8 |
| Industrial waste (TJ) | | | | | | | | |
| Production | 185155 | 337798 | 389454 | 457800 | 496629 | 587599 | 581087 | 3.5 |
| Net imports ¹ | - | - | 41 | 1061 | 2268 | 2444 | 1996 | - |
| Stock changes | - | -29 | -3 | -10 | 4 | 1 | .. | .. |
| Gross consumption | 185155 | 337769 | 389492 | 458851 | 498901 | 590044 | 583083 | 3.5 |
| Statistical differences | -65 | -646 | -996 | -148 | 157 | -3007 | .. | .. |
| Transformation processes | 113741 | 137345 | 113415 | 169254 | 190757 | 251442 | .. | 3.9 |
| Energy industry own use | 5222 | 229 | 2326 | 2705 | 3110 | 3556 | .. | 18.7 |
| Losses | - | - | 53 | 7 | - | - | .. | .. |
| Final energy consumption | 66127 | 199549 | 272702 | 286737 | 305191 | 332039 | .. | 3.2 |
| <i>Industry</i> | 63028 | 194957 | 219328 | 235197 | 252484 | 278633 | .. | 2.3 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 3099 | 4592 | 53374 | 51540 | 52707 | 53406 | .. | 16.6 |
| Municipal waste - renewables (TJ) | | | | | | | | |
| Production | 191125 | 358681 | 575014 | 614855 | 631440 | 639127 | 647241 | 3.7 |
| Net imports ¹ | - | - | - | 9317 | 11011 | 12950 | 14156 | - |
| Stock changes | - | 4 | -7 | - | - | - | - | - |
| Gross consumption | 191125 | 358685 | 575007 | 624172 | 642451 | 652077 | 661397 | 3.8 |
| Statistical differences | 2 | -2896 | 2223 | - | 1 | - | .. | .. |
| Transformation processes | 189050 | 298200 | 538953 | 574651 | 587687 | 595020 | .. | 4.4 |
| Energy industry own use | 34 | 4 | 426 | 1796 | 1540 | 1443 | .. | 44.5 |
| Losses | - | - | - | - | - | - | .. | .. |
| Final energy consumption | 2043 | 57585 | 37851 | 47725 | 53225 | 55614 | .. | -0.2 |
| <i>Industry</i> | 16 | 25051 | 9368 | 23332 | 25779 | 27063 | .. | 0.5 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 2027 | 32534 | 28483 | 24393 | 27446 | 28551 | .. | -0.8 |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

IEA TOTAL

Table 7. Aggregated renewables and waste statistics (continued)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|--|---------|---------|---------|---------|---------|---------|---------|--|
| Municipal waste - non-renewables (TJ) | | | | | | | | |
| Production | 186916 | 349902 | 524373 | 605997 | 618791 | 641305 | 645592 | 3.9 |
| Net imports ¹ | - | - | - | 7689 | 8948 | 10803 | 11706 | - |
| Stock changes | - | 4 | - | 7 | -3 | 8 | - | - |
| Gross consumption | 186916 | 349906 | 524373 | 613693 | 627736 | 652116 | 657298 | 4.0 |
| Statistical differences | - | -3065 | 1617 | -23 | -32 | 1 | .. | .. |
| Transformation processes | 185480 | 291210 | 483135 | 553652 | 562741 | 581977 | .. | 4.4 |
| Energy industry own use | 34 | 4 | 426 | 2492 | 2083 | 1902 | .. | 47.0 |
| Losses | - | - | 4 | - | - | - | .. | .. |
| Final energy consumption | 1402 | 55627 | 42425 | 57526 | 62880 | 68238 | .. | 1.3 |
| <i>Industry</i> | 13 | 24493 | 13200 | 29027 | 30349 | 35486 | .. | 2.3 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 1389 | 31134 | 29225 | 28499 | 32531 | 32752 | .. | 0.3 |
| Solid Biofuel excluding charcoal (TJ) | | | | | | | | |
| Production | 5474530 | 6010499 | 7052557 | 7261574 | 7269289 | 7218173 | 7373600 | 1.2 |
| Net imports ¹ | 6758 | 23801 | 132644 | 208589 | 205274 | 212234 | 215373 | 14.7 |
| Stock changes | 8628 | -413 | 1229 | -256 | -125 | 99 | -1093 | - |
| Gross consumption | 5489916 | 6033887 | 7186430 | 7469907 | 7474438 | 7430506 | 7587880 | 1.3 |
| Statistical differences | 5950 | 4203 | 1344 | 9532 | -545 | 10684 | .. | .. |
| Transformation processes | 1655623 | 1026281 | 1643589 | 1979239 | 2002132 | 2028780 | .. | 4.4 |
| Energy industry own use | 6 | 136 | 10896 | 11785 | 1287 | 508 | .. | 8.6 |
| Losses | - | 12 | 127 | 11 | 28 | - | .. | .. |
| Final energy consumption | 3840237 | 5011661 | 5533162 | 5488404 | 5470446 | 5411902 | .. | 0.5 |
| <i>Industry</i> | 1428242 | 2579029 | 2493701 | 2572462 | 2592799 | 2608197 | .. | 0.1 |
| <i>Transport</i> | 1 | - | - | - | - | - | .. | - |
| <i>Other</i> | 2411994 | 2432632 | 3039461 | 2915942 | 2877647 | 2803705 | .. | 0.9 |
| Charcoal (kt) | | | | | | | | |
| Production | 81 | 109 | 68 | 68 | 68 | 70 | 79 | -2.7 |
| Net imports ¹ | 11 | 52 | 147 | 180 | 185 | 181 | 181 | 8.1 |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 92 | 161 | 215 | 248 | 253 | 251 | 260 | 2.8 |
| Statistical differences | - | - | - | - | - | - | .. | .. |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | .. |
| Final energy consumption | 92 | 161 | 215 | 248 | 253 | 251 | .. | 2.8 |
| <i>Industry</i> | - | 28 | 10 | 11 | 11 | 11 | .. | -5.7 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 92 | 133 | 205 | 237 | 242 | 240 | .. | 3.8 |
| Biogases (TJ) | | | | | | | | |
| Production | 63233 | 235891 | 524448 | 870297 | 896800 | 910809 | 922312 | 8.8 |
| Net imports ¹ | - | - | - | - | - | - | -42 | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 63233 | 235891 | 524448 | 870297 | 896800 | 910809 | 922270 | 8.8 |
| Statistical differences | 1 | -23 | -92 | 273 | 630 | 258 | .. | .. |
| Transformation processes | 47585 | 154410 | 434706 | 711847 | 735961 | 749349 | .. | 10.4 |
| Energy industry own use | - | 68 | 19885 | 22875 | 22031 | 26852 | .. | 45.3 |
| Losses | - | - | 918 | 907 | 964 | 954 | .. | .. |
| Final energy consumption | 15649 | 81390 | 68847 | 134941 | 138474 | 133912 | .. | 3.2 |
| <i>Industry</i> | 9154 | 67112 | 15336 | 37691 | 39005 | 25247 | .. | -5.9 |
| <i>Transport</i> | - | 7 | 1476 | 5628 | 5757 | 5923 | .. | 52.4 |
| <i>Other</i> | 6495 | 14271 | 52035 | 91622 | 93712 | 102742 | .. | 13.1 |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

IEA TOTAL

Table 7. Aggregated renewables and waste statistics (continued)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|-----------------------------------|------|------|-------|-------|-------|-------|-------|---|
| Biogasoline (kt) | | | | | | | | |
| Production | - | 4735 | 43140 | 47216 | 48413 | 50227 | 51882 | 15.9 |
| Net imports ¹ | - | 79 | 912 | -405 | -34 | -1301 | -1704 | - |
| Stock changes | - | 77 | -171 | -258 | -385 | 185 | -437 | - |
| Gross consumption | - | 4891 | 43881 | 46553 | 47994 | 49111 | 49741 | 15.5 |
| Statistical differences | - | 365 | -2501 | 19 | 7 | -14 | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | 5256 | 41380 | 46572 | 48001 | 49097 | .. | 15.0 |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | 5256 | 41374 | 46559 | 47989 | 49080 | .. | 15.0 |
| <i>Other</i> | - | - | 6 | 13 | 12 | 17 | .. | - |
| Biodiesel (kt) | | | | | | | | |
| Production | 7 | 738 | 11106 | 17363 | 16992 | 17904 | 19264 | 22.1 |
| Net imports ¹ | - | 11 | 2184 | 1647 | 2314 | 3529 | 2383 | 43.4 |
| Stock changes | - | -5 | 42 | 52 | -83 | -298 | 535 | - |
| Gross consumption | 7 | 744 | 13332 | 18950 | 19060 | 21135 | 22182 | 23.3 |
| Statistical differences | 1 | - | -92 | -25 | -32 | 125 | .. | - |
| Transformation processes | - | - | - | 49 | 44 | 35 | .. | - |
| Energy industry own use | - | - | - | 100 | 134 | 138 | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 8 | 744 | 13240 | 18776 | 18850 | 21087 | .. | 23.2 |
| <i>Industry</i> | - | - | 35 | 276 | 368 | 379 | .. | - |
| <i>Transport</i> | 7 | 742 | 13019 | 17794 | 17633 | 19843 | .. | 22.8 |
| <i>Other</i> | 1 | 2 | 186 | 706 | 849 | 865 | .. | 46.1 |
| Other liquid biofuels (kt) | | | | | | | | |
| Production | - | 17 | 1405 | 1145 | 1381 | 1929 | 1707 | 34.4 |
| Net imports ¹ | - | - | 729 | 877 | 918 | 499 | 470 | - |
| Stock changes | - | - | - | - | - | - | 2 | - |
| Gross consumption | - | 17 | 2134 | 2022 | 2299 | 2428 | 2179 | 36.4 |
| Statistical differences | - | - | 3 | - | -1 | - | .. | - |
| Transformation processes | - | 1 | 1536 | 1479 | 1740 | 1752 | .. | 59.5 |
| Energy industry own use | - | - | 16 | 33 | 32 | 57 | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | 16 | 585 | 510 | 526 | 619 | .. | 25.7 |
| <i>Industry</i> | - | - | 321 | 461 | 481 | 567 | .. | - |
| <i>Transport</i> | - | 16 | 66 | 11 | 6 | 7 | .. | -5.0 |
| <i>Other</i> | - | - | 198 | 38 | 39 | 45 | .. | - |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Figure 1. Contribution of renewables in 1990

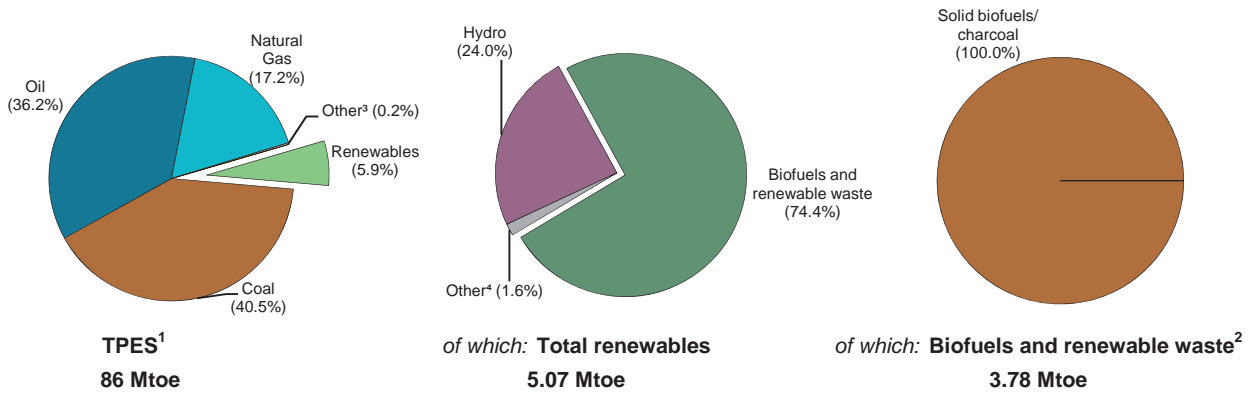


Figure 2. Contribution of renewables in 2017 provisional

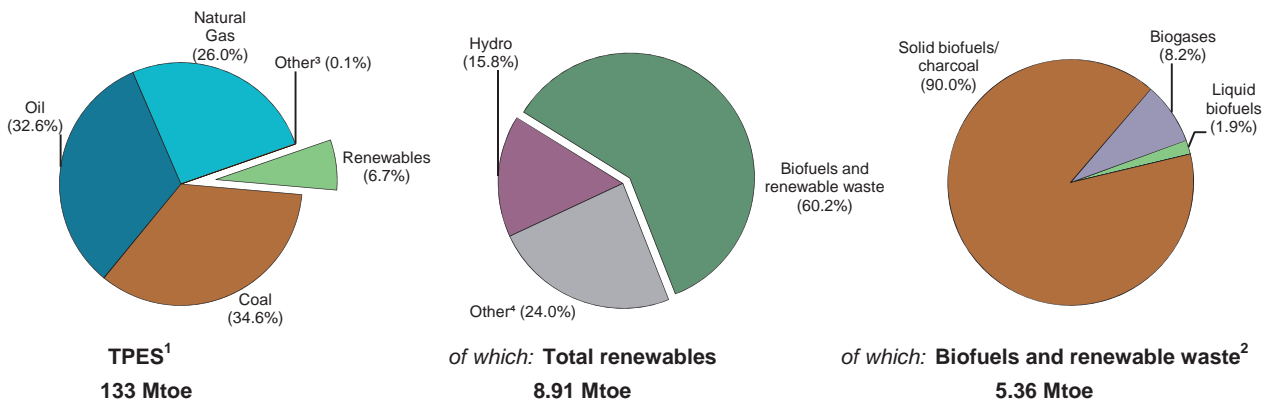
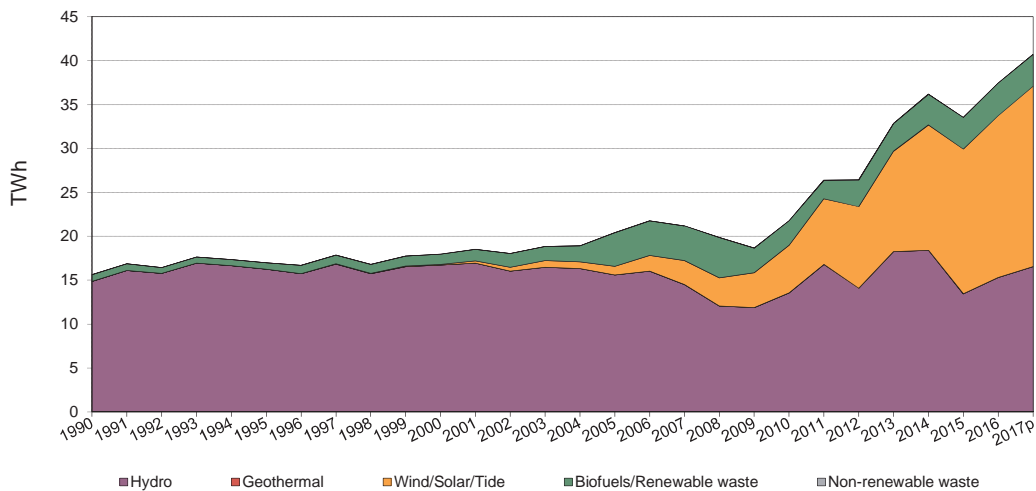


Figure 3. Electricity production by renewables and waste energy source



1. Total primary energy supply includes electricity trade.
 2. Biofuels and renewable waste include solid biofuels, liquid biofuels, biogases, and renewable municipal waste.
 3. Includes non-renewable municipal waste, industrial waste, peat, shale oil, electricity trade, and other sources of primary energy. (In the case of negative values, the net exports of electricity are greater than the other products in this category).
 4. Includes geothermal, solar, wind and tide.

Note: Totals may not sum due to rounding.
Source: IEA/OECD World Energy Balances.

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Table 1. Energy supply, GDP and population

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|---|--------|--------|---------|---------|---------|---------|---------|--|
| TPES (Mtoe) | 86.14 | 108.11 | 127.30 | 124.95 | 125.13 | 129.75 | 132.68 | 1.2 |
| of which: Renewables (Mtoe) ¹ | 5.07 | 6.35 | 6.68 | 7.92 | 8.01 | 8.29 | 8.91 | 2.0 |
| Renewables/TPES(%) | 5.9 | 5.9 | 5.2 | 6.3 | 6.4 | 6.4 | 6.7 | 0.8 |
| GDP (billion 2010 US dollars) | 675.25 | 957.35 | 1297.26 | 1452.07 | 1493.12 | 1522.35 | 1557.01 | 2.9 |
| TPES/GDP ² | 0.13 | 0.11 | 0.10 | 0.09 | 0.08 | 0.09 | 0.09 | -1.6 |
| TPES/GDP (year 2010 = 100) | 130 | 115 | 100 | 88 | 85 | 87 | 87 | -1.6 |
| Population (millions) | 17.28 | 19.28 | 22.34 | 23.79 | 24.13 | 24.52 | 24.92 | 1.5 |
| TPES/population (toe per capita) | 4.98 | 5.61 | 5.70 | 5.25 | 5.19 | 5.29 | 5.33 | -0.3 |
| Electricity generation (TWh) ³ | 154.3 | 209.9 | 252.6 | 247.4 | 251.3 | 256.3 | 260.0 | 1.3 |
| of which: Renewables (TWh) ^{1,3} | 14.90 | 17.59 | 21.72 | 36.16 | 33.46 | 37.20 | 40.53 | 5.0 |
| Renew./Total Elec.(%) ^{1,4} | 9.7 | 8.4 | 8.6 | 14.6 | 13.3 | 14.5 | 15.6 | 3.7 |
| Road energy consumption (Mtoe) | 18.7 | 22.3 | 25.3 | 26.5 | 27.0 | 27.2 | .. | .. |
| of which: Liquid biofuels (Mtoe) | - | - | 0.17 | 0.25 | 0.25 | 0.16 | .. | .. |
| Liq. biofuels/road tr.(%) ⁵ | - | - | 0.7 | 1.0 | 0.9 | 0.6 | - | - |

1. Renewables do not include industrial waste, non-renewable municipal waste and pumped storage production.

2. In units of toe per thousand 2010 US dollars.

3. Electricity generation = gross production - amount of electricity produced in pumped storage plants.

4. Electricity share generated from renewables over the total electricity production.

5. Energy from liquid biofuels consumed in road transport over the total energy consumed in road transport.

Source: IEA/OECD *World Energy Balances* and OECD *Main Economic Indicators*.

Table 2. Net generating capacity of renewable and waste sources (MWe)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | Average annual percent change 00-16 |
|---|-------------|-------------|--------------|--------------|--------------|--------------|--|
| Total capacity | 8653 | 9681 | 12541 | 17353 | 18145 | 18599 | 4.2 |
| Hydro | 8321 | 9201 | 9449 | 8724 | 8724 | 8724 | -0.3 |
| Hydro <1MW | 1 | 3 | 8 | 7 | 7 | 7 | 5.4 |
| Hydro 1-10MW | 49 | 49 | 172 | 157 | 157 | 157 | 7.5 |
| Hydro 10+MW | 7331 | 7659 | 7853 | 7144 | 7144 | 7144 | -0.4 |
| Mixed plants | - | - | - | - | - | - | - |
| Pure pumped storage | 940 | 1490 | 1416 | 1416 | 1416 | 1416 | -0.3 |
| Geothermal | - | - | - | - | - | - | - |
| Solar photovoltaic | - | 25 | 399 | 4004 | 4357 | 4718 | 38.8 |
| Solar thermal | - | - | 3 | 3 | 3 | 3 | - |
| Tide, wave, ocean | - | - | 1 | 1 | 1 | 1 | - |
| Wind | - | 33 | 1864 | 3797 | 4234 | 4327 | 35.6 |
| Industrial waste | - | - | - | - | - | - | - |
| Municipal waste | - | - | - | - | - | - | - |
| Solid biofuels | 332 | 332 | 597 | 598 | 598 | 598 | 3.7 |
| Biogases | - | 90 | 228 | 226 | 228 | 228 | 6.0 |
| Liquid biofuels | - | - | - | - | - | - | - |
| Solar collectors surface (1000 m ²) | - | 2743 | 8892 | 10957 | 12292 | 12314 | 9.8 |
| Cap. of solar collectors (MW _{th}) ¹ | - | 1920 | 6224 | 7670 | 8604 | 8620 | 9.8 |

1. Converted at 0.7 kW_{th}/m² of solar collector area, as estimated by the IEA Solar Heating & Cooling Programme.

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Table 3. Capacity factors (%)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 |
|--|--------------|--------------|--------------|--------------|--------------|--------------|
| Total plants¹ | 20.62 | 21.17 | 19.81 | 23.81 | 21.10 | 22.99 |
| Hydro | 20.41 | 20.74 | 16.37 | 24.10 | 17.59 | 20.04 |
| <i>of which: <1MW</i> | 21.88 | 24.22 | 19.22 | 29.86 | 21.80 | 24.83 |
| <i>of which: 1-10MW</i> | 21.88 | 24.22 | 19.33 | 28.79 | 21.01 | 23.94 |
| <i>of which: 10+MW</i> | 21.88 | 24.22 | 19.25 | 28.77 | 21.00 | 23.93 |
| <i>of which: pure pumped storage²</i> | 8.89 | 2.76 | 0.38 | 0.28 | 0.68 | 1.97 |
| Geothermal | - | - | - | - | - | - |
| Solar photovoltaic | - | 17.22 | 11.03 | 11.42 | 13.15 | 15.01 |
| Solar thermal | - | - | 11.88 | 12.30 | 14.16 | 16.16 |
| Tide, wave and ocean | - | - | - | - | - | - |
| Wind | - | 20.06 | 30.94 | 30.82 | 30.92 | 32.18 |
| Industrial waste | - | - | - | - | - | - |
| Municipal waste | - | - | - | - | - | - |
| Solid biofuels | 25.79 | 23.55 | 33.69 | 35.83 | 40.42 | 46.79 |
| Biogases | - | 56.95 | 50.85 | 82.57 | 74.64 | 63.64 |
| Biodiesels | - | - | - | - | - | - |
| Other liquid biofuels | - | - | - | - | - | - |

1. The capacity factor is defined as: the annual gross electricity generation divided by the reported net capacity times 365 (days/year) times 24 (hours/day).

2. In case a country has at least one mixed hydro plants, it is impossible to calculate capacity factor thus it is shown as 'not applicable'.

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Table 4. Gross electricity production from renewable and waste sources (GWh)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|--------------------------------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|---|
| Total electricity¹ | 15630 | 17950 | 21768 | 36195 | 33544 | 37448 | 40711 | 4.9 |
| Hydro | 14880 | 16720 | 13549 | 18421 | 13445 | 15318 | 16531 | -0.1 |
| <i>of which: pumped storage</i> | 732 | 360 | 47 | 35 | 84 | 244 | 184 | -3.9 |
| Geothermal | - | - | 1 | 1 | 1 | - | - | - |
| Solar photovoltaic | - | 38 | 386 | 4007 | 5019 | 6205 | 8066 | 37.0 |
| Solar thermal | - | - | 3 | 3 | 4 | 4 | 6 | - |
| Tide, wave, ocean | - | - | - | - | - | - | - | - |
| Wind | - | 58 | 5052 | 10252 | 11467 | 12199 | 12483 | 37.2 |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | - | - | - | - | - |
| Solid biofuels | 750 | 685 | 1761 | 1876 | 2117 | 2451 | 2365 | 7.6 |
| Biogases | - | 449 | 1016 | 1635 | 1491 | 1271 | 1260 | 6.3 |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| <i>of which:</i> | | | | | | | | |
| Electricity only plants | 14880 | 16816 | 19797 | 33882 | 31304 | 35007 | .. | - |
| Hydro | 14880 | 16720 | 13549 | 18421 | 13445 | 15318 | .. | - |
| <i>of which: pumped storage</i> | 732 | 360 | 47 | 35 | 84 | 244 | .. | - |
| Geothermal | - | - | 1 | 1 | 1 | - | - | - |
| Solar photovoltaic | - | 38 | 386 | 4007 | 5019 | 6205 | .. | - |
| Solar thermal | - | - | 3 | 3 | 4 | 4 | .. | - |
| Tide, wave, ocean | - | - | - | - | - | - | - | - |
| Wind | - | 58 | 5052 | 10252 | 11467 | 12199 | .. | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | - | - | - | - | - |
| Solid biofuels | - | - | 182 | 194 | 378 | 437 | .. | - |
| Biogases | - | - | 624 | 1004 | 990 | 844 | .. | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| CHP plants | 750 | 1134 | 1971 | 2313 | 2240 | 2441 | .. | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | - | - | - | - | - |
| Solid biofuels | 750 | 685 | 1579 | 1682 | 1739 | 2014 | .. | - |
| Biogases | - | 449 | 392 | 631 | 501 | 427 | .. | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |

1. **Total electricity** includes the electricity produced from industrial waste, non-renewable municipal waste and pumped storage. Electricity from renewable sources does *not* include the electricity produced from industrial waste, non-renewable municipal waste and pumped storage production.

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Table 5A. Heat production¹ from renewable and waste sources in the transformation sector (TJ)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|----------------------------|------|------|------|------|------|------|-------|--|
| Total heat | - | - | - | - | - | - | - | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | - | - | - | - | - |
| Solid biofuels | - | - | - | - | - | - | - | - |
| Biogases | - | - | - | - | - | - | - | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| <i>of which:</i> | | | | | | | | |
| CHP plants | - | - | - | - | - | - | - | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | - | - | - | - | - |
| Solid biofuels | - | - | - | - | - | - | - | - |
| Biogases | - | - | - | - | - | - | - | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| Heat only plants | - | - | - | - | - | - | - | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | - | - | - | - | - |
| Solid biofuels | - | - | - | - | - | - | - | - |
| Biogases | - | - | - | - | - | - | - | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |

1. Waste heat and heat production from heat pumps are not included and are reported separately in Table 5B.

Table 5B. Heat production from heat pumps and waste heat (TJ)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|----------------------------|------|------|------|------|------|------|-------|--|
| Total heat | - | - | - | - | - | - | - | - |
| Heat pumps ¹ | - | - | - | - | - | - | - | - |
| (-) Input to heat pumps | - | - | - | - | - | - | - | - |
| Other sources ² | - | - | - | - | - | - | - | - |

1. Installations producing heat for own use are not included.

2. Refers to production from hydrogen, purchased steam from industry, and waste heat.

Source: IEA/OECD *Electricity Statistics*.

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Table 6. Renewable and waste balance for 2016

| thousand tonnes of oil equivalent | Hydro ¹ | Wind | Tide wave ocean | Solar PV | Geo-thermal | Solar thermal | Industrial waste | Mun. waste renew. |
|------------------------------------|--------------------|--------------|-----------------|-------------|-------------|---------------|------------------|-------------------|
| Production | 1296 | 1049 | - | 534 | - | 356 | 94 | - |
| Imports | - | - | - | - | - | - | - | - |
| Exports | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| TPES | 1296 | 1049 | - | 534 | - | 356 | 94 | - |
| Statistical differences | - | - | - | - | - | - | - | - |
| Main activity electricity plants | -1296 | -1049 | - | -39 | - | -1 | - | - |
| Autoproducer electricity plants | - | - | - | -494 | - | - | - | - |
| Main activity CHP plants | - | - | - | - | - | - | - | - |
| Autoproducer CHP plants | - | - | - | - | - | - | - | - |
| Main heat plants | - | - | - | - | - | - | - | - |
| Autoproducer heat plants | - | - | - | - | - | - | - | - |
| Charcoal production plants | - | - | - | - | - | - | - | - |
| Other transformation | - | - | - | - | - | - | - | - |
| Energy Industry own use | - | - | - | - | - | - | - | - |
| Losses | - | - | - | - | - | - | - | - |
| TFC | - | - | - | - | - | 355 | 94 | - |
| Industry | - | - | - | - | - | - | 94 | - |
| Iron and steel | - | - | - | - | - | - | - | - |
| Chemical and petrochemical | - | - | - | - | - | - | 89 | - |
| Non-ferrous metals | - | - | - | - | - | - | - | - |
| Non-metallurgical minerals | - | - | - | - | - | - | - | - |
| Transport equipment | - | - | - | - | - | - | - | - |
| Machinery | - | - | - | - | - | - | - | - |
| Mining and quarrying | - | - | - | - | - | - | - | - |
| Food and tobacco | - | - | - | - | - | - | 4 | - |
| Paper, pulp and print | - | - | - | - | - | - | - | - |
| Wood and wood products | - | - | - | - | - | - | - | - |
| Construction | - | - | - | - | - | - | - | - |
| Textile and leather | - | - | - | - | - | - | - | - |
| Non-specified | - | - | - | - | - | - | - | - |
| Transport | - | - | - | - | - | - | - | - |
| Road | - | - | - | - | - | - | - | - |
| Other | - | - | - | - | - | - | - | - |
| Other | - | - | - | - | - | 355 | - | - |
| Residential | - | - | - | - | - | 346 | - | - |
| Commercial and public services | - | - | - | - | - | 10 | - | - |
| Agriculture/forestry | - | - | - | - | - | - | - | - |
| Fishing | - | - | - | - | - | - | - | - |
| Non-specified | - | - | - | - | - | - | - | - |
| Electricity generated - GWh | 15074 | 12199 | - | 6205 | - | 4 | - | - |
| <i>Electricity plants</i> | 15074 | 12199 | - | 6205 | - | 4 | - | - |
| <i>CHP plants</i> | - | - | - | - | - | - | - | - |
| Heat generated - TJ | - | - | - | - | - | - | - | - |
| <i>CHP plants</i> | - | - | - | - | - | - | - | - |
| <i>Heat plants</i> | - | - | - | - | - | - | - | - |

1. Hydro does not include pumped hydro.

Source: IEA/OECD *World Energy Balances*.

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Table 6. Renewable and waste balance for 2016 (continued)

| Mun. waste non-ren. | Wood/wood waste | Charcoal | Bio-gases | Bio-gasoline | Bio-diesel | Other liquid biofuels | Total renew. & waste sources ² | Share in total energy sources ³ |
|---------------------|-----------------|----------|-------------|--------------|------------|-----------------------|---|--|
| - | 4474 | - | 417 | 114 | 47 | - | 8381 | 2.2% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | 4474 | - | 417 | 114 | 47 | - | 8381 | 6.5% |
| - | - | - | - | - | - | - | - | - |
| - | -100 | - | -226 | - | - | - | -2711 | x |
| - | - | - | - | - | - | - | -494 | x |
| - | - | - | - | - | - | - | - | - |
| - | -461 | - | -114 | - | - | - | -575 | x |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | 3913 | - | 77 | 114 | 47 | - | 4600 | 5.7% |
| - | 2731 | - | 26 | - | - | - | 2851 | 12.5% |
| - | - | - | - | - | - | - | - | - |
| - | 12 | - | - | - | - | - | 101 | 4.6% |
| - | 46 | - | - | - | - | - | 46 | 0.6% |
| - | 52 | - | 7 | - | - | - | 59 | 2.7% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | 2103 | - | 18 | - | - | - | 2125 | 56.7% |
| - | 176 | - | 1 | - | - | - | 177 | 18.6% |
| - | 342 | - | - | - | - | - | 342 | 72.9% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | 114 | 47 | - | 161 | 0.5% |
| - | - | - | - | 114 | 47 | - | 161 | 0.6% |
| - | - | - | - | - | - | - | - | - |
| - | 1182 | - | 51 | - | - | - | 1588 | 7.6% |
| - | 1176 | - | - | - | - | - | 1522 | 14.5% |
| - | 7 | - | 51 | - | - | - | 68 | 0.9% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | 2451 | - | 1271 | - | - | - | 37204 | 14.5% |
| - | 437 | - | 844 | - | - | - | 34763 | 14.3% |
| - | 2014 | - | 427 | - | - | - | 2441 | 18.3% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |

2. Total includes non-renewable waste.

3. Share of renewables on TFC excludes electricity and heat generated from renewable sources.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|--|------|------|-------|-------|-------|-------|-------|---|
| Geothermal (TJ) | | | | | | | | |
| Production | - | - | 18 | 18 | 23 | 8 | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | 18 | 18 | 23 | 8 | - | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | 18 | 18 | 23 | 8 | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Solar thermal (TJ) | | | | | | | | |
| Production | 3405 | 3418 | 10519 | 13264 | 14883 | 14918 | 15648 | 9.6 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 3405 | 3418 | 10519 | 13264 | 14883 | 14918 | 15648 | 9.6 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | 34 | 35 | 41 | 46 | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 3405 | 3418 | 10485 | 13229 | 14842 | 14872 | .. | 9.6 |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 3405 | 3418 | 10485 | 13229 | 14842 | 14872 | .. | 9.6 |
| Industrial waste (TJ) | | | | | | | | |
| Production | 7767 | 7490 | 4168 | 4177 | 3899 | 3915 | 4476 | -4.0 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 7767 | 7490 | 4168 | 4177 | 3899 | 3915 | 4476 | -4.0 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 7767 | 7490 | 4168 | 4177 | 3899 | 3915 | .. | -4.0 |
| <i>Industry</i> | 7767 | 7490 | 4168 | 4177 | 3899 | 3915 | .. | -4.0 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Municipal waste - renewables (TJ) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics (continued)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|--|---------|--------|--------|--------|--------|--------|--------|---|
| Municipal waste - non-renewables (TJ) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Solid Biofuel excluding charcoal (TJ) | | | | | | | | |
| Production | 158108 | 197572 | 180917 | 174095 | 185816 | 187324 | 202002 | -0.3 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 158108 | 197572 | 180917 | 174095 | 185816 | 187324 | 202002 | -0.3 |
| Statistical differences | - | - | - | - | 1 | 1 | .. | - |
| Transformation processes | 29683 e | 23310 | 18812 | 16711 | 20555 | 23491 | .. | 0.0 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 128425 | 174262 | 162105 | 157384 | 165262 | 163834 | .. | -0.4 |
| <i>Industry</i> | 54325 | 95543 | 106230 | 105327 | 115145 | 114334 | .. | 1.1 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 74100 | 78719 | 55875 | 52057 | 50117 | 49500 | .. | -2.9 |
| Charcoal (kt) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Biogases (TJ) | | | | | | | | |
| Production | - | 5780 | 12915 | 16316 | 16693 | 17471 | 18294 | 7.2 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | 5780 | 12915 | 16316 | 16693 | 17471 | 18294 | 7.2 |
| Statistical differences | - | - | -1 | -1 | 277 | - | .. | - |
| Transformation processes | - | 5780 | 11912 | 14005 | 14520 | 14247 | .. | 5.8 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | 1002 | 2310 | 2450 | 3224 | .. | - |
| <i>Industry</i> | - | - | 322 | 529 | 788 | 1094 | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | 680 | 1781 | 1662 | 2130 | .. | - |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics (continued)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|-----------------------------------|------|------|------|------|------|------|-------|---|
| Biogasoline (kt) | | | | | | | | |
| Production | - | - | 178 | 217 | 195 | 178 | 150 | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | 178 | 217 | 195 | 178 | 150 | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | 178 | 217 | 195 | 178 | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | 178 | 217 | 195 | 178 | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Biodiesel (kt) | | | | | | | | |
| Production | - | - | 61 | 129 | 138 | 54 | 4 | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | 61 | 129 | 138 | 54 | 4 | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | 61 | 129 | 138 | 54 | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | 61 | 129 | 138 | 54 | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Other liquid biofuels (kt) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Figure 1. Contribution of renewables in 1990

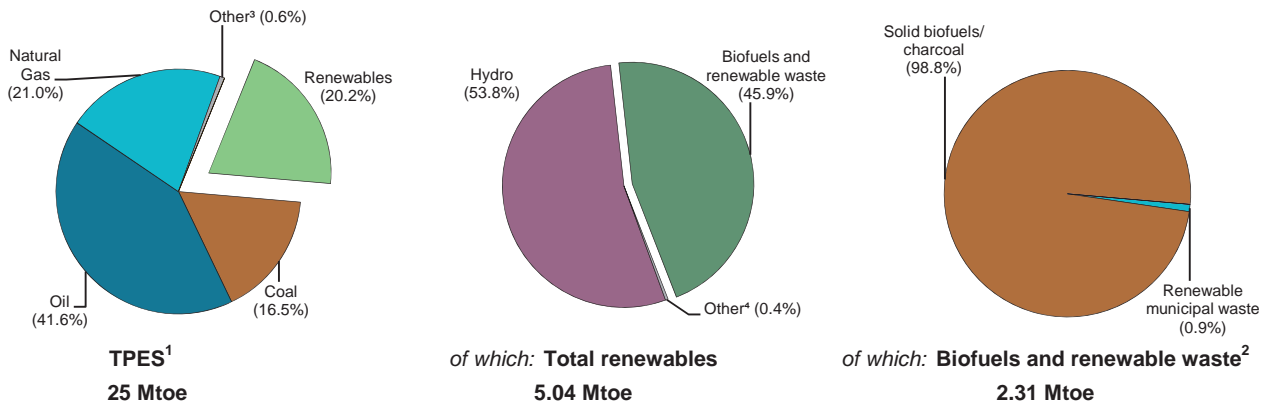


Figure 2. Contribution of renewables in 2017 provisional

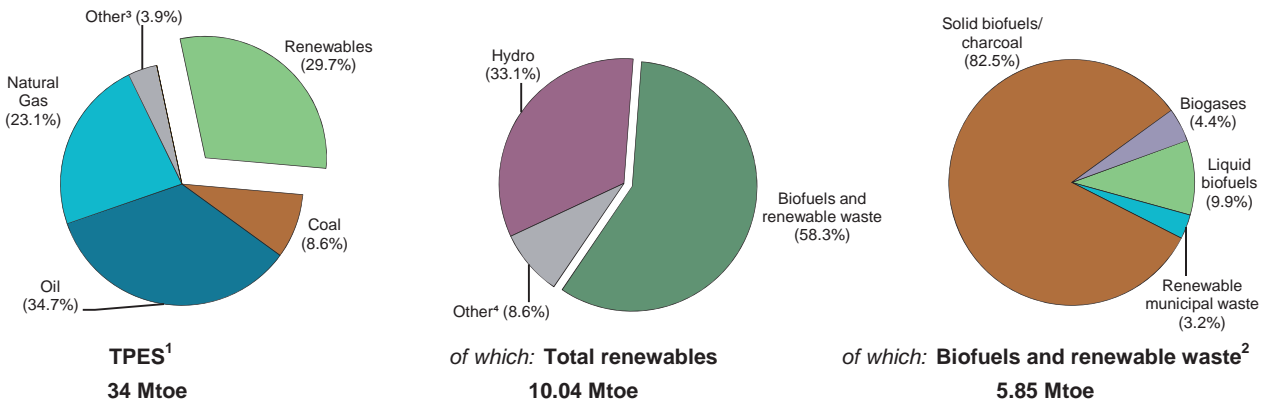
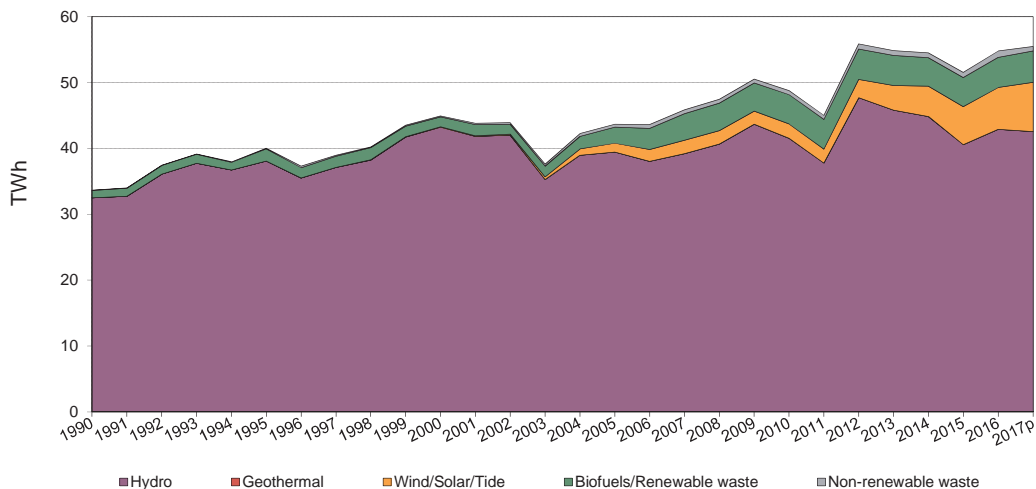


Figure 3. Electricity production by renewables and waste energy source



1. Total primary energy supply includes electricity trade.
2. Biofuels and renewable waste include solid biofuels, liquid biofuels, biogases, and renewable municipal waste.
3. Includes non-renewable municipal waste, industrial waste, peat, shale oil, electricity trade, and other sources of primary energy. (In the case of negative values, the net exports of electricity are greater than the other products in this category).
4. Includes geothermal, solar, wind and tide.

Note: Totals may not sum due to rounding.
Source: IEA/OECD World Energy Balances.

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Table 1. Energy supply, GDP and population

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|---|--------|--------|--------|--------|--------|--------|--------|-------------------------------------|
| TPES (Mtoe) | 24.88 | 28.61 | 33.65 | 32.18 | 32.93 | 33.32 | 33.79 | 1.0 |
| of which: Renewables (Mtoe) ¹ | 5.04 | 6.57 | 9.02 | 9.74 | 9.74 | 10.05 | 10.04 | 2.5 |
| Renewables/TPES(%) | 20.2 | 23.0 | 26.8 | 30.3 | 29.6 | 30.2 | 29.7 | 1.5 |
| GDP (billion 2010 US dollars) | 260.20 | 336.50 | 391.89 | 409.56 | 414.03 | 420.04 | 432.79 | 1.5 |
| TPES/GDP ² | 0.10 | 0.09 | 0.09 | 0.08 | 0.08 | 0.08 | 0.08 | -0.5 |
| TPES/GDP (year 2010 = 100) | 111 | 99 | 100 | 92 | 93 | 92 | 91 | -0.5 |
| Population (millions) | 7.68 | 8.01 | 8.36 | 8.54 | 8.63 | 8.74 | 8.80 | 0.6 |
| TPES/population (toe per capita) | 3.24 | 3.57 | 4.02 | 3.77 | 3.82 | 3.81 | 3.84 | 0.4 |
| Electricity generation (TWh) ³ | 49.3 | 59.9 | 67.9 | 61.6 | 61.8 | 65.3 | 67.5 | 0.7 |
| of which: Renewables (TWh) ^{1,3} | 32.64 | 43.44 | 44.98 | 49.98 | 47.24 | 50.77 | 50.91 | 0.9 |
| Renew./Total Elec.(%) ^{1,4} | 66.2 | 72.5 | 66.2 | 81.1 | 76.5 | 77.8 | 75.5 | 0.2 |
| Road energy consumption (Mtoe) | 4.4 | 5.9 | 7.6 | 7.6 | 7.8 | 8.0 | .. | .. |
| of which: Liquid biofuels (Mtoe) | 0.01 | 0.02 | 0.49 | 0.59 | 0.64 | 0.53 | .. | .. |
| Liq. biofuels/road tr.(%) ⁵ | 0.1 | 0.3 | 6.5 | 7.7 | 8.2 | 6.6 | - | - |

1. Renewables do not include industrial waste, non-renewable municipal waste and pumped storage production.

2. In units of toe per thousand 2010 US dollars.

3. Electricity generation = gross production - amount of electricity produced in pumped storage plants.

4. Electricity share generated from renewables over the total electricity production.

5. Energy from liquid biofuels consumed in road transport over the total energy consumed in road transport.

Source: IEA/OECD World Energy Balances and OECD Main Economic Indicators.

Table 2. Net generating capacity of renewable and waste sources (MWe)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | Average annual percent change 00-16 |
|---|--------------|--------------|--------------|--------------|--------------|--------------|-------------------------------------|
| Total capacity | 11392 | 12555 | 16557 | 18301 | 19016 | 19614 | 2.8 |
| Hydro | 10947 | 11613 | 12706 | 13293 | 13351 | 13689 | 1.0 |
| Hydro <1MW | - | 265 | 357 | 408 | 353 | 396 | 2.5 |
| Hydro 1-10MW | - | 542 | 762 | 902 | 927 | 936 | 3.5 |
| Hydro 10+MW | - | 6869 | 6794 | 6772 | 6840 | 7126 | 0.2 |
| Mixed plants | 3919 | 3937 | 4793 | 5211 | 5231 | 5231 | 1.8 |
| Pure pumped storage | - | - | - | - | - | - | - |
| Geothermal | - | - | 1 | 1 | 1 | 1 | - |
| Solar photovoltaic | - | 5 | 154 | 785 | 937 | 1096 | 40.1 |
| Solar thermal | - | - | - | - | - | - | - |
| Tide, wave, ocean | - | - | - | - | - | - | - |
| Wind | - | 50 | 981 | 2110 | 2489 | 2730 | 28.4 |
| Industrial waste | 39 | 71 | 302 | 436 | 480 | 436 | 12.0 |
| Municipal waste | 6 | 12 | 479 | 524 | 570 | 542 | 26.9 |
| Solid biofuels | 400 | 780 | 1589 | 959 | 993 | 917 | 1.0 |
| Biogases | - | 24 | 330 | 192 | 194 | 202 | 14.2 |
| Liquid biofuels | - | - | 15 | 1 | 1 | 1 | - |
| Solar collectors surface (1000 m ²) | 461 | 2202 | 4441 | 5165 | 5221 | 5210 | 5.5 |
| Cap. of solar collectors (MW _{th}) ¹ | 323 | 1541 | 3109 | 3616 | 3655 | 3647 | 5.5 |

1. Converted at 0.7 kW_{th}/m² of solar collector area, as estimated by the IEA Solar Heating & Cooling Programme.

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Table 3. Capacity factors (%)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 |
|--|--------------|--------------|--------------|--------------|--------------|--------------|
| Total plants¹ | 33.76 | 40.86 | 33.63 | 34.00 | 30.95 | 31.89 |
| Hydro | 33.90 | 42.48 | 37.34 | 38.50 | 34.71 | 35.79 |
| <i>of which: <1MW</i> | - | 40.89 | 51.94 | 56.28 | 56.30 | 56.25 |
| <i>of which: 1-10MW</i> | - | 62.21 | 50.12 | 53.33 | 45.47 | 49.78 |
| <i>of which: 10+MW</i> | - | 62.01 | 56.11 | 58.64 | 52.78 | 54.15 |
| <i>of which: pure pumped storage²</i> | x | x | x | x | x | x |
| Geothermal | - | - | 15.96 | 4.38 | 0.70 | 0.24 |
| Solar photovoltaic | - | 7.37 | 6.58 | 11.42 | 11.42 | 11.42 |
| Solar thermal | - | - | - | - | - | - |
| Tide, wave and ocean | - | - | - | - | - | - |
| Wind | - | 15.24 | 24.02 | 20.81 | 22.20 | 21.89 |
| Industrial waste | 11.16 | 10.94 | 11.51 | 7.51 | 8.36 | 13.73 |
| Municipal waste | 50.48 | 86.51 | 12.31 | 15.16 | 14.38 | 14.32 |
| Solid biofuels | 31.84 | 21.00 | 25.66 | 40.95 | 40.20 | 45.87 |
| Biogases | - | 29.01 | 22.35 | 36.76 | 36.72 | 36.56 |
| Biodiesels | - | - | - | - | - | - |
| Other liquid biofuels | - | - | 23.13 | 1.53 | 1.61 | 8.58 |

1. The capacity factor is defined as: the annual gross electricity generation divided by the reported net capacity times 365 (days/year) times 24 (hours/day).

2. In case a country has at least one mixed hydro plants, it is impossible to calculate capacity factor thus it is shown as 'not applicable'.

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Table 4. Gross electricity production from renewable and waste sources (GWh)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|--------------------------------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|---|
| Total electricity¹ | 33687 | 44946 | 48782 | 54508 | 51559 | 54786 | 55501 | 1.2 |
| Hydro | 32507 | 43219 | 41558 | 44836 | 40592 | 42919 | 42572 | -0.1 |
| <i>of which: pumped storage</i> | 998 | 1383 | 3195 | 3826 | 3536 | 3081 | 3882 | 6.3 |
| Geothermal | - | - | 1 | - | - | - | - | - |
| Solar photovoltaic | - | 3 | 89 | 785 | 937 | 1096 | 1248 | 42.6 |
| Solar thermal | - | - | - | - | - | - | - | - |
| Tide, wave, ocean | - | - | - | - | - | - | - | - |
| Wind | - | 67 | 2064 | 3846 | 4840 | 5235 | 6234 | 30.6 |
| Industrial waste | 38 | 69 | 304 | 288 | 351 | 524 | 389 | 10.7 |
| Municipal waste renew. | 10 | 32 | 214 | 276 | 289 | 271 | 477 | 17.2 |
| Municipal waste non-renew. | 16 | 59 | 303 | 418 | 429 | 409 | 318 | 10.4 |
| Solid biofuels | 1116 | 1436 | 3572 | 3441 | 3497 | 3684 | 3638 | 5.6 |
| Biogases | - | 61 | 647 | 618 | 624 | 647 | 625 | 14.7 |
| Liquid biofuels | - | - | 30 | - | - | 1 | .. | .. |
| of which: | | | | | | | | |
| Electricity only plants | 33040 | 43784 | 45942 | 51808 | 48845 | 51416 | .. | - |
| Hydro | 32507 | 43219 | 41558 | 44836 | 40592 | 42919 | .. | - |
| <i>of which: pumped storage</i> | 998 | 1383 | 3195 | 3826 | 3536 | 3081 | .. | - |
| Geothermal | - | - | 1 | - | - | - | - | - |
| Solar photovoltaic | - | 3 | 89 | 785 | 937 | 1096 | .. | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Tide, wave, ocean | - | - | - | - | - | - | - | - |
| Wind | - | 67 | 2064 | 3846 | 4840 | 5235 | .. | - |
| Industrial waste | - | 41 | 76 | 76 | 76 | 208 | .. | - |
| Municipal waste renew. | - | 17 | 155 | 237 | 239 | 191 | .. | - |
| Municipal waste non-renew. | - | 28 | 207 | 355 | 349 | 280 | .. | - |
| Solid biofuels | 533 | 363 | 1187 | 1109 | 1232 | 895 | .. | - |
| Biogases | - | 46 | 595 | 564 | 580 | 591 | .. | - |
| Liquid biofuels | - | - | 10 | - | - | 1 | .. | .. |
| CHP plants | 647 | 1162 | 2840 | 2700 | 2714 | 3370 | .. | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Industrial waste | 38 | 28 | 228 | 212 | 275 | 316 | .. | - |
| Municipal waste renew. | 10 | 15 | 59 | 39 | 50 | 80 | .. | - |
| Municipal waste non-renew. | 16 | 31 | 96 | 63 | 80 | 129 | .. | - |
| Solid biofuels | 583 | 1073 | 2385 | 2332 | 2265 | 2789 | .. | - |
| Biogases | - | 15 | 52 | 54 | 44 | 56 | .. | - |
| Liquid biofuels | - | - | 20 | - | - | - | - | - |

1. **Total electricity** includes the electricity produced from industrial waste, non-renewable municipal waste and pumped storage. Electricity from renewable sources does *not* include the electricity produced from industrial waste, non-renewable municipal waste and pumped storage production.

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Table 5A. Heat production¹ from renewable and waste sources in the transformation sector (TJ)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|----------------------------|-------------|--------------|--------------|--------------|--------------|--------------|--------------|--|
| Total heat | 3939 | 10204 | 40200 | 42756 | 44543 | 46519 | 47861 | 9.5 |
| Geothermal | - | 416 | 538 | 519 | 578 | 556 | 535 | 1.5 |
| Solar thermal | - | - | 43 | 70 | 70 | 70 | 70 | - |
| Industrial waste | 749 | 642 | 1225 | 2168 | 2270 | 2955 | 1878 | 6.5 |
| Municipal waste renew. | 679 | 1048 | 2034 | 2133 | 2381 | 2414 | 2749 | 5.8 |
| Municipal waste non-renew. | 1107 | 1723 | 3266 | 3414 | 3800 | 3853 | 4382 | 5.6 |
| Solid biofuels | 1404 | 6375 | 32616 | 34223 | 35276 | 36425 | 38078 | 11.1 |
| Biogases | - | - | 307 | 209 | 145 | 224 | 169 | - |
| Liquid biofuels | - | - | 171 | 20 | 23 | 22 | .. | .. |
| <i>of which:</i> | | | | | | | | |
| CHP plants | 2094 | 3166 | 20623 | 19727 | 21420 | 21770 | .. | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | 749 | 642 | 1093 | 2051 | 2148 | 2840 | .. | - |
| Municipal waste renew. | 511 | 606 | 1474 | 1524 | 1811 | 1842 | .. | - |
| Municipal waste non-renew. | 834 | 989 | 2352 | 2421 | 2871 | 2920 | .. | - |
| Solid biofuels | - | 929 | 15298 | 13592 | 14513 | 14012 | .. | - |
| Biogases | - | - | 235 | 139 | 77 | 156 | .. | - |
| Liquid biofuels | - | - | 171 | - | - | - | .. | .. |
| Heat only plants | 1845 | 7038 | 19577 | 23029 | 23123 | 24749 | .. | - |
| Geothermal | - | 416 | 538 | 519 | 578 | 556 | .. | - |
| Solar thermal | - | - | 43 | 70 | 70 | 70 | .. | - |
| Industrial waste | - | - | 132 | 117 | 122 | 115 | .. | - |
| Municipal waste renew. | 168 | 442 | 560 | 609 | 570 | 572 | .. | - |
| Municipal waste non-renew. | 273 | 734 | 914 | 993 | 929 | 933 | .. | - |
| Solid biofuels | 1404 | 5446 | 17318 | 20631 | 20763 | 22413 | .. | - |
| Biogases | - | - | 72 | 70 | 68 | 68 | .. | - |
| Liquid biofuels | - | - | - | 20 | 23 | 22 | .. | - |

1. Waste heat and heat production from heat pumps are not included and are reported separately in Table 5B.

Table 5B. Heat production from heat pumps and waste heat (TJ)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|----------------------------|----------|----------|----------|----------|----------|----------|----------|--|
| Total heat | - | - | - | - | - | - | - | - |
| Heat pumps ¹ | - | - | - | - | - | - | - | - |
| (-) Input to heat pumps | - | - | - | - | - | - | - | - |
| Other sources ² | - | - | - | - | - | - | - | - |

1. Installations producing heat for own use are not included.

2. Refers to production from hydrogen, purchased steam from industry, and waste heat.

Source: IEA/OECD *Electricity Statistics*.

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Table 6. Renewable and waste balance for 2016

| thousand tonnes of oil equivalent | Hydro ¹ | Wind | Tide wave ocean | Solar PV | Geo-thermal | Solar thermal | Industrial waste | Mun. waste renew. |
|------------------------------------|--------------------|-------------|-----------------|-------------|-------------|---------------|------------------|-------------------|
| Production | 3425 | 450 | - | 94 | 34 | 185 | 551 | 175 |
| Imports | - | - | - | - | - | - | - | - |
| Exports | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| TPES | 3425 | 450 | - | 94 | 34 | 185 | 551 | 175 |
| Statistical differences | - | - | - | - | - | - | - | - |
| Main activity electricity plants | -3380 | -450 | - | -94 | - | - | -31 | -46 |
| Autoproducer electricity plants | -45 | - | - | - | - | - | -45 | -45 |
| Main activity CHP plants | - | - | - | - | - | - | -93 | -32 |
| Autoproducer CHP plants | - | - | - | - | - | - | -34 | -33 |
| Main heat plants | - | - | - | - | -24 | -2 | - | -19 |
| Autoproducer heat plants | - | - | - | - | -2 | - | -4 | - |
| Charcoal production plants | - | - | - | - | - | - | - | - |
| Other transformation | - | - | - | - | - | - | - | - |
| Energy Industry own use | - | - | - | - | - | - | -43 | - |
| Losses | - | - | - | - | - | - | - | - |
| TFC | - | - | - | - | 7 | 183 | 301 | - |
| Industry | - | - | - | - | - | - | 300 | - |
| Iron and steel | - | - | - | - | - | - | - | - |
| Chemical and petrochemical | - | - | - | - | - | - | 77 | - |
| Non-ferrous metals | - | - | - | - | - | - | 4 | - |
| Non-metallc minerals | - | - | - | - | - | - | 179 | - |
| Transport equipment | - | - | - | - | - | - | - | - |
| Machinery | - | - | - | - | - | - | - | - |
| Mining and quarrying | - | - | - | - | - | - | - | - |
| Food and tobacco | - | - | - | - | - | - | - | - |
| Paper, pulp and print | - | - | - | - | - | - | 2 | - |
| Wood and wood products | - | - | - | - | - | - | 36 | - |
| Construction | - | - | - | - | - | - | 1 | - |
| Textile and leather | - | - | - | - | - | - | - | - |
| Non-specified | - | - | - | - | - | - | 1 | - |
| Transport | - | - | - | - | - | - | - | - |
| Road | - | - | - | - | - | - | - | - |
| Other | - | - | - | - | - | - | - | - |
| Other | - | - | - | - | 7 | 183 | 1 | - |
| Residential | - | - | - | - | - | 137 | - | - |
| Commercial and public services | - | - | - | - | 7 | 43 | 1 | - |
| Agriculture/forestry | - | - | - | - | - | 3 | - | - |
| Fishing | - | - | - | - | - | - | - | - |
| Non-specified | - | - | - | - | - | - | - | - |
| Electricity generated - GWh | 39838 | 5235 | - | 1096 | - | - | 524 | 271 |
| <i>Electricity plants</i> | 39838 | 5235 | - | 1096 | - | - | 208 | 191 |
| <i>CHP plants</i> | - | - | - | - | - | - | 316 | 80 |
| Heat generated - TJ | - | - | - | - | 556 | 70 | 2955 | 2414 |
| <i>CHP plants</i> | - | - | - | - | - | - | 2840 | 1842 |
| <i>Heat plants</i> | - | - | - | - | 556 | 70 | 115 | 572 |

1. Hydro does not include pumped hydro.

Source: IEA/OECD *World Energy Balances*.

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Table 6. Renewable and waste balance for 2016 (continued)

| Mun. waste non-ren. | Wood/ wood waste | Charcoal | Bio-gases | Bio-gasoline | Bio-diesel | Other liquid biofuels | Total renew. & waste sources ² | Share in total energy sources ³ |
|---------------------|------------------|-----------|------------|--------------|------------|-----------------------|---|--|
| 268 | 4698 | - | 313 | 139 | 255 | 1 | 10588 | 85.6% |
| - | 362 | 11 | - | 52 | 445 | - | 870 | 2.7% |
| - | -270 | -1 | - | -133 | -183 | - | -587 | 5.6% |
| - | 2 | - | - | -1 | -4 | - | -3 | x |
| 268 | 4792 | 10 | 313 | 58 | 513 | 1 | 10869 | 32.6% |
| - | - | - | - | -1 | -2 | - | -3 | x |
| -74 | -157 | - | -231 | - | - | - | -4463 | x |
| -60 | -33 | - | -9 | - | - | - | -237 | x |
| -51 | -364 | - | -8 | - | - | - | -548 | x |
| -52 | -363 | - | -5 | - | - | - | -487 | x |
| -31 | -654 | - | -2 | - | - | -1 | -733 | x |
| - | -2 | - | - | - | - | - | -8 | x |
| - | -3 | 1 | - | - | - | - | -2 | x |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | -43 | x |
| - | - | - | - | - | - | - | - | - |
| - | 3215 | 11 | 59 | 57 | 511 | - | 4344 | 15.6% |
| - | 1366 | - | 48 | - | 20 | - | 1734 | 22.1% |
| - | - | - | 1 | - | - | - | 1 | 0.1% |
| - | 30 | - | 16 | - | - | - | 123 | 12.9% |
| - | 1 | - | - | - | - | - | 5 | 2.0% |
| - | 90 | - | 1 | - | - | - | 270 | 28.2% |
| - | 1 | - | - | - | - | - | 1 | 0.9% |
| - | 7 | - | 1 | - | - | - | 8 | 1.3% |
| - | - | - | - | - | - | - | - | - |
| - | 150 | - | 7 | - | - | - | 157 | 19.5% |
| - | 719 | - | 21 | - | - | - | 742 | 44.0% |
| - | 332 | - | - | - | - | - | 368 | 54.5% |
| - | 25 | - | - | - | 20 | - | 46 | 8.5% |
| - | - | - | - | - | - | - | - | - |
| - | 10 | - | - | - | - | - | 11 | 5.9% |
| - | - | - | 1 | 57 | 475 | - | 533 | 6.2% |
| - | - | - | - | 57 | 472 | - | 529 | 6.6% |
| - | - | - | 1 | - | 3 | - | 4 | 0.7% |
| - | 1849 | 11 | 10 | - | 17 | - | 2078 | 21.9% |
| - | 1587 | 7 | 2 | - | - | - | 1733 | 27.4% |
| - | 106 | 4 | 8 | - | 3 | - | 172 | 6.5% |
| - | 156 | - | - | - | 14 | - | 173 | 33.2% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| 409 | 3684 | - | 647 | - | - | 1 | 51705 | 79.2% |
| 280 | 895 | - | 591 | - | - | 1 | 48335 | 88.1% |
| 129 | 2789 | - | 56 | - | - | - | 3370 | 32.4% |
| 3853 | 36425 | - | 224 | - | - | 22 | 46519 | 53.9% |
| 2920 | 14012 | - | 156 | - | - | - | 21770 | 43.7% |
| 933 | 22413 | - | 68 | - | - | 22 | 24749 | 68.0% |

2. Total includes non-renewable waste.

3. Share of renewables on TFC excludes electricity and heat generated from renewable sources.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|--|------|------|-------|-------|-------|-------|-------|---|
| Geothermal (TJ) | | | | | | | | |
| Production | 151 | 1037 | 1446 | 1320 | 1459 | 1412 | 1386 | 1.9 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 151 | 1037 | 1446 | 1320 | 1459 | 1412 | 1386 | 1.9 |
| Statistical differences | - | - | - | - | - | - | .. | .. |
| Transformation processes | - | 831 | 1125 | 1053 | 1158 | 1112 | .. | 1.8 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | .. |
| Final energy consumption | 151 | 206 | 321 | 267 | 301 | 300 | .. | 2.4 |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 151 | 206 | 321 | 267 | 301 | 300 | .. | 2.4 |
| Solar thermal (TJ) | | | | | | | | |
| Production | 621 | 2611 | 6903 | 7636 | 7742 | 7741 | 7695 | 7.0 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 621 | 2611 | 6903 | 7636 | 7742 | 7741 | 7695 | 7.0 |
| Statistical differences | - | - | - | - | - | - | .. | .. |
| Transformation processes | - | - | 48 | 77 | 77 | 77 | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | .. |
| Final energy consumption | 621 | 2611 | 6855 | 7559 | 7665 | 7664 | .. | 7.0 |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 621 | 2611 | 6855 | 7559 | 7665 | 7664 | .. | 7.0 |
| Industrial waste (TJ) | | | | | | | | |
| Production | 6576 | 7630 | 17352 | 19321 | 20114 | 23090 | 19597 | 7.2 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 6576 | 7630 | 17352 | 19321 | 20114 | 23090 | 19597 | 7.2 |
| Statistical differences | - | - | -327 | - | - | -1 | .. | .. |
| Transformation processes | 2542 | 1455 | 5590 | 5473 | 5900 | 8670 | .. | 11.8 |
| Energy industry own use | - | - | 2324 | 2007 | 1865 | 1818 | .. | - |
| Losses | - | - | - | - | - | - | .. | .. |
| Final energy consumption | 4034 | 6175 | 9111 | 11841 | 12349 | 12601 | .. | 4.6 |
| <i>Industry</i> | 2924 | 5614 | 9064 | 11809 | 12312 | 12563 | .. | 5.2 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 1110 | 561 | 47 | 32 | 37 | 38 | .. | -15.5 |
| Municipal waste - renewables (TJ) | | | | | | | | |
| Production | 917 | 1765 | 5759 | 7332 | 7627 | 7316 | 7408 | 9.3 |
| Net imports ¹ | - | - | - | - | - | - | 419 | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 917 | 1765 | 5759 | 7332 | 7627 | 7316 | 7827 | 9.3 |
| Statistical differences | - | - | - | - | - | - | .. | .. |
| Transformation processes | 917 | 1765 | 5759 | 7332 | 7627 | 7316 | .. | 9.3 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | .. |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics (continued)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|--|-------|--------|--------|--------|--------|--------|--------|--|
| Municipal waste - non-renewables (TJ) | | | | | | | | |
| Production | 1497 | 2879 | 8622 | 11373 | 11719 | 11214 | 11348 | 8.9 |
| Net imports ¹ | - | - | - | - | - | - | 675 | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 1497 | 2879 | 8622 | 11373 | 11719 | 11214 | 12023 | 8.9 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | 1497 | 2879 | 8622 | 11373 | 11719 | 11214 | .. | 8.9 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Solid Biofuel excluding charcoal (TJ) | | | | | | | | |
| Production | 93544 | 118395 | 180892 | 179251 | 188412 | 196710 | 199953 | 3.2 |
| Net imports ¹ | 2325 | -1746 | 6773 | 9321 | 6564 | 3837 | 2888 | - |
| Stock changes | -545 | - | 299 | -4 | 280 | 87 | -1107 | - |
| Gross consumption | 95324 | 116649 | 187964 | 188568 | 195256 | 200634 | 201734 | 3.4 |
| Statistical differences | - | - | 3 | 1 | -2 | - | .. | - |
| Transformation processes | 8446 | 20199 | 67106 | 68282 | 70359 | 66026 | .. | 7.7 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 86878 | 96450 | 120861 | 120287 | 124895 | 134608 | .. | 2.1 |
| <i>Industry</i> | 22631 | 29009 | 47359 | 50002 | 48652 | 57187 | .. | 4.3 |
| <i>Transport</i> | 1 | - | - | - | - | - | .. | - |
| <i>Other</i> | 64246 | 67441 | 73502 | 70285 | 76243 | 77421 | .. | 0.9 |
| Charcoal (kt) | | | | | | | | |
| Production | - | - | 1 | 1 | 1 | 2 | 1 | - |
| Net imports ¹ | 7 | 10 | 11 | 11 | 14 | 14 | 12 | 2.1 |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 7 | 10 | 12 | 12 | 15 | 16 | 13 | 3.0 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 7 | 10 | 12 | 12 | 15 | 16 | .. | 3.0 |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 7 | 10 | 12 | 12 | 15 | 16 | .. | 3.0 |
| Biogases (TJ) | | | | | | | | |
| Production | - | 1275 | 6418 | 12234 | 12561 | 13109 | 10823 | 15.7 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | 1275 | 6418 | 12234 | 12561 | 13109 | 10823 | 15.7 |
| Statistical differences | - | - | - | - | - | -1 | .. | - |
| Transformation processes | - | 771 | 5750 | 10397 | 10637 | 10636 | .. | 17.8 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | 504 | 668 | 1837 | 1924 | 2472 | .. | 10.4 |
| <i>Industry</i> | - | 504 | 638 | 1439 | 1493 | 2006 | .. | 9.0 |
| <i>Transport</i> | - | - | 1 | 34 | 35 | 38 | .. | - |
| <i>Other</i> | - | - | 29 | 364 | 396 | 428 | .. | - |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics (continued)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|-----------------------------------|------|------|------|------|------|------|-------|---|
| Biogasoline (kt) | | | | | | | | |
| Production | - | - | 82 | 207 | 210 | 212 | 211 | - |
| Net imports ¹ | - | - | 22 | -122 | -120 | -123 | -126 | - |
| Stock changes | - | - | 3 | 4 | - | -1 | -1 | |
| Gross consumption | - | - | 107 | 89 | 90 | 88 | 84 | - |
| Statistical differences | - | - | - | -1 | - | -1 | .. | |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | |
| Final energy consumption | - | - | 107 | 88 | 90 | 87 | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | 107 | 88 | 90 | 87 | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Biodiesel (kt) | | | | | | | | |
| Production | 7 | 20 | 277 | 262 | 343 | 287 | 336 | 18.1 |
| Net imports ¹ | - | - | 238 | 373 | 356 | 295 | 256 | - |
| Stock changes | - | - | 4 | -3 | 4 | -5 | -7 | |
| Gross consumption | 7 | 20 | 519 | 632 | 703 | 577 | 585 | 23.4 |
| Statistical differences | 1 | - | - | 1 | - | -2 | .. | |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | |
| Final energy consumption | 8 | 20 | 519 | 633 | 703 | 575 | .. | 23.4 |
| <i>Industry</i> | - | - | 21 | 22 | 23 | 22 | .. | - |
| <i>Transport</i> | 7 | 18 | 477 | 592 | 661 | 534 | .. | 23.6 |
| <i>Other</i> | 1 | 2 | 21 | 19 | 19 | 19 | .. | 15.1 |
| Other liquid biofuels (kt) | | | | | | | | |
| Production | - | - | 15 | 1 | 1 | 1 | 1 | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | |
| Gross consumption | - | - | 15 | 1 | 1 | 1 | 1 | - |
| Statistical differences | - | - | 1 | - | - | - | .. | |
| Transformation processes | - | - | 16 | 1 | 1 | 1 | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Figure 1. Contribution of renewables in 1990

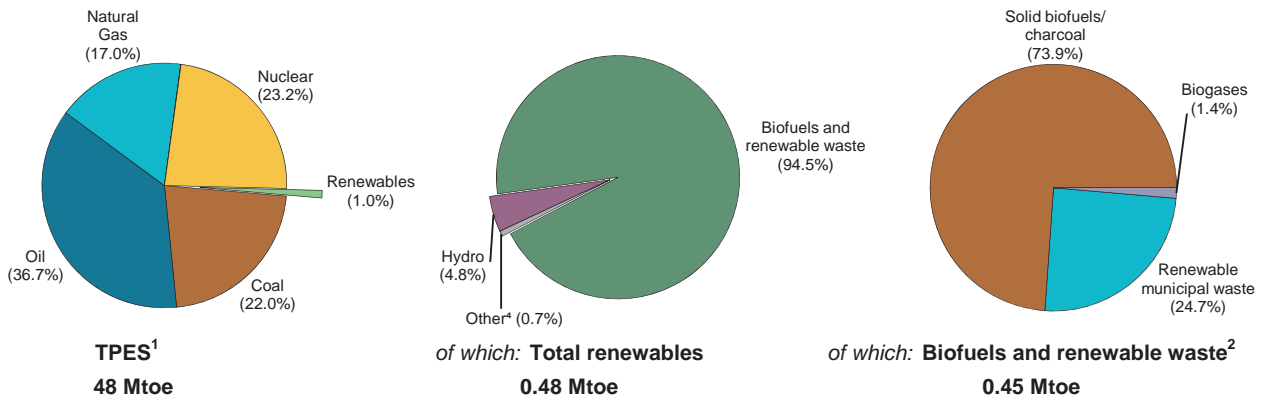


Figure 2. Contribution of renewables in 2017 provisional

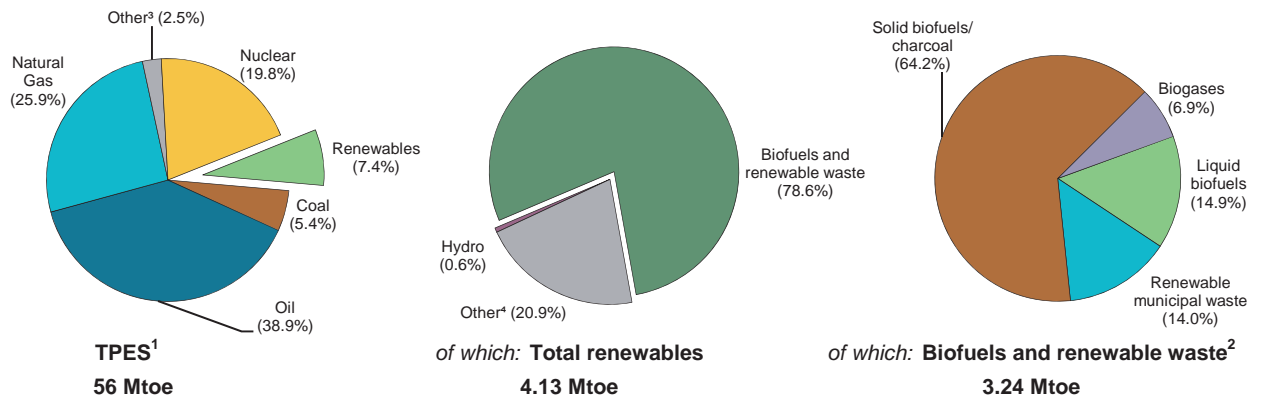
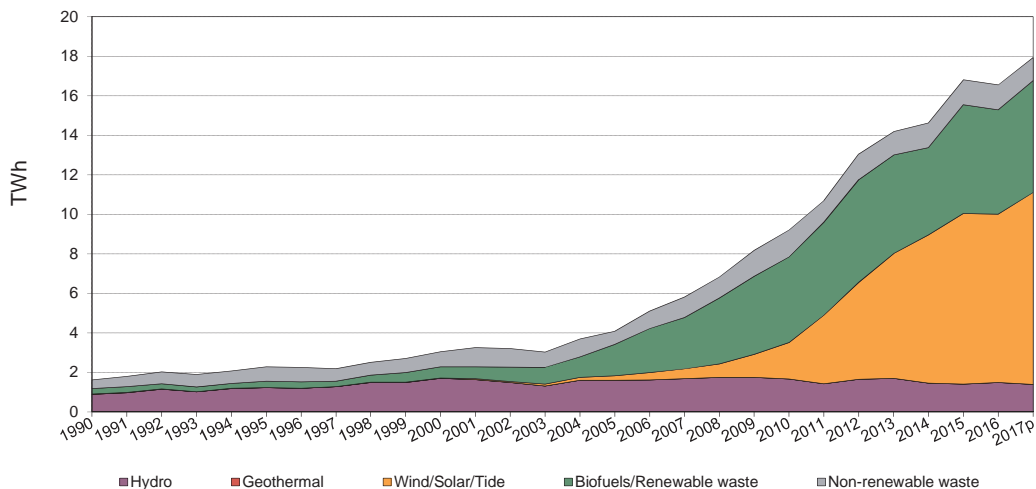


Figure 3. Electricity production by renewables and waste energy source



1. Total primary energy supply includes electricity trade.
 2. Biofuels and renewable waste include solid biofuels, liquid biofuels, biogases, and renewable municipal waste.
 3. Includes non-renewable municipal waste, industrial waste, peat, shale oil, electricity trade, and other sources of primary energy. (In the case of negative values, the net exports of electricity are greater than the other products in this category).
 4. Includes geothermal, solar, wind and tide.

Note: Totals may not sum due to rounding.
Source: IEA/OECD World Energy Balances.

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Table 1. Energy supply, GDP and population

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|---|--------|--------|--------|--------|--------|--------|--------|--|
| TPES (Mtoe) | 47.94 | 58.09 | 60.12 | 52.95 | 53.31 | 56.52 | 55.56 | -0.3 |
| of which: Renewables (Mtoe) ¹ | 0.48 | 0.64 | 2.83 | 3.40 | 3.66 | 3.92 | 4.13 | 11.6 |
| Renewables/TPES(%) | 1.0 | 1.1 | 4.7 | 6.4 | 6.9 | 6.9 | 7.4 | 11.9 |
| GDP (billion 2010 US dollars) | 329.97 | 411.80 | 483.55 | 500.78 | 507.93 | 515.10 | 524.01 | 1.4 |
| TPES/GDP ² | 0.15 | 0.14 | 0.12 | 0.11 | 0.10 | 0.11 | 0.11 | -1.7 |
| TPES/GDP (year 2010 = 100) | 117 | 113 | 100 | 85 | 84 | 88 | 85 | -1.7 |
| Population (millions) | 9.97 | 10.25 | 10.90 | 11.18 | 11.24 | 11.30 | 11.35 | 0.6 |
| TPES/population (toe per capita) | 4.81 | 5.67 | 5.52 | 4.74 | 4.74 | 5.00 | 4.90 | -0.9 |
| Electricity generation (TWh) ³ | 70.3 | 82.8 | 93.8 | 71.5 | 68.7 | 84.4 | 85.1 | 0.2 |
| of which: Renewables (TWh) ^{1,3} | 0.56 | 1.04 | 6.49 | 12.21 | 14.45 | 14.17 | 15.64 | 17.3 |
| Renew./Total Elec.(%) ^{1,4} | 0.8 | 1.3 | 6.9 | 17.1 | 21.0 | 16.8 | 18.4 | 17.1 |
| Road energy consumption (Mtoe) | 6.5 | 7.7 | 8.5 | 8.2 | 8.6 | 8.7 | .. | .. |
| of which: Liquid biofuels (Mtoe) | - | - | 0.37 | 0.42 | 0.26 | 0.44 | .. | .. |
| Liq. biofuels/road tr.(%) ⁵ | - | - | 4.3 | 5.1 | 3.0 | 5.1 | - | - |

1. Renewables do not include industrial waste, non-renewable municipal waste and pumped storage production.

2. In units of toe per thousand 2010 US dollars.

3. Electricity generation = gross production - amount of electricity produced in pumped storage plants.

4. Electricity share generated from renewables over the total electricity production.

5. Energy from liquid biofuels consumed in road transport over the total energy consumed in road transport.

Source: IEA/OECD *World Energy Balances* and OECD *Main Economic Indicators*.

Table 2. Net generating capacity of renewable and waste sources (MWe)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | Average annual percent change 00-16 |
|---|---------------|---------------|-------------|-------------|-------------|-------------|--|
| Total capacity | 1605 e | 1730 e | 4482 | 7498 | 7860 | 8210 | 10.2 |
| Hydro | 1401 | 1413 | 1425 | 1431 | 1422 | 1425 | 0.1 |
| Hydro <1MW | 6 | 6 | 9 | 11 | 11 | 11 | 3.9 |
| Hydro 1-10MW | 49 | 54 | 54 | 55 | 55 | 58 | 0.4 |
| Hydro 10+MW | 39 | 43 | 55 | 55 | 46 | 46 | 0.4 |
| Mixed plants | - | - | - | - | - | - | - |
| Pure pumped storage | 1307 | 1310 | 1307 | 1310 | 1310 | 1310 | - |
| Geothermal | - | - | - | - | - | - | - |
| Solar photovoltaic | - | - | 904 | 3027 | 3122 | 3300 | - |
| Solar thermal | - | - | - | - | - | - | - |
| Tide, wave, ocean | - | - | - | - | - | - | - |
| Wind | 5 | 14 | 912 | 1944 | 2176 | 2370 | 37.8 |
| Industrial waste | 120 e | 139 | 111 | 74 | 71 | 73 | -3.9 |
| Municipal waste | 52 e | 97 | 253 | 247 | 248 | 249 | 6.1 |
| Solid biofuels | 26 e | 47 | 640 | 553 | 588 | 561 | 16.8 |
| Biogases | 1 e | 20 e | 115 | 172 | 183 | 186 | 15.0 |
| Liquid biofuels | - | - | 122 | 50 | 50 | 46 | - |
| Solar collectors surface (1000 m ²) | 34 | 41 | 371 | 615 | 661 | 705 | 19.5 |
| Cap. of solar collectors (MW _{th}) ¹ | 24 | 29 | 260 | 431 | 463 | 494 | 19.4 |

1. Converted at 0.7 kW_{th}/m² of solar collector area, as estimated by the IEA Solar Heating & Cooling Programme.

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Table 3. Capacity factors (%)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 |
|--|----------------|----------------|--------------|--------------|--------------|--------------|
| Total plants¹ | 11.57 e | 20.13 e | 23.46 | 22.28 | 24.41 | 23.01 |
| Hydro | 7.31 | 13.73 | 13.36 | 11.66 | 11.39 | 11.93 |
| <i>of which: <1MW</i> | - | 36.15 | 28.37 | 24.38 | 27.67 | 31.22 |
| <i>of which: 1-10MW</i> | - | 49.89 | 34.35 | 35.04 | 32.92 | 37.75 |
| <i>of which: 10+MW</i> | - | 54.42 | 26.30 | 20.73 | 33.03 | 36.70 |
| <i>of which: pure pumped storage²</i> | 5.51 | 10.80 | 11.85 | 10.19 | 9.59 | 9.75 |
| Geothermal | - | - | - | - | - | - |
| Solar photovoltaic | - | - | 7.08 | 10.87 | 11.16 | 10.68 |
| Solar thermal | - | - | - | - | - | - |
| Tide, wave and ocean | - | - | - | - | - | - |
| Wind | 15.98 | 13.05 | 16.18 | 27.10 | 29.24 | 26.18 |
| Industrial waste | 21.97 e | 31.62 | 52.43 | 63.34 | 66.66 | 68.41 |
| Municipal waste | 76.84 e | 81.09 | 65.00 | 77.30 | 78.61 | 77.56 |
| Solid biofuels | 59.27 e | 39.83 | 51.79 | 54.32 | 69.00 | 68.97 |
| Biogases | 79.91 e | 55.94 e | 56.31 | 57.86 | 59.54 | 60.50 |
| Biodiesels | - | - | - | 11.29 | 14.13 | 16.21 |
| Other liquid biofuels | - | - | 25.14 | 23.30 | 34.14 | 5.14 |

1. The capacity factor is defined as: the annual gross electricity generation divided by the reported net capacity times 365 (days/year) times 24 (hours/day).

2. In case a country has at least one mixed hydro plants, it is impossible to calculate capacity factor thus it is shown as 'not applicable'.

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Table 4. Gross electricity production from renewable and waste sources (GWh)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|--------------------------------------|-------------|-------------|-------------|--------------|--------------|--------------|--------------|---|
| Total electricity¹ | 1627 | 3051 | 9209 | 14633 | 16808 | 16546 | 17931 | 11.0 |
| Hydro | 897 | 1699 | 1668 | 1462 | 1418 | 1489 | 1402 | -1.1 |
| <i>of which: pumped storage</i> | 631 | 1239 | 1356 | 1170 | 1100 | 1119 | 1127 | -0.6 |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar photovoltaic | - | - | 560 | 2883 | 3053 | 3086 | 3046 | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Tide, wave, ocean | - | - | - | - | - | - | - | - |
| Wind | 7 | 16 | 1292 | 4615 | 5574 | 5436 | 6653 | 42.6 |
| Industrial waste | 231 | 385 | 509 | 410 | 415 | 438 | 391 | 0.1 |
| Municipal waste renew. | 140 | 306 | 591 | 833 | 869 | 871 | 1031 | 7.4 |
| Municipal waste non-renew. | 210 | 383 | 850 | 840 | 839 | 821 | 773 | 4.2 |
| Solid biofuels | 135 | 164 | 2904 | 2631 | 3554 | 3389 | 3646 | 20.0 |
| Biogases | 7 | 98 | 566 | 871 | 955 | 986 | 962 | 14.4 |
| Liquid biofuels | - | - | 269 | 88 | 131 | 30 | 27 | - |
| of which: | | | | | | | | |
| Electricity only plants | 1627 | 2533 | 7458 | 11392 | 13396 | 13179 | .. | - |
| Hydro | 897 | 1699 | 1668 | 1462 | 1418 | 1489 | .. | - |
| <i>of which: pumped storage</i> | 631 | 1239 | 1356 | 1170 | 1100 | 1119 | .. | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar photovoltaic | - | - | 560 | 2883 | 3053 | 3086 | .. | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Tide, wave, ocean | - | - | - | - | - | - | - | - |
| Wind | 7 | 16 | 1292 | 4615 | 5574 | 5436 | .. | - |
| Industrial waste | 231 | 72 | 417 | - | - | - | - | - |
| Municipal waste renew. | 140 | 290 | 581 | 368 | 396 | 374 | .. | - |
| Municipal waste non-renew. | 210 | 367 | 839 | 546 | 569 | 543 | .. | - |
| Solid biofuels | 135 | 11 | 1900 | 1388 | 2298 | 2156 | .. | - |
| Biogases | 7 | 78 | 149 | 130 | 88 | 93 | .. | - |
| Liquid biofuels | - | - | 52 | - | - | 2 | .. | - |
| CHP plants | - | 518 | 1751 | 3241 | 3412 | 3367 | .. | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | 313 | 92 | 410 | 415 | 438 | .. | - |
| Municipal waste renew. | - | 16 | 10 | 465 | 473 | 497 | .. | - |
| Municipal waste non-renew. | - | 16 | 11 | 294 | 270 | 278 | .. | - |
| Solid biofuels | - | 153 | 1004 | 1243 | 1256 | 1233 | .. | - |
| Biogases | - | 20 | 417 | 741 | 867 | 893 | .. | - |
| Liquid biofuels | - | - | 217 | 88 | 131 | 28 | .. | - |

1. **Total electricity** includes the electricity produced from industrial waste, non-renewable municipal waste and pumped storage. Electricity from renewable sources does *not* include the electricity produced from industrial waste, non-renewable municipal waste and pumped storage production.

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Table 5A. Heat production¹ from renewable and waste sources in the transformation sector (TJ)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|----------------------------|------------|------------|-------------|-------------|-------------|-------------|-------------|--|
| Total heat | 411 | 885 | 3612 | 4030 | 3684 | 3480 | 3555 | 8.5 |
| Geothermal | 43 | 53 | 90 | 60 | 63 | 66 | 65 | 1.2 |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | 68 | 97 | 329 | 638 | 467 | 512 | 457 | 9.5 |
| Municipal waste renew. | 120 e | 347 | 1223 | 1366 | 1221 | 1124 | 1330 | 8.2 |
| Municipal waste non-renew. | 180 e | 347 | 1336 | 1213 | 1181 | 1068 | 1006 | 6.5 |
| Solid biofuels | - | - | 292 | 311 | 246 | 267 | 287 | - |
| Biogases | - | 41 | 273 | 317 | 388 | 429 | 396 | 14.3 |
| Liquid biofuels | - | - | 69 | 125 | 118 | 14 | 14 | - |
| <i>of which:</i> | | | | | | | | |
| CHP plants | - | 389 | 3522 | 3679 | 3617 | 3414 | .. | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | 78 | 329 | 638 | 467 | 512 | .. | - |
| Municipal waste renew. | - | 135 | 1223 | 1227 | 1219 | 1124 | .. | - |
| Municipal waste non-renew. | - | 135 | 1336 | 1061 | 1179 | 1068 | .. | - |
| Solid biofuels | - | - | 292 | 311 | 246 | 267 | .. | - |
| Biogases | - | 41 | 273 | 317 | 388 | 429 | .. | - |
| Liquid biofuels | - | - | 69 | 125 | 118 | 14 | .. | - |
| Heat only plants | 411 | 496 | 90 | 351 | 67 | 66 | .. | - |
| Geothermal | 43 | 53 | 90 | 60 | 63 | 66 | .. | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | 68 | 19 | - | - | - | - | - | - |
| Municipal waste renew. | 120 e | 212 | - | 139 | 2 | - | - | - |
| Municipal waste non-renew. | 180 e | 212 | - | 152 | 2 | - | - | - |
| Solid biofuels | - | - | - | - | - | - | - | - |
| Biogases | - | - | - | - | - | - | - | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |

1. Waste heat and heat production from heat pumps are not included and are reported separately in Table 5B.

Table 5B. Heat production from heat pumps and waste heat (TJ)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|----------------------------|----------|----------|----------|----------|----------|----------|----------|--|
| Total heat | - | - | - | - | - | - | - | - |
| Heat pumps ¹ | - | - | - | - | - | - | - | - |
| (-) Input to heat pumps | - | - | - | - | - | - | - | - |
| Other sources ² | - | - | - | - | - | - | - | - |

1. Installations producing heat for own use are not included.

2. Refers to production from hydrogen, purchased steam from industry, and waste heat.

Source: IEA/OECD *Electricity Statistics*.

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Table 6. Renewable and waste balance for 2016

| thousand tonnes of oil equivalent | Hydro ¹ | Wind | Tide wave ocean | Solar PV | Geo-thermal | Solar thermal | Industrial waste | Mun. waste renew. |
|------------------------------------|--------------------|-------------|-----------------|-------------|-------------|---------------|------------------|-------------------|
| Production | 32 | 467 | - | 265 | 3 | 23 | 319 | 381 |
| Imports | - | - | - | - | - | - | - | 4 |
| Exports | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| TPES | 32 | 467 | - | 265 | 3 | 23 | 319 | 385 |
| Statistical differences | - | - | - | - | - | - | - | - |
| Main activity electricity plants | -32 | -465 | - | - | - | - | - | -165 |
| Autoproducer electricity plants | - | -2 | - | -265 | - | - | - | - |
| Main activity CHP plants | - | - | - | - | - | - | -120 | -205 |
| Autoproducer CHP plants | - | - | - | - | - | - | -28 | -10 |
| Main heat plants | - | - | - | - | -3 | - | - | - |
| Autoproducer heat plants | - | - | - | - | - | - | - | - |
| Charcoal production plants | - | - | - | - | - | - | - | - |
| Other transformation | - | - | - | - | - | - | - | - |
| Energy Industry own use | - | - | - | - | - | - | -29 | - |
| Losses | - | - | - | - | - | - | - | - |
| TFC | - | - | - | - | - | 23 | 142 | 5 |
| Industry | - | - | - | - | - | - | 142 | 5 |
| Iron and steel | - | - | - | - | - | - | 2 | - |
| Chemical and petrochemical | - | - | - | - | - | - | 4 | - |
| Non-ferrous metals | - | - | - | - | - | - | - | - |
| Non-metallurgical minerals | - | - | - | - | - | - | 124 | - |
| Transport equipment | - | - | - | - | - | - | - | - |
| Machinery | - | - | - | - | - | - | - | - |
| Mining and quarrying | - | - | - | - | - | - | - | - |
| Food and tobacco | - | - | - | - | - | - | - | - |
| Paper, pulp and print | - | - | - | - | - | - | 12 | 5 |
| Wood and wood products | - | - | - | - | - | - | - | - |
| Construction | - | - | - | - | - | - | - | - |
| Textile and leather | - | - | - | - | - | - | - | - |
| Non-specified | - | - | - | - | - | - | - | - |
| Transport | - | - | - | - | - | - | - | - |
| Road | - | - | - | - | - | - | - | - |
| Other | - | - | - | - | - | - | - | - |
| Other | - | - | - | - | - | 23 | - | - |
| Residential | - | - | - | - | - | 22 | - | - |
| Commercial and public services | - | - | - | - | - | 1 | - | - |
| Agriculture/forestry | - | - | - | - | - | - | - | - |
| Fishing | - | - | - | - | - | - | - | - |
| Non-specified | - | - | - | - | - | - | - | - |
| Electricity generated - GWh | 370 | 5436 | - | 3086 | - | - | 438 | 871 |
| <i>Electricity plants</i> | 370 | 5436 | - | 3086 | - | - | - | 374 |
| <i>CHP plants</i> | - | - | - | - | - | - | 438 | 497 |
| Heat generated - TJ | - | - | - | - | 66 | - | 512 | 1124 |
| <i>CHP plants</i> | - | - | - | - | - | - | 512 | 1124 |
| <i>Heat plants</i> | - | - | - | - | 66 | - | - | - |

1. Hydro does not include pumped hydro.

Source: IEA/OECD *World Energy Balances*.

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Table 6. Renewable and waste balance for 2016 (continued)

| Mun. waste non-ren. | Wood/wood waste | Charcoal | Bio-gases | Bio-gasoline | Bio-diesel | Other liquid biofuels | Total renew. & waste sources ² | Share in total energy sources ³ |
|---------------------|-----------------|----------|------------|--------------|------------|-----------------------|---|--|
| 357 | 1292 | - | 227 | 160 | 212 | 3 | 3741 | 24.4% |
| 4 | 766 | 6 | - | 8 | 306 | 2 | 1096 | 1.4% |
| - | - | - | - | -125 | -116 | - | -241 | 0.8% |
| - | - | - | - | - | - | - | - | - |
| 361 | 2058 | 6 | 227 | 43 | 402 | 5 | 4596 | 8.1% |
| - | - | - | - | - | 1 | -1 | - | x |
| -228 | -505 | - | -15 | - | - | - | -1410 | x |
| - | - | - | -7 | - | - | - | -274 | x |
| -134 | -58 | - | -37 | - | - | -3 | -557 | x |
| - | -183 | - | -75 | - | -2 | - | -298 | x |
| - | - | - | - | - | - | - | -3 | x |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | -29 | x |
| - | - | - | - | - | - | - | - | - |
| - | 1312 | 6 | 92 | 43 | 401 | 1 | 2025 | 4.8% |
| - | 663 | - | 27 | - | 1 | 1 | 839 | 7.6% |
| - | - | - | - | - | - | - | 2 | 0.1% |
| - | 1 | - | 5 | - | 1 | - | 11 | 0.3% |
| - | - | - | - | - | - | - | - | - |
| - | 126 | - | - | - | - | - | 250 | 18.1% |
| - | - | - | - | - | - | - | - | - |
| - | 1 | - | - | - | - | 1 | 2 | 1.1% |
| - | - | - | - | - | - | - | - | - |
| - | 56 | - | 16 | - | - | - | 72 | 4.8% |
| - | 286 | - | 3 | - | - | - | 306 | 43.2% |
| - | 193 | - | - | - | - | - | 193 | 79.4% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | 2 | - | - | - | 2 | 1.1% |
| - | - | - | 1 | - | - | - | 1 | 0.3% |
| - | - | - | - | 43 | 398 | - | 441 | 4.9% |
| - | - | - | - | 43 | 398 | - | 441 | 5.1% |
| - | - | - | - | - | - | - | - | - |
| - | 649 | 6 | 65 | - | 2 | - | 745 | 5.5% |
| - | 611 | 6 | - | - | - | - | 639 | 7.9% |
| - | 27 | 1 | 28 | - | - | - | 57 | 1.2% |
| - | 11 | - | 37 | - | 2 | - | 50 | 6.5% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| 821 | 3389 | - | 986 | - | 14 | 16 | 15427 | 18.3% |
| 543 | 2156 | - | 93 | - | - | 2 | 12060 | 17.5% |
| 278 | 1233 | - | 893 | - | 14 | 14 | 3367 | 22.0% |
| 1068 | 267 | - | 429 | - | - | 14 | 3480 | 9.3% |
| 1068 | 267 | - | 429 | - | - | 14 | 3414 | 9.2% |
| - | - | - | - | - | - | - | 66 | 100.0% |

2. Total includes non-renewable waste.

3. Share of renewables on TFC excludes electricity and heat generated from renewable sources.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|--|--------|--------|-------|-------|-------|-------|-------|---|
| Geothermal (TJ) | | | | | | | | |
| Production | 89 | 133 | 180 | 129 | 135 | 141 | 139 | 0.4 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 89 | 133 | 180 | 129 | 135 | 141 | 139 | 0.4 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | 86 | 106 | 176 | 120 | 126 | 132 | .. | 1.4 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | 3 | 27 | 4 | 9 | 9 | 9 | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Solar thermal (TJ) | | | | | | | | |
| Production | 35 | 43 | 507 | 857 | 934 | 962 | 1032 | 21.4 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 35 | 43 | 507 | 857 | 934 | 962 | 1032 | 21.4 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 35 | 43 | 507 | 857 | 934 | 962 | .. | 21.4 |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 35 | 43 | 507 | 857 | 934 | 962 | .. | 21.4 |
| Industrial waste (TJ) | | | | | | | | |
| Production | 5499 | 10911 | 13827 | 13526 | 13479 | 13359 | 12347 | 1.3 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 5499 | 10911 | 13827 | 13526 | 13479 | 13359 | 12347 | 1.3 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | 3314 e | 5705 e | 8110 | 6121 | 6221 | 6205 | .. | 0.5 |
| Energy industry own use | - | - | - | 696 | 1242 | 1207 | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 2185 | 5206 | 5717 | 6709 | 6016 | 5947 | .. | 0.8 |
| <i>Industry</i> | 2185 | 5206 | 5717 | 6709 | 6016 | 5947 | .. | 0.8 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Municipal waste - renewables (TJ) | | | | | | | | |
| Production | 4706 e | 5896 | 13792 | 15238 | 15755 | 15960 | 19043 | 6.4 |
| Net imports ¹ | - | - | - | - | 83 | 157 | .. | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 4706 e | 5896 | 13792 | 15238 | 15838 | 16117 | 19043 | 6.5 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | 4706 e | 5896 | 13792 | 15000 | 15630 | 15910 | .. | 6.4 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | 238 | 208 | 207 | .. | - |
| <i>Industry</i> | - | - | - | 238 | 208 | 207 | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics (continued)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|--|---------|-------|-------|-------|-------|-------|-------|--|
| Municipal waste - non-renewables (TJ) | | | | | | | | |
| Production | 7058 e | 7633 | 17080 | 14895 | 14924 | 14964 | 14245 | 4.3 |
| Net imports ¹ | - | - | - | - | 90 | 171 | .. | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 7058 e | 7633 | 17080 | 14895 | 15014 | 15135 | 14245 | 4.4 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | 7058 e | 7633 | 17080 | 14895 | 15014 | 15135 | .. | 4.4 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Solid Biofuel excluding charcoal (TJ) | | | | | | | | |
| Production | 14064 | 13347 | 50250 | 46226 | 50155 | 54091 | 54927 | 9.1 |
| Net imports ¹ | - | 4373 | 21706 | 24502 | 32276 | 32056 | 32000 | 13.3 |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 14064 | 17720 | 71956 | 70728 | 82431 | 86147 | 86927 | 10.4 |
| Statistical differences | - | - | - | - | -22 | - | .. | - |
| Transformation processes | 608 | 766 | 26137 | 23516 | 31708 | 31216 | .. | 26.1 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 13456 e | 16954 | 45819 | 47212 | 50701 | 54931 | .. | 7.6 |
| <i>Industry</i> | 5696 e | 10593 | 23625 | 27216 | 27149 | 27748 | .. | 6.2 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 7760 | 6361 | 22194 | 19996 | 23552 | 27183 | .. | 9.5 |
| Charcoal (kt) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | 9 | 9 | 9 | 9 | 9 | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | 9 | 9 | 9 | 9 | 9 | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | 9 | 9 | 9 | 9 | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | 9 | 9 | 9 | 9 | .. | - |
| Biogases (TJ) | | | | | | | | |
| Production | 269 | 1207 | 5336 | 8672 | 9584 | 9496 | 9358 | 13.8 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 269 | 1207 | 5336 | 8672 | 9584 | 9496 | 9358 | 13.8 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | 146 | 1080 | 4126 | 5201 | 5608 | 5633 | .. | 10.9 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 123 | 127 | 1210 | 3471 | 3976 | 3863 | .. | 23.8 |
| <i>Industry</i> | 123 | 99 | 522 | 899 | 1146 | 1140 | .. | 16.5 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | 28 | 688 | 2572 | 2830 | 2723 | .. | 33.1 |

1. Net imports = total imports - total exports.

Source: IEA/OECD World Energy Balances.

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Table 7. Aggregated renewables and waste statistics (continued)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|-----------------------------------|------|------|------|------|------|------|-------|---|
| Biogasoline (kt) | | | | | | | | |
| Production | - | - | 83 | 252 | 237 | 233 | 267 | - |
| Net imports ¹ | - | - | 7 | -195 | -178 | -170 | -127 | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | 90 | 57 | 59 | 63 | 140 | - |
| Statistical differences | - | - | -7 | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | 83 | 57 | 59 | 63 | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | 83 | 57 | 59 | 63 | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Biodiesel (kt) | | | | | | | | |
| Production | - | - | 343 | 446 | 248 | 235 | 293 | - |
| Net imports ¹ | - | - | 19 | -20 | .. | 211 | 131 | - |
| Stock changes | - | - | -7 | - | - | - | - | - |
| Gross consumption | - | - | 355 | 426 | 248 | 446 | 424 | - |
| Statistical differences | - | - | -12 | -2 | 1 | 1 | .. | - |
| Transformation processes | - | - | - | 1 | 1 | 2 | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | 343 | 423 | 248 | 445 | .. | - |
| <i>Industry</i> | - | - | - | - | 1 | 1 | .. | - |
| <i>Transport</i> | - | - | 343 | 422 | 245 | 442 | .. | - |
| <i>Other</i> | - | - | - | 1 | 2 | 2 | .. | - |
| Other liquid biofuels (kt) | | | | | | | | |
| Production | - | - | 48 | 2 | 6 | 3 | 3 | - |
| Net imports ¹ | - | - | 28 | 15 | 20 | 2 | 2 | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | 76 | 17 | 26 | 5 | 5 | - |
| Statistical differences | - | - | - | -1 | - | -1 | .. | - |
| Transformation processes | - | - | 55 | 15 | 25 | 3 | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | 21 | 1 | 1 | 1 | .. | - |
| <i>Industry</i> | - | - | 13 | 1 | 1 | 1 | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | 8 | - | - | - | .. | - |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

CANADA

Figure 1. Contribution of renewables in 1990

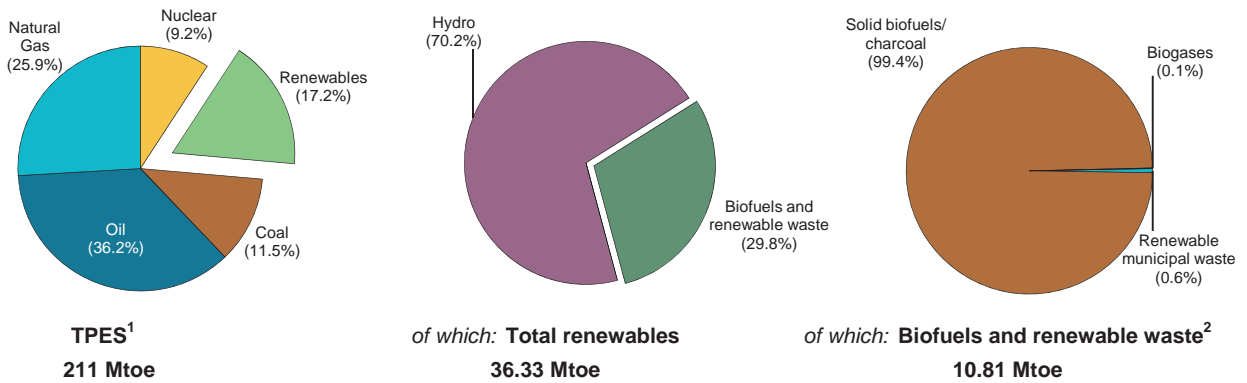


Figure 2. Contribution of renewables in 2017 provisional

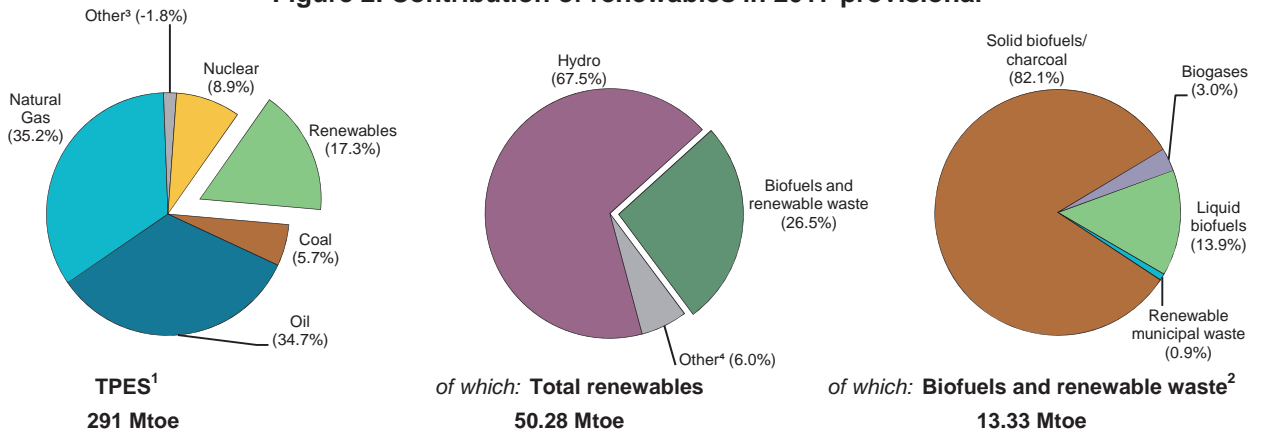
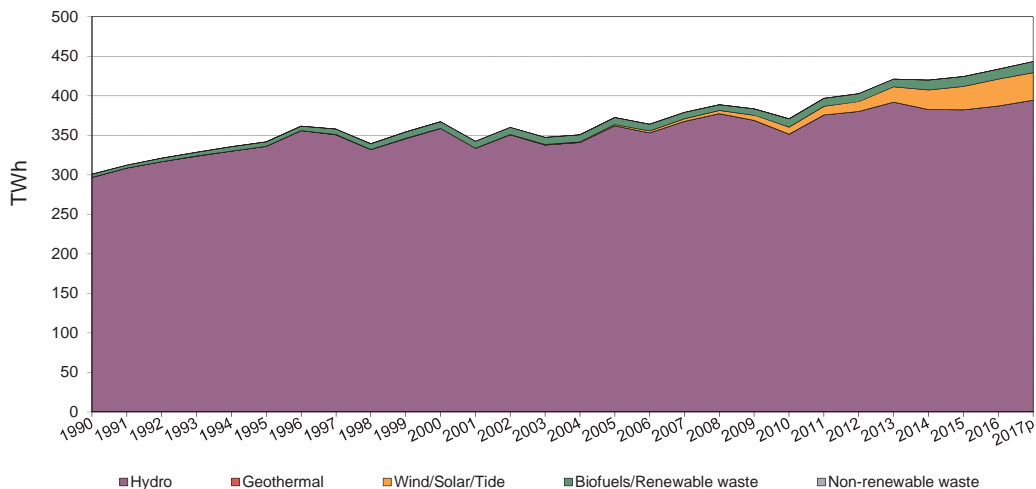


Figure 3. Electricity production by renewables and waste energy source



1. Total primary energy supply includes electricity trade.
 2. Biofuels and renewable waste include solid biofuels, liquid biofuels, biogases, and renewable municipal waste.
 3. Includes non-renewable municipal waste, industrial waste, peat, shale oil, electricity trade, and other sources of primary energy. (In the case of negative values, the net exports of electricity are greater than the other products in this category).
 4. Includes geothermal, solar, wind and tide.

Note: Totals may not sum due to rounding.
Source: IEA/OECD *World Energy Balances*.

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Table 1. Energy supply, GDP and population

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|---|---------|---------|---------|---------|---------|---------|---------|--|
| TPES (Mtoe) | 211.28 | 253.57 | 263.06 | 279.64 | 280.79 | 280.10 | 291.33 | 0.8 |
| of which: Renewables (Mtoe) ¹ | 36.33 | 44.58 | 44.00 | 49.06 | 49.28 | 48.79 | 50.28 | 0.7 |
| Renewables/TPES(%) | 17.2 | 17.6 | 16.7 | 17.5 | 17.6 | 17.4 | 17.3 | -0.1 |
| GDP (billion 2010 US dollars) | 1014.07 | 1342.74 | 1613.46 | 1784.65 | 1802.51 | 1828.00 | 1883.71 | 2.0 |
| TPES/GDP ² | 0.21 | 0.19 | 0.16 | 0.16 | 0.16 | 0.15 | 0.15 | -1.2 |
| TPES/GDP (year 2010 = 100) | 128 | 116 | 100 | 96 | 96 | 94 | 95 | -1.2 |
| Population (millions) | 27.69 | 30.69 | 34.01 | 35.54 | 35.83 | 36.27 | 36.71 | 1.1 |
| TPES/population (toe per capita) | 7.63 | 8.26 | 7.74 | 7.87 | 7.84 | 7.72 | 7.94 | -0.2 |
| Electricity generation (TWh) ³ | 482.0 | 605.6 | 604.2 | 661.6 | 668.0 | 667.3 | 674.3 | 0.6 |
| of which: Renewables (TWh) ^{1,3} | 300.69 | 366.99 | 370.75 | 419.67 | 424.22 | 433.60 | 443.06 | 1.1 |
| Renew./Total Elec.(%) ^{1,4} | 62.4 | 60.6 | 61.4 | 63.4 | 63.5 | 65.0 | 65.7 | 0.5 |
| Road energy consumption (Mtoe) | 33.1 | 39.3 | 48.3 | 49.2 | 48.8 | 48.4 | .. | .. |
| of which: Liquid biofuels (Mtoe) | - | 0.13 | 1.17 | 1.87 | 1.78 | 1.71 | .. | .. |
| Liq. biofuels/road tr.(%) ⁵ | - | 0.3 | 2.4 | 3.8 | 3.6 | 3.5 | - | - |

1. Renewables do not include industrial waste, non-renewable municipal waste and pumped storage production.

2. In units of toe per thousand 2010 US dollars.

3. Electricity generation = gross production - amount of electricity produced in pumped storage plants.

4. Electricity share generated from renewables over the total electricity production.

5. Energy from liquid biofuels consumed in road transport over the total energy consumed in road transport.

Source: IEA/OECD *World Energy Balances* and OECD *Main Economic Indicators*.

Table 2. Net generating capacity of renewable and waste sources (MWe)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | Average annual percent change 00-16 |
|---|--------------|--------------|--------------|--------------|--------------|--------------|--|
| Total capacity | 60335 | 68871 | 81010 | 89137 | 95626 | 97388 | 2.2 |
| Hydro | 59381 | 67407 e | 75078 | 75537 | 79420 | 80259 | 1.1 |
| Hydro <1MW | - | - | 27 | 27 | 30 | 25 | - |
| Hydro 1-10MW | - | - | 974 | 1086 | 1056 | 1045 | - |
| Hydro 10+MW | - | - | 73900 | 74250 | 78160 | 79015 | - |
| Mixed plants | - | - | - | - | - | - | - |
| Pure pumped storage | 186 | 177 e | 177 | 174 | 174 | 174 | -0.1 |
| Geothermal | - | - | - | - | - | - | - |
| Solar photovoltaic | - | 7 | 221 | 1843 | 2517 | 2661 | 45.0 |
| Solar thermal | - | - | - | - | - | - | - |
| Tide, wave, ocean | 20 | 20 e | 20 | 20 | 20 | 20 | - |
| Wind | 1 | 92 e | 3967 | 9694 | 11214 | 11973 | 35.6 |
| Industrial waste | - | - | - | - | - | - | - |
| Municipal waste | 14 | 14 | 35 | 77 | 77 | 77 | 11.2 |
| Solid biofuels | 914 e | 1227 e | 1553 | 1850 | 2262 | 2282 | 4.0 |
| Biogases | 5 e | 104 e | 136 | 116 | 116 | 116 | 0.7 |
| Liquid biofuels | - | - | - | - | - | - | - |
| Solar collectors surface (1000 m ²) | - | - | 1026 | 1250 | 1365 | 1380 | - |
| Cap. of solar collectors (MW _{th}) ¹ | - | - | 718 | 875 | 956 | 966 | - |

1. Converted at 0.7 kW_{th}/m² of solar collector area, as estimated by the IEA Solar Heating & Cooling Programme.

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Table 3. Capacity factors (%)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 |
|--|--------------|--------------|--------------|--------------|--------------|--------------|
| Total plants¹ | 56.92 | 60.86 | 52.27 | 53.77 | 50.67 | 50.85 |
| Hydro | 57.07 | 60.73 e | 53.44 | 57.82 | 54.95 | 55.07 |
| <i>of which: <1MW</i> | - | - | - | - | - | - |
| <i>of which: 1-10MW</i> | - | - | - | - | - | - |
| <i>of which: 10+MW</i> | - | - | 54.27 | 58.80 | 55.82 | 55.93 |
| <i>of which: pure pumped storage²</i> | 6.81 | 7.16 e | 7.16 | 7.28 | 7.28 | 7.28 |
| Geothermal | - | - | - | - | - | - |
| Solar photovoltaic | - | 26.09 e | 13.15 | 13.13 | 13.13 | 13.00 |
| Solar thermal | - | - | - | - | - | - |
| Tide, wave and ocean | 14.84 | 18.26 e | 15.96 | 8.93 | 7.39 | 10.38 |
| Wind | - | 32.76 e | 25.10 | 26.54 | 26.92 | 29.33 |
| Industrial waste | - | - | - | - | - | - |
| Municipal waste | 94.93 | x | 69.07 | 39.30 | 39.30 | 39.30 |
| Solid biofuels | 47.82 e | 68.52 e | 69.55 | 70.30 | 58.24 | 57.73 |
| Biogases | 52.51 e | 77.71 e | 66.59 | 95.69 | 95.69 | 95.69 |
| Biodiesels | - | - | - | - | - | - |
| Other liquid biofuels | - | - | - | - | - | - |

1. The capacity factor is defined as: the annual gross electricity generation divided by the reported net capacity times 365 (days/year) times 24 (hours/day).

2. In case a country has at least one mixed hydro plants, it is impossible to calculate capacity factor thus it is shown as 'not applicable'.

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Table 4. Gross electricity production from renewable and waste sources (GWh)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|--------------------------------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|-------------------------------------|
| Total electricity¹ | 300843 | 367158 | 370934 | 419878 | 424423 | 433801 | 443281 | 1.1 |
| Hydro | 296848 | 358620 | 351461 | 382574 | 382293 | 387208 | 394530 | 0.6 |
| <i>of which: pumped storage</i> | 111 | 111 | 111 | 111 | 111 | 111 | 111 | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar photovoltaic | - | 16 | 255 | 2120 | 2895 | 3031 | 3292 | 36.8 |
| Solar thermal | - | - | - | - | - | - | - | - |
| Tide, wave, ocean | 26 | 32 | 28 | 16 | 13 | 18 | 6 | -9.4 |
| Wind | - | 264 | 8724 | 22538 | 26446 | 30766 | 31453 | 32.5 |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | 76 | 99 | 138 | 172 | 172 | 172 | 198 | 4.2 |
| Municipal waste non-renew. | 41 | 54 | 74 | 93 | 93 | 93 | 106 | 4.0 |
| Solid biofuels | 3829 | 7365 | 9462 | 11393 | 11539 | 11541 | 12561 | 3.2 |
| Biogases | 23 | 708 | 792 | 972 | 972 | 972 | 1135 | 2.8 |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| <i>of which:</i> | | | | | | | | |
| Electricity only plants | 300726 | 367041 | 370765 | 419625 | 424170 | 433548 | .. | - |
| Hydro | 296848 | 358620 | 351461 | 382574 | 382293 | 387208 | .. | - |
| <i>of which: pumped storage</i> | 111 | 111 | 111 | 111 | 111 | 111 | .. | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar photovoltaic | - | 16 | 255 | 2120 | 2895 | 3031 | .. | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Tide, wave, ocean | 26 | 32 | 28 | 16 | 13 | 18 | .. | - |
| Wind | - | 264 | 8724 | 22538 | 26446 | 30766 | .. | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | - | 23 | 56 | 89 | 89 | 89 | .. | - |
| Municipal waste non-renew. | - | 13 | 30 | 48 | 48 | 48 | .. | - |
| Solid biofuels | 3829 | 7365 | 9462 | 11393 | 11539 | 11541 | .. | - |
| Biogases | 23 | 708 | 749 | 847 | 847 | 847 | .. | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| CHP plants | 117 | 117 | 169 | 253 | 253 | 253 | .. | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | 76 | 76 | 82 | 83 | 83 | 83 | .. | - |
| Municipal waste non-renew. | 41 | 41 | 44 | 45 | 45 | 45 | .. | - |
| Solid biofuels | - | - | - | - | - | - | - | - |
| Biogases | - | - | 43 | 125 | 125 | 125 | .. | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |

1. **Total electricity** includes the electricity produced from industrial waste, non-renewable municipal waste and pumped storage. Electricity from renewable sources does *not* include the electricity produced from industrial waste, non-renewable municipal waste and pumped storage production.

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Table 5A. Heat production¹ from renewable and waste sources in the transformation sector (TJ)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|----------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|--|
| Total heat | 2014 | 2014 | 4694 | 5156 | 5156 | 5156 | 5156 | 5.7 |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | 1309 | 1309 | 1373 | 1961 | 1961 | 1961 | 1961 | 2.4 |
| Municipal waste non-renew. | 705 | 705 | 739 | 1055 | 1055 | 1055 | 1055 | 2.4 |
| Solid biofuels | - | - | - | - | - | - | - | - |
| Biogases | - | - | 2582 | 2140 | 2140 | 2140 | 2140 | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| <i>of which:</i> | | | | | | | | |
| CHP plants | 633 | 633 | 739 | 857 | 857 | 857 | .. | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | 411 | 411 | 456 | 461 | 461 | 461 | .. | - |
| Municipal waste non-renew. | 222 | 222 | 245 | 248 | 248 | 248 | .. | - |
| Solid biofuels | - | - | - | - | - | - | - | - |
| Biogases | - | - | 38 | 148 | 148 | 148 | .. | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| Heat only plants | 1381 | 1381 | 3955 | 4299 | 4299 | 4299 | .. | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | 898 | 898 | 917 | 1500 | 1500 | 1500 | .. | - |
| Municipal waste non-renew. | 483 | 483 | 494 | 807 | 807 | 807 | .. | - |
| Solid biofuels | - | - | - | - | - | - | - | - |
| Biogases | - | - | 2544 | 1992 | 1992 | 1992 | .. | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |

1. Waste heat and heat production from heat pumps are not included and are reported separately in Table 5B.

Table 5B. Heat production from heat pumps and waste heat (TJ)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|----------------------------|----------|----------|----------|----------|----------|----------|----------|--|
| Total heat | - | - | - | - | - | - | - | - |
| Heat pumps ¹ | - | - | - | - | - | - | - | - |
| (-) Input to heat pumps | - | - | - | - | - | - | - | - |
| Other sources ² | - | - | - | - | - | - | - | - |

1. Installations producing heat for own use are not included.

2. Refers to production from hydrogen, purchased steam from industry, and waste heat.

Source: IEA/OECD *Electricity Statistics*.

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Table 6. Renewable and waste balance for 2016

| thousand tonnes of oil equivalent | Hydro ¹ | Wind | Tide wave ocean | Solar PV | Geo-thermal | Solar thermal | Industrial waste | Mun. waste renew. |
|------------------------------------|--------------------|--------------|-----------------|-------------|-------------|---------------|------------------|-------------------|
| Production | 33284 | 2645 | 2 | 261 | - | 42 | 142 | 119 |
| Imports | - | - | - | - | - | - | - | - |
| Exports | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| TPES | 33284 | 2645 | 2 | 261 | - | 42 | 142 | 119 |
| Statistical differences | - | - | - | - | - | - | - | - |
| Main activity electricity plants | -30625 | -2548 | -2 | -261 | - | - | - | -31 |
| Autoproducer electricity plants | -2659 | -97 | - | - | - | - | - | - |
| Main activity CHP plants | - | - | - | - | - | - | - | -21 |
| Autoproducer CHP plants | - | - | - | - | - | - | - | - |
| Main heat plants | - | - | - | - | - | - | - | -66 |
| Autoproducer heat plants | - | - | - | - | - | - | - | - |
| Charcoal production plants | - | - | - | - | - | - | - | - |
| Other transformation | - | - | - | - | - | - | - | - |
| Energy Industry own use | - | - | - | - | - | - | - | - |
| Losses | - | - | - | - | - | - | - | - |
| TFC | - | - | - | - | - | 42 | 142 | - |
| Industry | - | - | - | - | - | - | 142 | - |
| Iron and steel | - | - | - | - | - | - | - | - |
| Chemical and petrochemical | - | - | - | - | - | - | - | - |
| Non-ferrous metals | - | - | - | - | - | - | - | - |
| Non-metallc minerals | - | - | - | - | - | - | 142 | - |
| Transport equipment | - | - | - | - | - | - | - | - |
| Machinery | - | - | - | - | - | - | - | - |
| Mining and quarrying | - | - | - | - | - | - | - | - |
| Food and tobacco | - | - | - | - | - | - | - | - |
| Paper, pulp and print | - | - | - | - | - | - | - | - |
| Wood and wood products | - | - | - | - | - | - | - | - |
| Construction | - | - | - | - | - | - | - | - |
| Textile and leather | - | - | - | - | - | - | - | - |
| Non-specified | - | - | - | - | - | - | - | - |
| Transport | - | - | - | - | - | - | - | - |
| Road | - | - | - | - | - | - | - | - |
| Other | - | - | - | - | - | - | - | - |
| Other | - | - | - | - | - | 42 | - | - |
| Residential | - | - | - | - | - | - | - | - |
| Commercial and public services | - | - | - | - | - | - | - | - |
| Agriculture/forestry | - | - | - | - | - | - | - | - |
| Fishing | - | - | - | - | - | - | - | - |
| Non-specified | - | - | - | - | - | 42 | - | - |
| Electricity generated - GWh | 387097 | 30766 | 18 | 3031 | - | - | - | 172 |
| <i>Electricity plants</i> | 387097 | 30766 | 18 | 3031 | - | - | - | 89 |
| <i>CHP plants</i> | - | - | - | - | - | - | - | 83 |
| Heat generated - TJ | - | - | - | - | - | - | - | 1961 |
| <i>CHP plants</i> | - | - | - | - | - | - | - | 461 |
| <i>Heat plants</i> | - | - | - | - | - | - | - | 1500 |

1. Hydro does not include pumped hydro.

Source: IEA/OECD *World Energy Balances*.

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Table 6. Renewable and waste balance for 2016 (continued)

| Mun. waste non-ren. | Wood/wood waste | Charcoal | Bio-gases | Bio-gasoline | Bio-diesel | Other liquid biofuels | Total renew. & waste sources ² | Share in total energy sources ³ |
|---------------------|-----------------|----------|-------------|--------------|------------|-----------------------|---|--|
| 64 | 11126 | - | 405 | 858 | 334 | - | 49282 | 10.4% |
| - | 111 | - | - | 556 | 291 | - | 958 | 1.1% |
| - | -913 | - | - | - | -328 | - | -1241 | 0.4% |
| - | - | - | - | - | - | - | - | - |
| 64 | 10324 | - | 405 | 1415 | 297 | - | 49000 | 17.5% |
| - | - | - | - | 1 | - | - | 1 | x |
| -17 | - | - | -176 | - | - | - | -33660 | x |
| - | -2646 | - | -32 | - | - | - | -5434 | x |
| -12 | - | - | -17 | - | - | - | -50 | x |
| - | - | - | -19 | - | - | - | -19 | x |
| -35 | - | - | -52 | - | - | - | -153 | x |
| - | - | - | -36 | - | - | - | -36 | x |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | -2 | - | - | - | -2 | x |
| - | - | - | - | - | - | - | - | - |
| - | 7677 | - | 72 | 1415 | 297 | - | 9645 | 5.0% |
| - | 4676 | - | 56 | - | - | - | 4874 | 11.6% |
| - | - | - | 1 | - | - | - | 1 | 0.0% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | 142 | 6.1% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | 4676 | - | 55 | - | - | - | 4731 | 47.7% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | 1415 | 297 | - | 1712 | 2.8% |
| - | - | - | - | 1415 | 297 | - | 1712 | 3.5% |
| - | - | - | - | - | - | - | - | - |
| - | 3002 | - | 15 | - | - | - | 3059 | 4.7% |
| - | 3002 | - | - | - | - | - | 3002 | 9.3% |
| - | - | - | 15 | - | - | - | 15 | 0.1% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | 42 | 5.0% |
| 93 | 11541 | - | 972 | - | - | - | 433690 | 65.0% |
| 48 | 11541 | - | 847 | - | - | - | 433437 | 66.2% |
| 45 | - | - | 125 | - | - | - | 253 | 2.1% |
| 1055 | - | - | 2140 | - | - | - | 5156 | 20.2% |
| 248 | - | - | 148 | - | - | - | 857 | 4.0% |
| 807 | - | - | 1992 | - | - | - | 4299 | 99.7% |

2. Total includes non-renewable waste.

3. Share of renewables on TFC excludes electricity and heat generated from renewable sources.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|--|--------|--------|------|------|------|------|--------|---|
| Geothermal (TJ) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Solar thermal (TJ) | | | | | | | | |
| Production | - | - | 1539 | 1702 | 1760 | 1760 | 1760 e | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | 1539 | 1702 | 1760 | 1760 | 1760 e | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | 1539 | 1702 | 1760 | 1760 | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | 1539 | 1702 | 1760 | 1760 | .. | - |
| Industrial waste (TJ) | | | | | | | | |
| Production | 1563 e | 3162 e | 4748 | 5606 | 5783 | 5960 | 6135 | 4.0 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 1563 e | 3162 e | 4748 | 5606 | 5783 | 5960 | 6135 | 4.0 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 1563 e | 3162 e | 4748 | 5606 | 5783 | 5960 | .. | 4.0 |
| <i>Industry</i> | 1563 e | 3162 e | 4748 | 5606 | 5783 | 5960 | .. | 4.0 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Municipal waste - renewables (TJ) | | | | | | | | |
| Production | 2524 e | 3231 e | 3422 | 4963 | 4963 | 4963 | 4963 | 2.7 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 2524 e | 3231 e | 3422 | 4963 | 4963 | 4963 | 4963 | 2.7 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | 2524 e | 3231 e | 3422 | 4963 | 4963 | 4963 | .. | 2.7 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics (continued)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|--|--------|--------|--------|--------|--------|--------|--------|---|
| Municipal waste - non-renewables (TJ) | | | | | | | | |
| Production | 1359 e | 1740 e | 1842 | 2695 | 2695 | 2695 | 2695 | 2.8 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 1359 e | 1740 e | 1842 | 2695 | 2695 | 2695 | 2695 | 2.8 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | 1359 e | 1740 e | 1842 | 2695 | 2695 | 2695 | .. | 2.8 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Solid Biofuel excluding charcoal (TJ) | | | | | | | | |
| Production | 450315 | 561335 | 494905 | 507853 | 504582 | 465806 | 488500 | -1.2 |
| Net imports ¹ | -515 | -3127 | -18311 | -21515 | -20948 | -33571 | -29970 | 16.0 |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 449800 | 558208 | 476594 | 486338 | 483634 | 432235 | 458530 | -1.6 |
| Statistical differences | - | - | - | -499 | -10271 | -7 | .. | - |
| Transformation processes | 36758 | 70704 | 90833 | 109374 | 110778 | 110790 | .. | 2.8 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 413042 | 487504 | 385761 | 376465 | 362585 | 321438 | .. | -2.6 |
| <i>Industry</i> | 236646 | 327669 | 248881 | 250785 | 236905 | 195758 | .. | -3.2 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 176396 | 159835 | 136880 | 125680 | 125680 | 125680 | .. | -1.5 |
| Charcoal (kt) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Biogases (TJ) | | | | | | | | |
| Production | 276 e | 7787 e | 14710 | 16977 | 16977 | 16977 | 16977 | 5.0 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 276 e | 7787 e | 14710 | 16977 | 16977 | 16977 | 16977 | 5.0 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | 276 e | 7787 e | 12912 | 13894 | 13894 | 13894 | .. | 3.7 |
| Energy industry own use | - | - | 38 | 78 | 78 | 78 | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | 1760 | 3005 | 3005 | 3005 | .. | - |
| <i>Industry</i> | - | - | 1356 | 2360 | 2360 | 2360 | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | 404 | 645 | 645 | 645 | .. | - |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics (continued)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|-----------------------------------|------|-------|------|------|------|------|-------|---|
| Biogasoline (kt) | | | | | | | | |
| Production | - | 144 e | 1093 | 1396 | 1357 | 1341 | 1361 | 15.0 |
| Net imports ¹ | - | 64 e | 386 | 899 | 868 | 869 | 1062 | 17.7 |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | 208 e | 1479 | 2295 | 2225 | 2210 | 2423 | 15.9 |
| Statistical differences | - | - | - | -1 | - | 1 | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | 208 | 1479 | 2294 | 2225 | 2211 | .. | 15.9 |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | 208 | 1479 | 2294 | 2225 | 2211 | .. | 15.9 |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Biodiesel (kt) | | | | | | | | |
| Production | - | - | 123 | 267 | 271 | 380 | 354 | - |
| Net imports ¹ | - | - | 127 | 192 | 129 | -42 | -5 | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | 250 | 459 | 400 | 338 | 349 | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | 250 | 459 | 400 | 338 | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | 250 | 459 | 400 | 338 | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Other liquid biofuels (kt) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Figure 1. Contribution of renewables in 1990

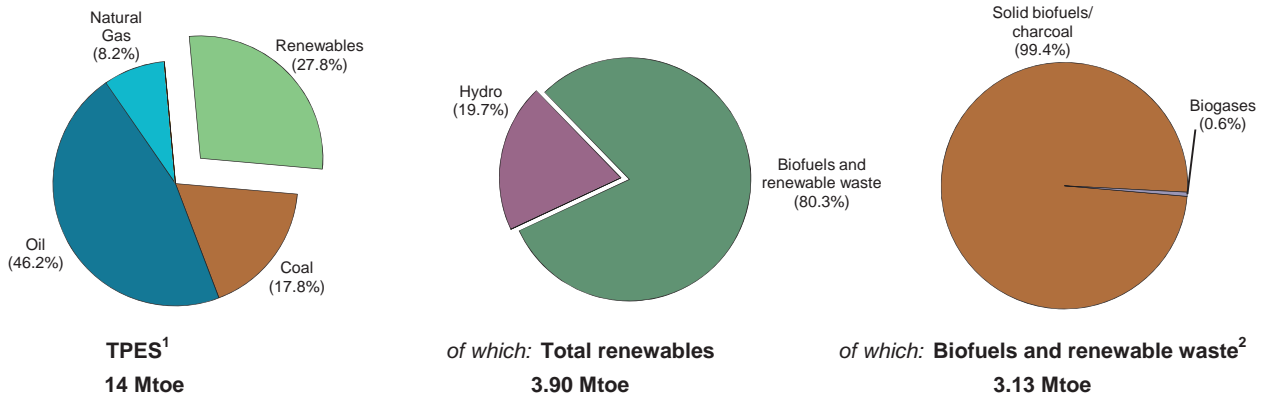


Figure 2. Contribution of renewables in 2017 provisional

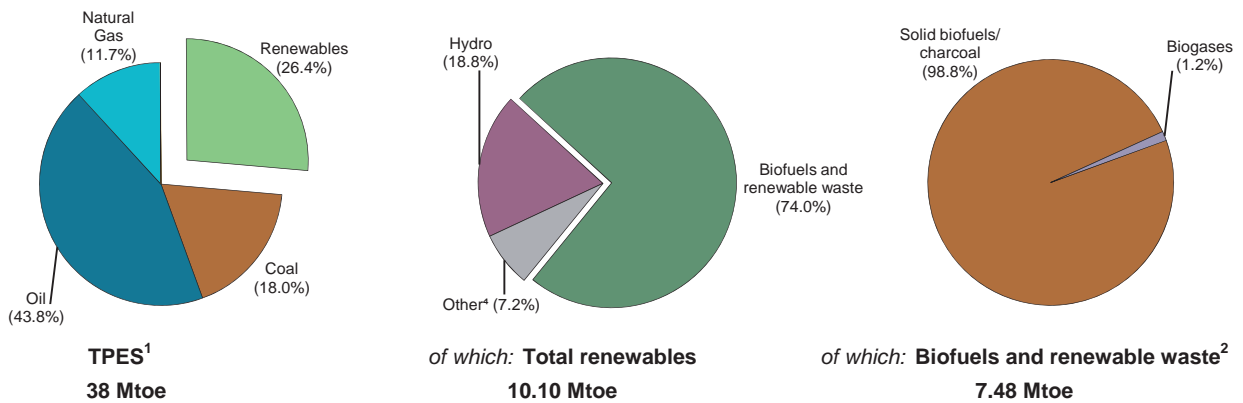
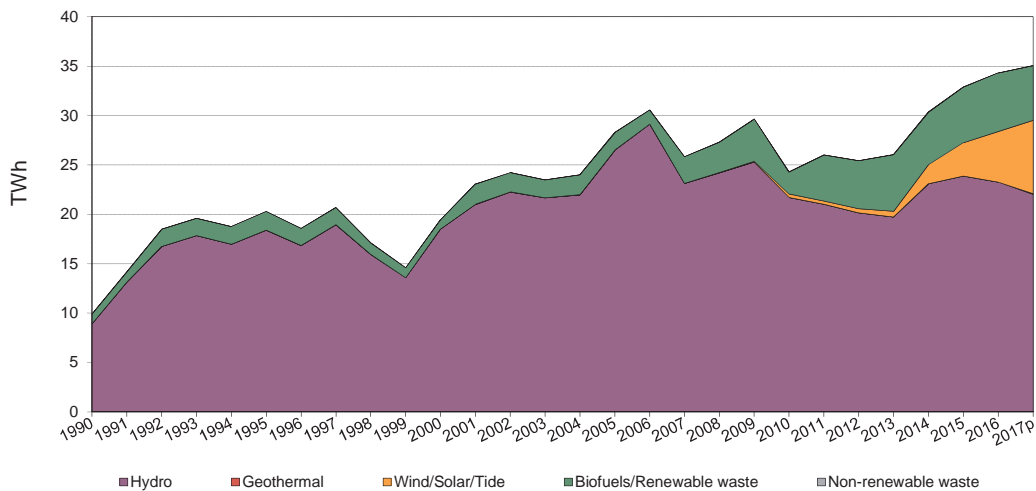


Figure 3. Electricity production by renewables and waste energy source



1. Total primary energy supply includes electricity trade.
2. Biofuels and renewable waste include solid biofuels, liquid biofuels, biogases, and renewable municipal waste.
3. Includes non-renewable municipal waste, industrial waste, peat, shale oil, electricity trade, and other sources of primary energy. (In the case of negative values, the net exports of electricity are greater than the other products in this category).
4. Includes geothermal, solar, wind and tide.

Note: Totals may not sum due to rounding.
Source: IEA/OECD *World Energy Balances*.

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Table 1. Energy supply, GDP and population

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|---|-------|--------|--------|--------|--------|--------|--------|--|
| TPES (Mtoe) | 14.01 | 25.17 | 30.85 | 34.77 | 35.51 | 37.80 | 38.18 | 2.5 |
| of which: Renewables (Mtoe) ¹ | 3.90 | 6.31 | 6.83 | 9.56 | 9.68 | 10.24 | 10.10 | 2.8 |
| Renewables/TPES(%) | 27.8 | 25.1 | 22.1 | 27.5 | 27.3 | 27.1 | 26.4 | 0.3 |
| GDP (billion 2010 US dollars) | 75.46 | 144.53 | 218.54 | 258.59 | 264.56 | 267.90 | 271.90 | 3.8 |
| TPES/GDP ² | 0.19 | 0.17 | 0.14 | 0.13 | 0.13 | 0.14 | 0.14 | -1.3 |
| TPES/GDP (year 2010 = 100) | 132 | 123 | 100 | 95 | 95 | 100 | 99 | -1.3 |
| Population (millions) | 13.18 | 15.40 | 17.09 | 17.84 | 18.05 | 18.28 | 18.52 | 1.1 |
| TPES/population (toe per capita) | 1.06 | 1.63 | 1.80 | 1.95 | 1.97 | 2.07 | 2.06 | 1.4 |
| Electricity generation (TWh) ³ | 18.4 | 40.1 | 60.4 | 70.8 | 75.4 | 79.3 | 78.9 | 4.1 |
| of which: Renewables (TWh) ^{1,3} | 9.89 | 19.46 | 24.30 | 30.35 | 32.87 | 34.32 | 35.05 | 3.5 |
| Renew./Total Elec.(%) ^{1,4} | 53.8 | 48.5 | 40.2 | 42.9 | 43.6 | 43.3 | 44.4 | -0.5 |
| Road energy consumption (Mtoe) | 2.6 | 5.1 | 6.3 | 7.2 | 7.6 | 7.9 | .. | .. |
| of which: Liquid biofuels (Mtoe) | - | - | - | - | - | - | .. | .. |
| Liq. biofuels/road tr.(%) ⁵ | - | - | - | - | - | - | - | - |

1. Renewables do not include industrial waste, non-renewable municipal waste and pumped storage production.

2. In units of toe per thousand 2010 US dollars.

3. Electricity generation = gross production - amount of electricity produced in pumped storage plants.

4. Electricity share generated from renewables over the total electricity production.

5. Energy from liquid biofuels consumed in road transport over the total energy consumed in road transport.

Source: IEA/OECD *World Energy Balances* and OECD *Main Economic Indicators*.

Table 2. Net generating capacity of renewable and waste sources (MWe)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | Average annual percent change 00-16 |
|---|-------------|-------------|-------------|-------------|-------------|-------------|--|
| Total capacity | 2678 | 4452 | 6156 | 8328 | 8451 | 9298 | 4.7 |
| Hydro | 2678 | 4430 | 5467 | 6445 | 6499 | 6671 | 2.6 |
| Hydro <1MW | 1 | 1 | 4 | 10 | 15 | 16 | 18.9 |
| Hydro 1-10MW | 15 | 31 | 52 | 250 | 301 | 347 | 16.3 |
| Hydro 10+MW | 2662 | 4398 | 5411 | 6185 | 6183 | 6308 | 2.3 |
| Mixed plants | - | - | - | - | - | - | - |
| Pure pumped storage | - | - | - | - | - | - | - |
| Geothermal | - | - | - | - | - | - | - |
| Solar photovoltaic | - | - | - | 221 | 576 | 1125 | - |
| Solar thermal | - | - | - | - | - | - | - |
| Tide, wave, ocean | - | - | - | - | - | - | - |
| Wind | - | - | 163 | 736 | 910 | 1039 | - |
| Industrial waste | - | - | - | - | - | - | - |
| Municipal waste | - | - | - | - | - | - | - |
| Solid biofuels | - | 22 | 526 | 884 | 417 | 410 | 20.1 |
| Biogases | - | - | - | 42 | 49 | 53 | - |
| Liquid biofuels | - | - | - | - | - | - | - |
| Solar collectors surface (1000 m ²) | - | - | 39 | 391 | 408 | 436 | - |
| Cap. of solar collectors (MW _{th}) ¹ | - | - | 27 | 274 | 286 | 305 | - |

1. Converted at 0.7 kW_{th}/m² of solar collector area, as estimated by the IEA Solar Heating & Cooling Programme.

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Table 3. Capacity factors (%)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 |
|--|--------------|--------------|--------------|--------------|--------------|--------------|
| Total plants¹ | 42.16 | 49.89 | 45.05 | 41.60 | 44.40 | 42.14 |
| Hydro | 38.06 | 47.71 | 45.35 | 40.91 | 41.95 | 39.83 |
| <i>of which: <1MW</i> | - | 1.63 | 44.63 | 12.77 | 12.89 | 23.16 |
| <i>of which: 1-10MW</i> | - | 26.30 | 60.57 | 15.81 | 16.31 | 16.45 |
| <i>of which: 10+MW</i> | 38.29 | 47.87 | 45.20 | 41.97 | 43.27 | 41.16 |
| <i>of which: pure pumped storage²</i> | - | - | - | - | - | - |
| Geothermal | - | - | - | - | - | - |
| Solar photovoltaic | - | - | - | 24.82 | 24.99 | 26.78 |
| Solar thermal | - | - | - | - | - | - |
| Tide, wave and ocean | - | - | - | - | - | - |
| Wind | - | - | 23.25 | 22.38 | 26.52 | 26.91 |
| Industrial waste | - | - | - | - | - | - |
| Municipal waste | - | - | - | - | - | - |
| Solid biofuels | - | x | 48.77 | 68.27 | x | x |
| Biogases | - | - | - | 10.87 | 2.80 | 2.64 |
| Biodiesels | - | - | - | - | - | - |
| Other liquid biofuels | - | - | - | - | - | - |

1. The capacity factor is defined as: the annual gross electricity generation divided by the reported net capacity times 365 (days/year) times 24 (hours/day).

2. In case a country has at least one mixed hydro plants, it is impossible to calculate capacity factor thus it is shown as 'not applicable'.

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Table 4. Gross electricity production from renewable and waste sources (GWh)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|--------------------------------------|-------------|--------------|--------------|--------------|--------------|--------------|--------------|---|
| Total electricity¹ | 9891 | 19457 | 24296 | 30349 | 32872 | 34319 | 35052 | 3.5 |
| Hydro | 8928 | 18516 | 21717 | 23099 | 23881 | 23274 | 22034 | 1.0 |
| <i>of which: pumped storage</i> | - | - | - | - | - | - | - | - |
| Geothermal | - | - | - | - | - | - | 64 | - |
| Solar photovoltaic | - | - | - | 480 | 1261 | 2639 | 3896 | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Tide, wave, ocean | - | - | - | - | - | - | - | - |
| Wind | - | - | 332 | 1443 | 2115 | 2449 | 3520 | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | - | - | - | - | - |
| Solid biofuels | 963 | 941 | 2247 | 5287 | 5603 | 5945 | 5526 | 11.0 |
| Biogases | - | - | - | 40 | 12 | 12 | 12 | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| of which: | | | | | | | | |
| Electricity only plants | 8928 | 18516 | 22049 | 25022 | 27257 | 28362 | .. | - |
| Hydro | 8928 | 18516 | 21717 | 23099 | 23881 | 23274 | .. | - |
| <i>of which: pumped storage</i> | - | - | - | - | - | - | - | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar photovoltaic | - | - | - | 480 | 1261 | 2639 | .. | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Tide, wave, ocean | - | - | - | - | - | - | - | - |
| Wind | - | - | 332 | 1443 | 2115 | 2449 | .. | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | - | - | - | - | - |
| Solid biofuels | - | - | - | - | - | - | - | - |
| Biogases | - | - | - | - | - | - | - | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| CHP plants | 963 | 941 | 2247 | 5327 | 5615 | 5957 | .. | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | - | - | - | - | - |
| Solid biofuels | 963 | 941 | 2247 | 5287 | 5603 | 5945 | .. | - |
| Biogases | - | - | - | 40 | 12 | 12 | .. | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |

1. **Total electricity** includes the electricity produced from industrial waste, non-renewable municipal waste and pumped storage. Electricity from renewable sources does *not* include the electricity produced from industrial waste, non-renewable municipal waste and pumped storage production.

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Table 5A. Heat production¹ from renewable and waste sources in the transformation sector (TJ)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|----------------------------|------|------|------|------|------|------|-------|--|
| Total heat | - | - | - | - | - | - | - | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | - | - | - | - | - |
| Solid biofuels | - | .. | .. | .. | .. | - | - | .. |
| Biogases | - | - | - | .. | .. | .. | - | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| <i>of which:</i> | | | | | | | | |
| CHP plants | - | - | - | - | - | - | - | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | - | - | - | - | - |
| Solid biofuels | - | .. | .. | .. | .. | - | - | .. |
| Biogases | - | - | - | .. | .. | .. | - | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| Heat only plants | - | - | - | - | - | - | - | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | - | - | - | - | - |
| Solid biofuels | - | - | - | - | - | - | - | - |
| Biogases | - | - | - | - | - | - | - | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |

1. Waste heat and heat production from heat pumps are not included and are reported separately in Table 5B.

Table 5B. Heat production from heat pumps and waste heat (TJ)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|----------------------------|------|------|------|------|------|------|-------|--|
| Total heat | - | - | - | - | - | - | - | - |
| Heat pumps ¹ | - | - | - | - | - | - | - | - |
| (-) Input to heat pumps | - | - | - | - | - | - | - | - |
| Other sources ² | - | - | - | - | - | - | - | - |

1. Installations producing heat for own use are not included.

2. Refers to production from hydrogen, purchased steam from industry, and waste heat.

Source: IEA/OECD *Electricity Statistics*.

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Table 6. Renewable and waste balance for 2016

| thousand tonnes of oil equivalent | Hydro ¹ | Wind | Tide wave ocean | Solar PV | Geo-thermal | Solar thermal | Industrial waste | Mun. waste renew. |
|------------------------------------|--------------------|-------------|-----------------|-------------|-------------|---------------|------------------|-------------------|
| Production | 2001 | 211 | - | 227 | - | 33 e | - | - |
| Imports | - | - | - | - | - | - | - | - |
| Exports | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| TPES | 2001 | 211 | - | 227 | - | 33 | - | - |
| Statistical differences | - | - | - | - | - | - | - | - |
| Main activity electricity plants | -1987 | -211 | - | -227 | - | - | - | - |
| Autoproducer electricity plants | -14 | - | - | - | - | - | - | - |
| Main activity CHP plants | - | - | - | - | - | - | - | - |
| Autoproducer CHP plants | - | - | - | - | - | - | - | - |
| Main heat plants | - | - | - | - | - | - | - | - |
| Autoproducer heat plants | - | - | - | - | - | - | - | - |
| Charcoal production plants | - | - | - | - | - | - | - | - |
| Other transformation | - | - | - | - | - | - | - | - |
| Energy Industry own use | - | - | - | - | - | - | - | - |
| Losses | - | - | - | - | - | - | - | - |
| TFC | - | - | - | - | - | 33 | - | - |
| Industry | - | - | - | - | - | - | - | - |
| Iron and steel | - | - | - | - | - | - | - | - |
| Chemical and petrochemical | - | - | - | - | - | - | - | - |
| Non-ferrous metals | - | - | - | - | - | - | - | - |
| Non-metallc minerals | - | - | - | - | - | - | - | - |
| Transport equipment | - | - | - | - | - | - | - | - |
| Machinery | - | - | - | - | - | - | - | - |
| Mining and quarrying | - | - | - | - | - | - | - | - |
| Food and tobacco | - | - | - | - | - | - | - | - |
| Paper, pulp and print | - | - | - | - | - | - | - | - |
| Wood and wood products | - | - | - | - | - | - | - | - |
| Construction | - | - | - | - | - | - | - | - |
| Textile and leather | - | - | - | - | - | - | - | - |
| Non-specified | - | - | - | - | - | - | - | - |
| Transport | - | - | - | - | - | - | - | - |
| Road | - | - | - | - | - | - | - | - |
| Other | - | - | - | - | - | - | - | - |
| Other | - | - | - | - | - | 33 | - | - |
| Residential | - | - | - | - | - | - | - | - |
| Commercial and public services | - | - | - | - | - | - | - | - |
| Agriculture/forestry | - | - | - | - | - | - | - | - |
| Fishing | - | - | - | - | - | - | - | - |
| Non-specified | - | - | - | - | - | 33 e | - | - |
| Electricity generated - GWh | 23274 | 2449 | - | 2639 | - | - | - | - |
| <i>Electricity plants</i> | 23274 | 2449 | - | 2639 | - | - | - | - |
| <i>CHP plants</i> | - | - | - | - | - | - | - | - |
| Heat generated - TJ | - | - | - | - | - | - | - | - |
| <i>CHP plants</i> | - | - | - | - | - | - | - | - |
| <i>Heat plants</i> | - | - | - | - | - | - | - | - |

1. Hydro does not include pumped hydro.

Source: IEA/OECD *World Energy Balances*.

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Table 6. Renewable and waste balance for 2016 (continued)

| Mun. waste non-ren. | Wood/wood waste | Charcoal | Bio-gases | Bio-gasoline | Bio-diesel | Other liquid biofuels | Total renew. & waste sources ² | Share in total energy sources ³ |
|---------------------|-----------------|-----------|-----------|--------------|------------|-----------------------|---|--|
| - | 7693 | - | 89 | - | - | - | 10254 | 81.8% |
| - | - | 1 | - | - | - | - | 1 | - |
| - | - | - | - | - | - | - | - | - |
| - | -11 | - | - | - | - | - | -11 | x |
| - | 7682 | 1 | 89 | - | - | - | 10244 | 27.1% |
| - | 219 | 7 | - | - | - | - | 226 | x |
| - | - | - | - | - | - | - | -2425 | x |
| - | - | - | - | - | - | - | -14 | x |
| - | -993 | - | -67 | - | - | - | -1060 | x |
| - | -3131 | - | -1 | - | - | - | -3132 | x |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | -110 e | 44 | - | - | - | - | -66 | x |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | -10 | - | -16 | - | - | - | -26 | x |
| - | 3658 | 51 | 5 | - | - | - | 3747 | 14.1% |
| - | 1933 | 7 | - | - | - | - | 1940 | 18.3% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | 8 | 3 | - | - | - | - | 11 | 3.8% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | 1497 | - | - | - | - | - | 1497 | 64.3% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | 429 | 5 | - | - | - | - | 434 | 14.0% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | 1724 | 44 | 5 | - | - | - | 1806 | 27.9% |
| - | 1707 | 41 | - | - | - | - | 1748 | 39.9% |
| - | 17 | 3 | 5 | - | - | - | 25 | 1.4% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | 33 | 99.7% |
| - | 5945 | - | 12 | - | - | - | 34319 | 43.3% |
| - | - | - | - | - | - | - | 28362 | 38.7% |
| - | 5945 | - | 12 | - | - | - | 5957 | 100.0% |
| - | .. | - | .. | - | - | - | .. | .. |
| - | .. | - | .. | - | - | - | .. | .. |
| - | - | - | - | - | - | - | - | - |

2. Total includes non-renewable waste.

3. Share of renewables on TFC excludes electricity and heat generated from renewable sources.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|--|------|------|-------|--------|--------|--------|--------|---|
| Geothermal (TJ) | | | | | | | | |
| Production | - | - | - | - | - | - | 2304 | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | 2304 | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Solar thermal (TJ) | | | | | | | | |
| Production | - | - | 124 e | 1243 e | 1297 e | 1386 e | 1386 e | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | 124 e | 1243 e | 1297 e | 1386 e | 1386 e | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | 124 e | 1243 e | 1297 e | 1386 e | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | 124 e | 1243 e | 1297 e | 1386 e | .. | - |
| Industrial waste (TJ) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Municipal waste - renewables (TJ) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics (continued)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|--|--------|--------|--------|--------|--------|--------|--------|---|
| Municipal waste - non-renewables (TJ) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Solid Biofuel excluding charcoal (TJ) | | | | | | | | |
| Production | 130456 | 197448 | 204914 | 306708 | 302030 | 322096 | 309234 | 3.1 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | -467 | - | - |
| Gross consumption | 130456 | 197448 | 204914 | 306708 | 302030 | 321629 | 309234 | 3.1 |
| Statistical differences | 2 | 1 | - | 6204 | 3283 | 9169 | .. | - |
| Transformation processes | 23051 | 33297 | 34469 | 146757 | 154526 | 177241 | .. | 11.0 |
| Energy industry own use | 25 | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | 46 | 422 | .. | - |
| Final energy consumption | 107382 | 164152 | 170445 | 166155 | 150741 | 153135 | .. | -0.4 |
| <i>Industry</i> | 28096 | 47276 | 45674 | 91358 | 81345 | 80935 | .. | 3.4 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 79286 | 116876 | 124771 | 74797 | 69396 | 72200 | .. | -3.0 |
| Charcoal (kt) | | | | | | | | |
| Production | 249 e | 253 e | 248 e | 72 | 73 | 65 | 65 | -8.1 |
| Net imports ¹ | - | - | 37 e | - | - | 1 | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 249 e | 253 e | 285 e | 72 | 73 | 66 | 65 | -8.1 |
| Statistical differences | - | - | - | -1 | - | 10 | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 249 e | 253 e | 285 e | 71 | 73 | 76 | .. | -7.2 |
| <i>Industry</i> | - | - | - | 3 | - | 11 | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 249 e | 253 e | 285 e | 68 | 73 | 65 | .. | -8.1 |
| Biogases (TJ) | | | | | | | | |
| Production | 737 | 214 | 362 | 2325 | 3671 | 3747 | 3811 | 19.6 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 737 | 214 | 362 | 2325 | 3671 | 3747 | 3811 | 19.6 |
| Statistical differences | - | - | - | 84 | -144 | - | .. | - |
| Transformation processes | 737 | 214 | 362 | 2326 | 2841 | 2855 | .. | 17.6 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | 687 | .. | - |
| Final energy consumption | - | - | - | 83 | 686 | 205 | .. | - |
| <i>Industry</i> | - | - | - | 79 | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | 4 e | 686 | 205 | .. | - |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics (continued)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|-----------------------------------|------|------|------|------|------|------|-------|---|
| Biogasoline (kt) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Biodiesel (kt) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Other liquid biofuels (kt) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Figure 1. Contribution of renewables in 1990

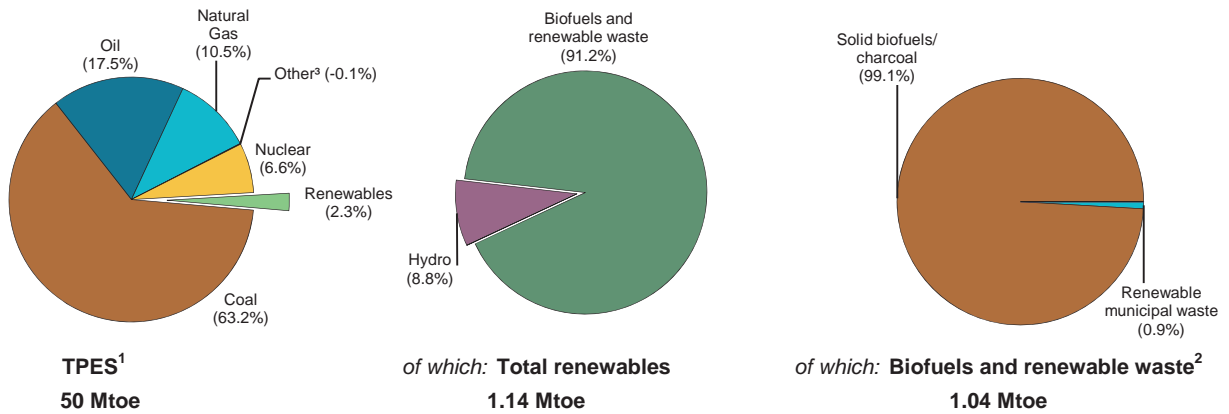


Figure 2. Contribution of renewables in 2017 provisional

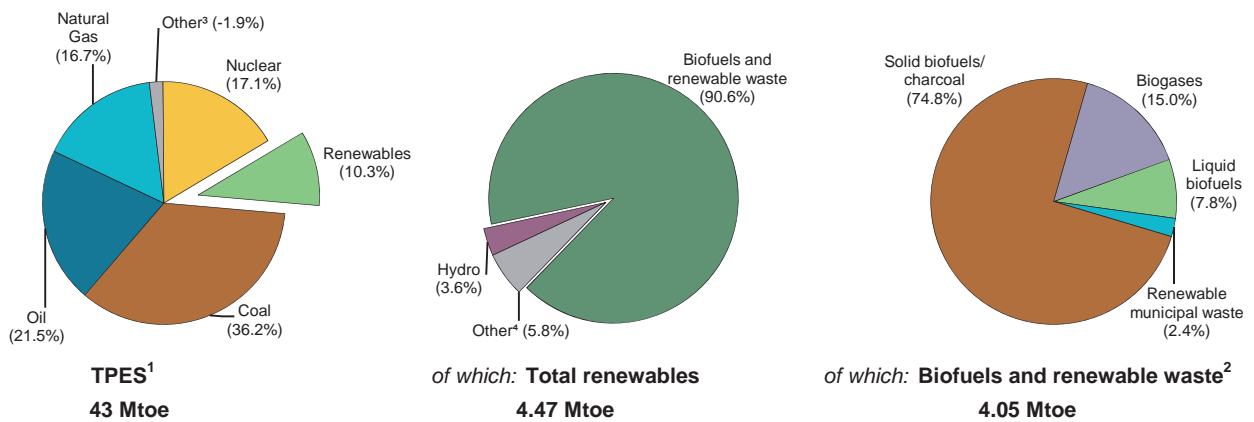
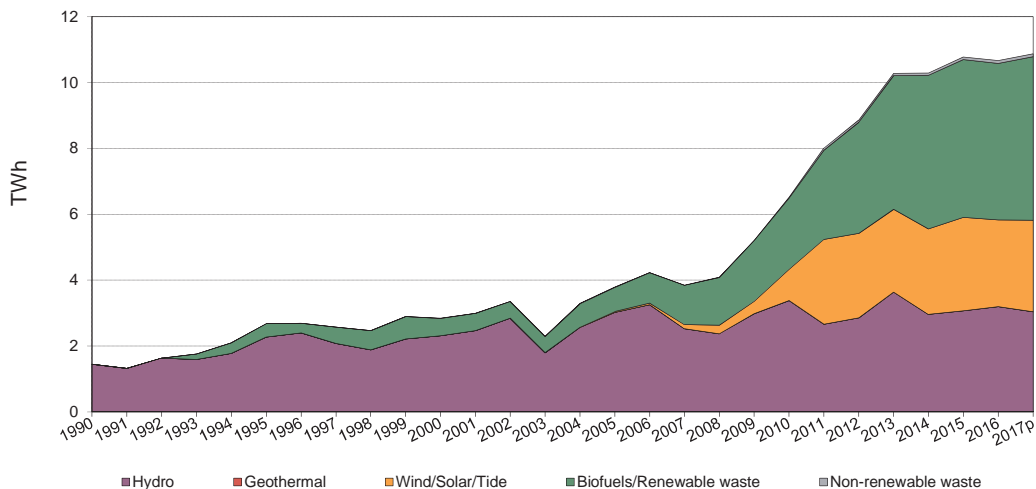


Figure 3. Electricity production by renewables and waste energy source



1. Total primary energy supply includes electricity trade.
2. Biofuels and renewable waste include solid biofuels, liquid biofuels, biogases, and renewable municipal waste.
3. Includes non-renewable municipal waste, industrial waste, peat, shale oil, electricity trade, and other sources of primary energy. (In the case of negative values, the net exports of electricity are greater than the other products in this category).
4. Includes geothermal, solar, wind and tide.

Note: Totals may not sum due to rounding.
Source: IEA/OECD World Energy Balances.

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Table 1. Energy supply, GDP and population

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|---|--------|--------|--------|--------|--------|--------|--------|-------------------------------------|
| TPES (Mtoe) | 49.80 | 41.24 | 45.15 | 41.96 | 42.03 | 41.55 | 43.19 | 0.3 |
| of which: Renewables (Mtoe) ¹ | 1.14 | 1.61 | 3.13 | 4.18 | 4.28 | 4.31 | 4.47 | 6.2 |
| Renewables/TPES(%) | 2.3 | 3.9 | 6.9 | 9.9 | 10.2 | 10.4 | 10.3 | 5.9 |
| GDP (billion 2010 US dollars) | 144.55 | 151.84 | 207.48 | 214.12 | 225.49 | 231.34 | 241.26 | 2.8 |
| TPES/GDP ² | 0.34 | 0.27 | 0.22 | 0.20 | 0.19 | 0.18 | 0.18 | -2.4 |
| TPES/GDP (year 2010 = 100) | 158 | 125 | 100 | 90 | 86 | 83 | 82 | -2.4 |
| Population (millions) | 10.36 | 10.27 | 10.52 | 10.53 | 10.54 | 10.57 | 10.59 | 0.2 |
| TPES/population (toe per capita) | 4.81 | 4.01 | 4.29 | 3.99 | 3.99 | 3.93 | 4.08 | 0.1 |
| Electricity generation (TWh) ³ | 62.3 | 72.9 | 85.3 | 85.1 | 82.6 | 82.1 | 85.9 | 1.0 |
| of which: Renewables (TWh) ^{1,3} | 1.16 | 2.28 | 5.90 | 9.17 | 9.42 | 9.38 | 9.62 | 8.8 |
| Renew./Total Elec.(%) ^{1,4} | 1.9 | 3.1 | 6.9 | 10.8 | 11.4 | 11.4 | 11.2 | 7.8 |
| Road energy consumption (Mtoe) | 2.3 | 3.9 | 5.5 | 5.6 | 5.9 | 6.1 | .. | .. |
| of which: Liquid biofuels (Mtoe) | - | 0.06 | 0.23 | 0.32 | 0.30 | 0.29 | .. | .. |
| Liq. biofuels/road tr.(%) ⁵ | - | 1.6 | 4.2 | 5.6 | 5.1 | 4.8 | - | - |

1. Renewables do not include industrial waste, non-renewable municipal waste and pumped storage production.

2. In units of toe per thousand 2010 US dollars.

3. Electricity generation = gross production - amount of electricity produced in pumped storage plants.

4. Electricity share generated from renewables over the total electricity production.

5. Energy from liquid biofuels consumed in road transport over the total energy consumed in road transport.

Source: IEA/OECD *World Energy Balances* and OECD *Main Economic Indicators*.

Table 2. Net generating capacity of renewable and waste sources (MWe)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | Average annual percent change 00-16 |
|---|---------------|-------------|-------------|-------------|-------------|-------------|-------------------------------------|
| Total capacity | 1410 e | 2101 | 4569 | 5366 | 5412 | 5415 | 6.1 |
| Hydro | 1410 e | 2097 | 2196 | 2252 | 2260 | 2262 | 0.5 |
| Hydro <1MW | .. | 52 | 141 | 150 | 154 | 156 | 7.1 |
| Hydro 1-10MW | .. | 90 | 155 | 177 | 181 | 181 | 4.5 |
| Hydro 10+MW | .. | 810 | 753 | 753 | 753 | 753 | -0.5 |
| Mixed plants | .. | 450 | 450 | 475 | 475 | 475 | 0.3 |
| Pure pumped storage | .. | 695 | 697 | 697 | 697 | 697 | 0.0 |
| Geothermal | - | - | - | - | - | - | - |
| Solar photovoltaic | - | - | 1727 | 2068 | 2075 | 2068 | - |
| Solar thermal | - | - | - | - | - | - | - |
| Tide, wave, ocean | - | - | - | - | - | - | - |
| Wind | - | 1 | 213 | 278 | 281 | 282 | 42.3 |
| Industrial waste | - | - | 1 | 1 | 3 | 3 | - |
| Municipal waste | - | 3 | 43 | 45 | 45 | 55 | 19.9 |
| Solid biofuels | - | .. | 271 | 355 | 380 | 376 | .. |
| Biogases | - | .. | 118 | 367 | 368 | 369 | .. |
| Liquid biofuels | - | - | - | - | - | - | - |
| Solar collectors surface (1000 m ²) | - | - | 309 | 507 | 538 | 569 | - |
| Cap. of solar collectors (MW _{th}) ¹ | - | - | 216 | 355 | 377 | 398 | - |

1. Converted at 0.7 kW_{th}/m² of solar collector area, as estimated by the IEA Solar Heating & Cooling Programme.

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Table 3. Capacity factors (%)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 |
|--|----------------|--------------|--------------|--------------|--------------|--------------|
| Total plants¹ | 11.73 e | 15.45 | 16.29 | 21.90 | 22.73 | 22.49 |
| Hydro | 11.73 e | 12.59 | 17.57 | 15.01 | 15.51 | 16.16 |
| <i>of which: <1MW</i> | x | 53.78 | 44.91 | 35.42 | 33.05 | 35.31 |
| <i>of which: 1-10MW</i> | x | 32.72 | 44.47 | 35.23 | 35.06 | 35.98 |
| <i>of which: 10+MW</i> | x | 17.69 | 24.72 | 13.61 | 12.02 | 14.36 |
| <i>of which: pure pumped storage²</i> | x | x | x | x | x | x |
| Geothermal | - | - | - | - | - | - |
| Solar photovoltaic | - | - | 4.07 | 11.72 | 12.45 | 11.77 |
| Solar thermal | - | - | - | - | - | - |
| Tide, wave and ocean | - | - | - | - | - | - |
| Wind | - | 10.10 | 17.98 | 19.57 | 23.26 | 20.12 |
| Industrial waste | - | - | 38.52 | x | 75.16 | 59.32 |
| Municipal waste | - | 49.40 | 15.75 | 37.18 | 36.64 | 34.10 |
| Solid biofuels | - | x | 62.86 | 64.06 | 62.83 | 62.78 |
| Biogases | - | x | 61.40 | 80.36 | 80.99 | 80.10 |
| Biodiesels | - | - | - | - | - | - |
| Other liquid biofuels | - | - | - | - | - | - |

1. The capacity factor is defined as: the annual gross electricity generation divided by the reported net capacity times 365 (days/year) times 24 (hours/day).

2. In case a country has at least one mixed hydro plants, it is impossible to calculate capacity factor thus it is shown as 'not applicable'.

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Table 4. Gross electricity production from renewable and waste sources (GWh)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|--------------------------------------|-------------|-------------|-------------|--------------|--------------|--------------|--------------|---|
| Total electricity¹ | 1449 | 2845 | 6520 | 10293 | 10777 | 10666 | 10878 | 8.2 |
| Hydro | 1449 | 2313 | 3380 | 2961 | 3071 | 3202 | 3039 | 1.6 |
| <i>of which: pumped storage</i> | 288 | 555 | 591 | 1052 | 1276 | 1202 | 1170 | 4.5 |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar photovoltaic | - | - | 616 | 2123 | 2264 | 2131 | 2188 | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Tide, wave, ocean | - | - | - | - | - | - | - | - |
| Wind | - | 1 | 335 | 477 | 573 | 497 | 591 | 45.6 |
| Industrial waste | - | - | 3 | 10 | 20 | 15 | 15 | - |
| Municipal waste renew. | - | 8 | 35 | 88 | 87 | 99 | 114 | 16.9 |
| Municipal waste non-renew. | - | 6 | 24 | 59 | 58 | 65 | 76 | 16.1 |
| Solid biofuels | - | 382 | 1492 | 1992 | 2092 | 2067 | 2216 | 10.9 |
| Biogases | - | 135 | 635 | 2583 | 2612 | 2590 | 2639 | 19.1 |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| of which: | | | | | | | | |
| Electricity only plants | 1449 | 2476 | 4978 | 5671 | 6008 | 5894 | .. | - |
| Hydro | 1449 | 2313 | 3380 | 2961 | 3071 | 3202 | .. | - |
| <i>of which: pumped storage</i> | 288 | 555 | 591 | 1052 | 1276 | 1202 | .. | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar photovoltaic | - | - | 616 | 2123 | 2264 | 2131 | .. | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Tide, wave, ocean | - | - | - | - | - | - | - | - |
| Wind | - | 1 | 335 | 477 | 573 | 497 | .. | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | - | - | - | - | - |
| Solid biofuels | - | 135 | 594 | 54 | 49 | 14 | .. | - |
| Biogases | - | 27 | 53 | 56 | 51 | 50 | .. | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| CHP plants | - | 369 | 1542 | 4622 | 4769 | 4772 | .. | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | 3 | 10 | 20 | 15 | .. | - |
| Municipal waste renew. | - | 8 | 35 | 88 | 87 | 99 | .. | - |
| Municipal waste non-renew. | - | 6 | 24 | 59 | 58 | 65 | .. | - |
| Solid biofuels | - | 247 | 898 | 1938 | 2043 | 2053 | .. | - |
| Biogases | - | 108 | 582 | 2527 | 2561 | 2540 | .. | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |

1. **Total electricity** includes the electricity produced from industrial waste, non-renewable municipal waste and pumped storage. Electricity from renewable sources does *not* include the electricity produced from industrial waste, non-renewable municipal waste and pumped storage production.

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Table 5A. Heat production¹ from renewable and waste sources in the transformation sector (TJ)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|----------------------------|------------|-------------|-------------|-------------|-------------|--------------|--------------|-------------------------------------|
| Total heat | 299 | 6159 | 4737 | 9317 | 9991 | 10233 | 10813 | 3.4 |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | 7 | 82 | 260 | 314 | 350 | 405 | 314 | 8.2 |
| Municipal waste renew. | 175 | 1485 | 1058 | 1570 | 1562 | 1501 | 1699 | 0.8 |
| Municipal waste non-renew. | 117 | 989 | 705 | 1047 | 1042 | 1000 | 1133 | 0.8 |
| Solid biofuels | - | 3219 | 2458 | 5821 | 6414 | 6727 | 6916 | 4.6 |
| Biogases | - | 384 | 256 | 565 | 623 | 600 | 751 | 4.0 |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| <i>of which:</i> | | | | | | | | |
| CHP plants | - | 4498 | 3583 | 8197 | 8527 | 9006 | .. | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | 9 | 98 | 141 | 134 | .. | - |
| Municipal waste renew. | - | 753 | 1058 | 1570 | 1562 | 1501 | .. | - |
| Municipal waste non-renew. | - | 501 | 705 | 1047 | 1042 | 1000 | .. | - |
| Solid biofuels | - | 2934 | 1555 | 4917 | 5159 | 5771 | .. | - |
| Biogases | - | 310 | 256 | 565 | 623 | 600 | .. | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| Heat only plants | 299 | 1661 | 1154 | 1120 | 1464 | 1227 | .. | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | 7 | 82 | 251 | 216 | 209 | 271 | .. | - |
| Municipal waste renew. | 175 | 732 | - | - | - | - | - | - |
| Municipal waste non-renew. | 117 | 488 | - | - | - | - | - | - |
| Solid biofuels | - | 285 | 903 | 904 | 1255 | 956 | .. | - |
| Biogases | - | 74 | - | - | - | - | - | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |

1. Waste heat and heat production from heat pumps are not included and are reported separately in Table 5B.

Table 5B. Heat production from heat pumps and waste heat (TJ)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|----------------------------|----------|----------|-------------|-------------|-------------|-------------|-------------|-------------------------------------|
| Total heat | - | - | 1616 | 1724 | 1750 | 2394 | 2490 | - |
| Heat pumps ¹ | - | - | 94 | 77 | 68 | 60 | 62 | - |
| (-) Input to heat pumps | - | - | 29 | 22 | 22 | 22 | 22 | - |
| Other sources ² | - | - | 1551 | 1669 | 1704 | 2356 | 2450 | - |

1. Installations producing heat for own use are not included.

2. Refers to production from hydrogen, purchased steam from industry, and waste heat.

Source: IEA/OECD *Electricity Statistics*.

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Table 6. Renewable and waste balance for 2016

| thousand tonnes of oil equivalent | Hydro ¹ | Wind | Tide wave ocean | Solar PV | Geo-thermal | Solar thermal | Industrial waste | Mun. waste renew. |
|------------------------------------|--------------------|------------|-----------------|-------------|-------------|---------------|------------------|-------------------|
| Production | 172 | 43 | - | 183 | - | 19 | 247 | 86 |
| Imports | - | - | - | - | - | - | - | - |
| Exports | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| TPES | 172 | 43 | - | 183 | - | 19 | 247 | 86 |
| Statistical differences | - | - | - | - | - | - | - | - |
| Main activity electricity plants | -121 | -43 | - | -183 | - | - | - | - |
| Autoproducer electricity plants | -51 | - | - | - | - | - | - | - |
| Main activity CHP plants | - | - | - | - | - | - | -3 | -20 |
| Autoproducer CHP plants | - | - | - | - | - | - | -4 | -44 |
| Main heat plants | - | - | - | - | - | - | - | - |
| Autoproducer heat plants | - | - | - | - | - | - | -9 | - |
| Charcoal production plants | - | - | - | - | - | - | - | - |
| Other transformation | - | - | - | - | - | - | - | - |
| Energy Industry own use | - | - | - | - | - | - | - | - |
| Losses | - | - | - | - | - | - | - | - |
| TFC | - | - | - | - | - | 19 | 232 | 22 |
| Industry | - | - | - | - | - | - | 217 | - |
| Iron and steel | - | - | - | - | - | - | - | - |
| Chemical and petrochemical | - | - | - | - | - | - | 3 | - |
| Non-ferrous metals | - | - | - | - | - | - | - | - |
| Non-metallc minerals | - | - | - | - | - | - | 214 | - |
| Transport equipment | - | - | - | - | - | - | - | - |
| Machinery | - | - | - | - | - | - | - | - |
| Mining and quarrying | - | - | - | - | - | - | - | - |
| Food and tobacco | - | - | - | - | - | - | - | - |
| Paper, pulp and print | - | - | - | - | - | - | - | - |
| Wood and wood products | - | - | - | - | - | - | - | - |
| Construction | - | - | - | - | - | - | - | - |
| Textile and leather | - | - | - | - | - | - | - | - |
| Non-specified | - | - | - | - | - | - | - | - |
| Transport | - | - | - | - | - | - | - | - |
| Road | - | - | - | - | - | - | - | - |
| Other | - | - | - | - | - | - | - | - |
| Other | - | - | - | - | - | 19 | 15 | 22 |
| Residential | - | - | - | - | - | 15 | - | - |
| Commercial and public services | - | - | - | - | - | 4 | 15 | 22 |
| Agriculture/forestry | - | - | - | - | - | - | - | - |
| Fishing | - | - | - | - | - | - | - | - |
| Non-specified | - | - | - | - | - | - | - | - |
| Electricity generated - GWh | 2000 | 497 | - | 2131 | - | - | 15 | 99 |
| <i>Electricity plants</i> | 2000 | 497 | - | 2131 | - | - | - | - |
| <i>CHP plants</i> | - | - | - | - | - | - | 15 | 99 |
| Heat generated - TJ | - | - | - | - | - | - | 405 | 1501 |
| <i>CHP plants</i> | - | - | - | - | - | - | 134 | 1501 |
| <i>Heat plants</i> | - | - | - | - | - | - | 271 | - |

1. Hydro does not include pumped hydro.

Source: IEA/OECD *World Energy Balances*.

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Table 6. Renewable and waste balance for 2016 (continued)

| Mun. waste non-ren. | Wood/wood waste | Charcoal | Bio-gases | Bio-gasoline | Bio-diesel | Other liquid biofuels | Total renew. & waste sources ² | Share in total energy sources ³ |
|---------------------|-----------------|----------|-------------|--------------|------------|-----------------------|---|--|
| 57 | 2970 | - | 601 | 75 | 132 | - | 4585 | 16.7% |
| - | 209 | - | - | 25 | 197 | - | 431 | 2.0% |
| - | -272 | - | - | -46 | -80 | - | -398 | 5.0% |
| - | - | - | - | -5 | 4 | - | -1 | x |
| 57 | 2906 | - | 601 | 49 | 253 | - | 4616 | 11.1% |
| - | - | - | - | -1 | - | - | -1 | x |
| - | -1 | - | -8 | - | - | - | -356 | x |
| - | -6 | - | -6 | - | - | - | -63 | x |
| -13 | -426 | - | -18 | - | - | - | -480 | x |
| -29 | -167 | - | -405 | - | - | - | -649 | x |
| - | -19 | - | - | - | - | - | -19 | x |
| - | -9 | - | - | - | - | - | -18 | x |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| 15 | 2278 | - | 165 | 48 | 253 | - | 3032 | 11.9% |
| - | 475 | - | 6 | - | - | - | 698 | 10.7% |
| - | - | - | - | - | - | - | - | - |
| - | 1 | - | - | - | - | - | 4 | 0.4% |
| - | - | - | - | - | - | - | - | - |
| - | 2 | - | - | - | - | - | 216 | 19.1% |
| - | - | - | - | - | - | - | - | - |
| - | 3 | - | - | - | - | - | 3 | 0.4% |
| - | - | - | - | - | - | - | - | - |
| - | 8 | - | 3 | - | - | - | 11 | 1.9% |
| - | 286 | - | 3 | - | - | - | 289 | 48.7% |
| - | 168 | - | - | - | - | - | 168 | 73.4% |
| - | 3 | - | - | - | - | - | 3 | 1.5% |
| - | - | - | - | - | - | - | - | - |
| - | 5 | - | - | - | - | - | 5 | 1.3% |
| - | - | - | - | 48 | 253 | - | 301 | 4.7% |
| - | - | - | - | 48 | 246 | - | 294 | 4.8% |
| - | - | - | - | - | 7 | - | 7 | 2.6% |
| 15 | 1802 | - | 158 | - | - | - | 2031 | 18.9% |
| - | 1777 | - | - | - | - | - | 1792 | 25.6% |
| 15 | 16 | - | 21 | - | - | - | 93 | 3.0% |
| - | 10 | - | 137 | - | - | - | 147 | 23.0% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| 65 | 2067 | - | 2590 | - | - | - | 9464 | 11.5% |
| - | 14 | - | 50 | - | - | - | 4692 | 12.0% |
| 65 | 2053 | - | 2540 | - | - | - | 4772 | 11.1% |
| 1000 | 6727 | - | 600 | - | - | - | 10233 | 8.0% |
| 1000 | 5771 | - | 600 | - | - | - | 9006 | 8.9% |
| - | 956 | - | - | - | - | - | 1227 | 4.4% |

2. Total includes non-renewable waste.

3. Share of renewables on TFC excludes electricity and heat generated from renewable sources.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|--|------|------|------|------|------|-------|-------|---|
| Geothermal (TJ) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Solar thermal (TJ) | | | | | | | | |
| Production | - | - | 366 | 691 | 742 | 787 | 837 | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | 366 | 691 | 742 | 787 | 837 | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | 366 | 691 | 742 | 787 | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | 366 | 691 | 742 | 787 | .. | - |
| Industrial waste (TJ) | | | | | | | | |
| Production | 283 | 2370 | 6659 | 8194 | 9382 | 10361 | 10500 | 9.7 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 283 | 2370 | 6659 | 8194 | 9382 | 10361 | 10500 | 9.7 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | 9 | 109 | 498 | 554 | 753 | 661 | .. | 11.9 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 274 | 2261 | 6161 | 7640 | 8629 | 9700 | .. | 9.5 |
| <i>Industry</i> | 258 | 2031 | 5661 | 7012 | 7918 | 9077 | .. | 9.8 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 16 | 230 | 500 | 628 | 711 | 623 | .. | 6.4 |
| Municipal waste - renewables (TJ) | | | | | | | | |
| Production | 394 | 1914 | 2625 | 3453 | 3342 | 3581 | 4082 | 4.0 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 394 | 1914 | 2625 | 3453 | 3342 | 3581 | 4082 | 4.0 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | 327 | 1726 | 1744 | 2551 | 2372 | 2664 | .. | 2.7 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 67 | 188 | 881 | 902 | 970 | 917 | .. | 10.4 |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 67 | 188 | 881 | 902 | 970 | 917 | .. | 10.4 |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics (continued)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|--|-------|-------|--------|--------|--------|--------|--------|---|
| Municipal waste - non-renewables (TJ) | | | | | | | | |
| Production | 263 | 1275 | 1749 | 2302 | 2228 | 2387 | 2721 | 4.0 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 263 | 1275 | 1749 | 2302 | 2228 | 2387 | 2721 | 4.0 |
| Statistical differences | - | - | - | - | - | - | .. | .. |
| Transformation processes | 218 | 1150 | 1162 | 1700 | 1581 | 1776 | .. | 2.8 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | .. |
| Final energy consumption | 45 | 125 | 587 | 602 | 647 | 611 | .. | 10.4 |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 45 | 125 | 587 | 602 | 647 | 611 | .. | 10.4 |
| Solid Biofuel excluding charcoal (TJ) | | | | | | | | |
| Production | 43184 | 55256 | 102385 | 118981 | 123694 | 124330 | 129303 | 5.2 |
| Net imports ¹ | - | - | -4883 | -3298 | -3375 | -2665 | -2500 | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 43184 | 55256 | 97502 | 115683 | 120319 | 121665 | 126803 | 5.1 |
| Statistical differences | - | - | - | - | - | - | .. | .. |
| Transformation processes | - | 7974 | 16593 | 23756 | 26065 | 26307 | .. | 7.7 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | .. |
| Final energy consumption | 43184 | 47282 | 80909 | 91927 | 94254 | 95358 | .. | 4.5 |
| <i>Industry</i> | - | 5346 | 17004 | 18763 | 19831 | 19904 | .. | 8.6 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 43184 | 41936 | 63905 | 73164 | 74423 | 75454 | .. | 3.7 |
| Charcoal (kt) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | .. |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | .. |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Biogases (TJ) | | | | | | | | |
| Production | - | 1509 | 7398 | 25457 | 25681 | 25161 | 25391 | 19.2 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | 1509 | 7398 | 25457 | 25681 | 25161 | 25391 | 19.2 |
| Statistical differences | - | - | - | - | - | - | .. | .. |
| Transformation processes | - | 1427 | 5114 | 19693 | 19813 | 18272 | .. | 17.3 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | .. |
| Final energy consumption | - | 82 | 2284 | 5764 | 5868 | 6889 | .. | 31.9 |
| <i>Industry</i> | - | 19 | 50 | 190 | 216 | 267 | .. | 18.0 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | 63 | 2234 | 5574 | 5652 | 6622 | .. | 33.8 |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics (continued)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|-----------------------------------|------|------|------|------|------|------|-------|---|
| Biogasoline (kt) | | | | | | | | |
| Production | - | - | 95 | 104 | 105 | 116 | 102 | - |
| Net imports ¹ | - | - | -2 | -1 | -16 | -32 | -10 | - |
| Stock changes | - | - | -2 | -1 | 9 | -8 | - | - |
| Gross consumption | - | - | 91 | 102 | 98 | 76 | 92 | - |
| Statistical differences | - | - | -1 | - | - | -1 | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | 90 | 102 | 98 | 75 | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | 90 | 102 | 98 | 75 | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Biodiesel (kt) | | | | | | | | |
| Production | - | 67 | 198 | 219 | 168 | 149 | 157 | 5.1 |
| Net imports ¹ | - | 3 | -1 | 72 | 96 | 133 | 133 | 26.7 |
| Stock changes | - | - | - | -6 | - | 4 | -2 | - |
| Gross consumption | - | 70 | 197 | 285 | 264 | 286 | 288 | 9.2 |
| Statistical differences | - | - | -1 | -1 | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | 70 | 196 | 284 | 264 | 286 | .. | 9.2 |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | 70 | 196 | 284 | 264 | 286 | .. | 9.2 |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Other liquid biofuels (kt) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Figure 1. Contribution of renewables in 1990

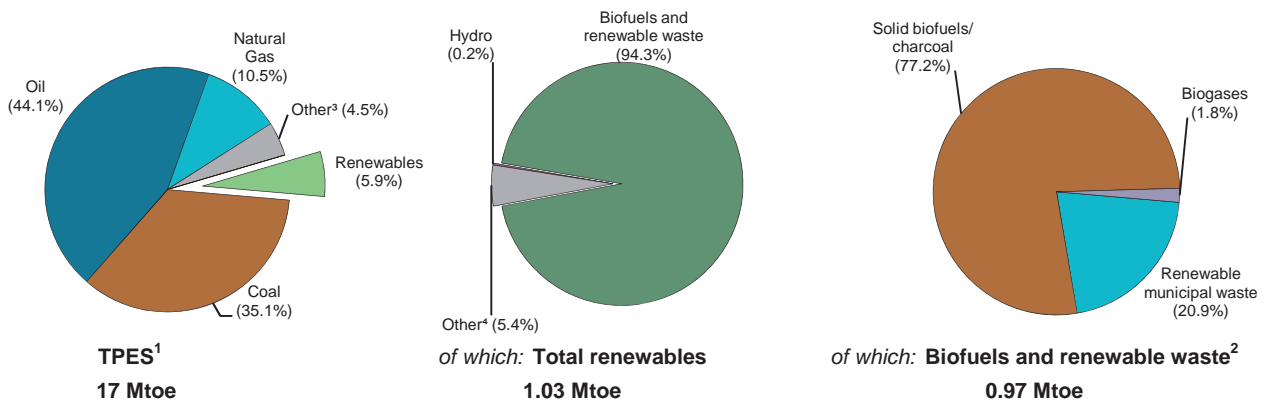


Figure 2. Contribution of renewables in 2017 provisional

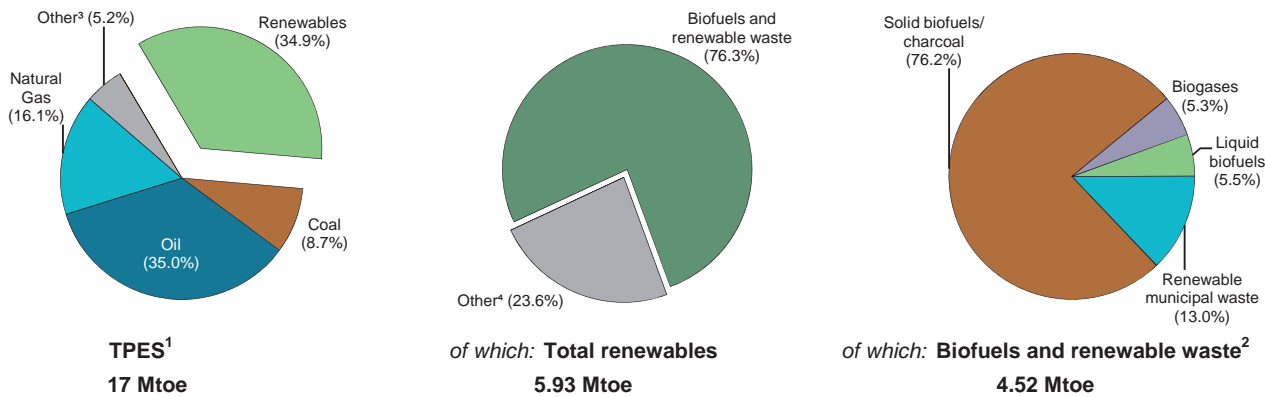
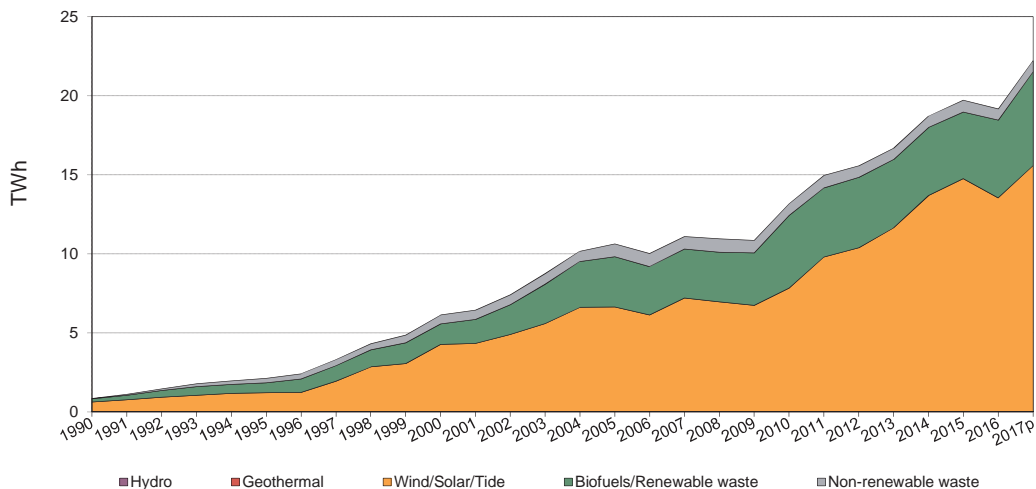


Figure 3. Electricity production by renewables and waste energy source



1. Total primary energy supply includes electricity trade.
 2. Biofuels and renewable waste include solid biofuels, liquid biofuels, biogases, and renewable municipal waste.
 3. Includes non-renewable municipal waste, industrial waste, peat, shale oil, electricity trade, and other sources of primary energy. (In the case of negative values, the net exports of electricity are greater than the other products in this category).
 4. Includes geothermal, solar, wind and tide.

Note: Totals may not sum due to rounding.
Source: IEA/OECD World Energy Balances.

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Table 1. Energy supply, GDP and population

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|---|--------|--------|--------|--------|--------|--------|--------|--|
| TPES (Mtoe) | 17.36 | 18.65 | 19.49 | 16.20 | 16.17 | 16.54 | 16.98 | -0.5 |
| of which: Renewables (Mtoe) ¹ | 1.03 | 1.80 | 3.92 | 4.53 | 4.82 | 5.01 | 5.93 | 7.3 |
| Renewables/TPES(%) | 5.9 | 9.6 | 20.1 | 28.0 | 29.8 | 30.3 | 34.9 | 7.9 |
| GDP (billion 2010 US dollars) | 229.13 | 298.22 | 322.00 | 335.44 | 340.83 | 347.52 | 355.31 | 1.0 |
| TPES/GDP ² | 0.08 | 0.06 | 0.06 | 0.05 | 0.05 | 0.05 | 0.05 | -1.6 |
| TPES/GDP (year 2010 = 100) | 125 | 103 | 100 | 80 | 78 | 79 | 79 | -1.6 |
| Population (millions) | 5.14 | 5.34 | 5.55 | 5.64 | 5.68 | 5.73 | 5.77 | 0.5 |
| TPES/population (toe per capita) | 3.38 | 3.49 | 3.51 | 2.87 | 2.85 | 2.89 | 2.94 | -1.0 |
| Electricity generation (TWh) ³ | 26.0 | 36.1 | 38.9 | 32.2 | 28.9 | 30.5 | 30.4 | -1.0 |
| of which: Renewables (TWh) ^{1,3} | 0.83 | 5.57 | 12.43 | 17.99 | 18.97 | 18.46 | 21.51 | 8.3 |
| Renew./Total Elec.(%) ^{1,4} | 3.2 | 15.5 | 32.0 | 55.9 | 65.5 | 60.5 | 70.7 | 9.4 |
| Road energy consumption (Mtoe) | 3.1 | 3.7 | 4.0 | 3.7 | 3.8 | 3.8 | .. | .. |
| of which: Liquid biofuels (Mtoe) | - | - | 0.03 | 0.23 | 0.23 | 0.24 | .. | .. |
| Liq. biofuels/road tr.(%) ⁵ | - | - | 0.7 | 6.3 | 6.2 | 6.2 | - | - |

1. Renewables do not include industrial waste, non-renewable municipal waste and pumped storage production.

2. In units of toe per thousand 2010 US dollars.

3. Electricity generation = gross production - amount of electricity produced in pumped storage plants.

4. Electricity share generated from renewables over the total electricity production.

5. Energy from liquid biofuels consumed in road transport over the total energy consumed in road transport.

Source: IEA/OECD *World Energy Balances* and OECD *Main Economic Indicators*.

Table 2. Net generating capacity of renewable and waste sources (MWe)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | Average annual percent change 00-16 |
|---|------------|-------------|-------------|-------------|-------------|-------------|--|
| Total capacity | 396 | 2758 | 5065 | 6913 | 7274 | 7580 | 6.5 |
| Hydro | 10 | 10 | 9 | 9 | 7 | 10 | - |
| Hydro <1MW | 6 | 6 | 5 | 5 | 3 | 4 | -2.5 |
| Hydro 1-10MW | 4 | 4 | 4 | 4 | 4 | 6 | 2.6 |
| Hydro 10+MW | - | - | - | - | - | - | - |
| Mixed plants | - | - | - | - | - | - | - |
| Pure pumped storage | - | - | - | - | - | - | - |
| Geothermal | - | - | - | - | - | - | - |
| Solar photovoltaic | - | 1 | 7 | 607 | 782 | 851 | 52.4 |
| Solar thermal | - | - | - | - | - | - | - |
| Tide, wave, ocean | - | - | - | - | - | - | - |
| Wind | 326 | 2390 | 3802 | 4887 | 5076 | 5245 | 5.0 |
| Industrial waste | - | - | - | - | - | - | - |
| Municipal waste | - | 230 | 299 | 325 | 331 | 334 | 2.4 |
| Solid biofuels | 40 | 86 | 868 | 989 | 973 | 1030 | 16.8 |
| Biogases | 20 | 41 | 80 | 96 | 104 | 110 | 6.4 |
| Liquid biofuels | - | - | - | - | 1 | - | - |
| Solar collectors surface (1000 m ²) | 57 | 243 | 480 | 810 | 1016 | 1369 | 11.4 |
| Cap. of solar collectors (MW _{th}) ¹ | 40 | 170 | 336 | 567 | 711 | 958 | 11.4 |

1. Converted at 0.7 kW_{th}/m² of solar collector area, as estimated by the IEA Solar Heating & Cooling Programme.

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Table 3. Capacity factors (%)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 |
|--|--------------|--------------|--------------|--------------|--------------|--------------|
| Total plants¹ | 24.44 | 25.37 | 29.70 | 30.90 | 30.95 | 28.87 |
| Hydro | 31.96 | 34.47 | 26.18 | 19.16 | 29.40 | 22.00 |
| <i>of which: <1MW</i> | 29.49 | 27.78 | 19.64 | 8.15 | 16.86 | 14.46 |
| <i>of which: 1-10MW</i> | 35.67 | 44.52 | 34.36 | 32.92 | 38.81 | 27.03 |
| <i>of which: 10+MW</i> | - | - | - | - | - | - |
| <i>of which: pure pumped storage²</i> | - | - | - | - | - | - |
| Geothermal | - | - | - | - | - | - |
| Solar photovoltaic | - | 13.70 | 9.83 | 11.20 | 8.82 | 9.98 |
| Solar thermal | - | - | - | - | - | - |
| Tide, wave and ocean | - | - | - | - | - | - |
| Wind | 21.37 | 20.26 | 23.45 | 30.55 | 31.78 | 27.82 |
| Industrial waste | - | - | - | - | - | - |
| Municipal waste | - | 61.33 | 63.37 | 56.53 | 57.60 | 53.63 |
| Solid biofuels | 30.82 | 54.62 | 43.71 | 34.15 | 32.88 | 38.58 |
| Biogases | 22.58 | 58.07 | 50.99 | 54.48 | 53.90 | 59.48 |
| Biodiesels | - | - | - | - | - | - |
| Other liquid biofuels | - | - | - | - | - | - |

1. The capacity factor is defined as: the annual gross electricity generation divided by the reported net capacity times 365 (days/year) times 24 (hours/day).

2. In case a country has at least one mixed hydro plants, it is impossible to calculate capacity factor thus it is shown as 'not applicable'.

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Table 4. Gross electricity production from renewable and waste sources (GWh)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|--------------------------------------|------------|-------------|--------------|--------------|--------------|--------------|--------------|---|
| Total electricity¹ | 848 | 6128 | 13176 | 18716 | 19719 | 19168 | 22211 | 7.9 |
| Hydro | 28 | 30 | 21 | 15 | 18 | 19 | 15 | -4.0 |
| <i>of which: pumped storage</i> | - | - | - | - | - | - | - | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar photovoltaic | - | 1 | 6 | 596 | 604 | 744 | 789 | 48.1 |
| Solar thermal | - | - | - | - | - | - | - | - |
| Tide, wave, ocean | - | - | - | - | - | - | - | - |
| Wind | 610 | 4241 | 7809 | 13079 | 14133 | 12782 | 14777 | 7.6 |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | 39 | 680 | 912 | 886 | 919 | 863 | 852 | 1.3 |
| Municipal waste non-renew. | 23 | 556 | 747 | 724 | 751 | 706 | 697 | 1.3 |
| Solid biofuels | 108 | 411 | 3324 | 2958 | 2803 | 3481 | 4524 | 15.2 |
| Biogases | 40 | 209 | 357 | 458 | 491 | 573 | 557 | 5.9 |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| of which: | | | | | | | | |
| Electricity only plants | 638 | 4275 | 7837 | 13691 | 14756 | 13546 | .. | - |
| Hydro | 28 | 30 | 21 | 15 | 18 | 19 | .. | - |
| <i>of which: pumped storage</i> | - | - | - | - | - | - | - | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar photovoltaic | - | 1 | 6 | 596 | 604 | 744 | .. | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Tide, wave, ocean | - | - | - | - | - | - | - | - |
| Wind | 610 | 4241 | 7809 | 13079 | 14133 | 12782 | .. | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | - | - | - | - | - |
| Solid biofuels | - | - | - | - | - | - | - | - |
| Biogases | - | 3 | 1 | 1 | 1 | 1 | .. | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| CHP plants | 210 | 1853 | 5339 | 5025 | 4963 | 5622 | .. | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | 39 | 680 | 912 | 886 | 919 | 863 | .. | - |
| Municipal waste non-renew. | 23 | 556 | 747 | 724 | 751 | 706 | .. | - |
| Solid biofuels | 108 | 411 | 3324 | 2958 | 2803 | 3481 | .. | - |
| Biogases | 40 | 206 | 356 | 457 | 490 | 572 | .. | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |

1. **Total electricity** includes the electricity produced from industrial waste, non-renewable municipal waste and pumped storage. Electricity from renewable sources does *not* include the electricity produced from industrial waste, non-renewable municipal waste and pumped storage production.

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Table 5A. Heat production¹ from renewable and waste sources in the transformation sector (TJ)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|----------------------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|-------------------------------------|
| Total heat | 19496 | 31109 | 63621 | 71230 | 75274 | 80818 | 88010 | 6.3 |
| Geothermal | 24 | 29 | 106 | 83 | 70 | 112 | 180 | 11.3 |
| Solar thermal | 6 | 24 | 143 | 736 | 956 | 1483 | 1690 | 28.4 |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | 6814 | 10574 | 12989 | 13927 | 14974 | 15379 | 15498 | 2.3 |
| Municipal waste non-renew. | 5150 | 8651 | 10627 | 11395 | 12251 | 12582 | 12680 | 2.3 |
| Solid biofuels | 7373 | 10889 | 36923 | 42340 | 44104 | 47584 | 56106 | 10.1 |
| Biogases | 129 | 903 | 1148 | 2071 | 2411 | 3439 | 1701 | 3.8 |
| Liquid biofuels | - | 39 | 1685 | 678 | 508 | 239 | 155 | 8.5 |
| <i>of which:</i> | | | | | | | | |
| CHP plants | 884 | 16997 | 42729 | 49386 | 51408 | 55111 | .. | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | 261 | 7214 | 11593 | 12557 | 13341 | 13456 | .. | - |
| Municipal waste non-renew. | 199 | 5903 | 9485 | 10274 | 10915 | 11009 | .. | - |
| Solid biofuels | 319 | 3189 | 20651 | 24782 | 25212 | 27798 | .. | - |
| Biogases | 105 | 691 | 1000 | 1773 | 1940 | 2848 | .. | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| Heat only plants | 18612 | 14112 | 20892 | 21844 | 23866 | 25707 | .. | - |
| Geothermal | 24 | 29 | 106 | 83 | 70 | 112 | .. | - |
| Solar thermal | 6 | 24 | 143 | 736 | 956 | 1483 | .. | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | 6553 | 3360 | 1396 | 1370 | 1633 | 1923 | .. | - |
| Municipal waste non-renew. | 4951 | 2748 | 1142 | 1121 | 1336 | 1573 | .. | - |
| Solid biofuels | 7054 | 7700 | 16272 | 17558 | 18892 | 19786 | .. | - |
| Biogases | 24 | 212 | 148 | 298 | 471 | 591 | .. | - |
| Liquid biofuels | - | 39 | 1685 | 678 | 508 | 239 | .. | - |

1. Waste heat and heat production from heat pumps are not included and are reported separately in Table 5B.

Table 5B. Heat production from heat pumps and waste heat (TJ)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|----------------------------|----------|-------------|-------------|-------------|-------------|-------------|-------------|-------------------------------------|
| Total heat | - | 3624 | 2481 | 2938 | 3192 | 3522 | 3851 | 0.4 |
| Heat pumps ¹ | - | 78 | 38 | 109 | 158 | 181 | 180 | 5.0 |
| (-) Input to heat pumps | - | 76 | 36 | 47 | 47 | 50 | 47 | -2.8 |
| Other sources ² | - | 3622 | 2479 | 2876 | 3081 | 3391 | 3718 | 0.2 |

1. Installations producing heat for own use are not included.

2. Refers to production from hydrogen, purchased steam from industry, and waste heat.

Source: IEA/OECD *Electricity Statistics*.

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Table 6. Renewable and waste balance for 2016

| thousand tonnes of oil equivalent | Hydro ¹ | Wind | Tide wave ocean | Solar PV | Geo-thermal | Solar thermal | Industrial waste | Mun. waste renew. |
|------------------------------------|--------------------|--------------|-----------------|------------|-------------|---------------|------------------|-------------------|
| Production | 2 | 1099 | - | 64 | 5 | 49 | - | 460 |
| Imports | - | - | - | - | - | - | - | 72 |
| Exports | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| TPES | 2 | 1099 | - | 64 | 5 | 49 | - | 532 |
| Statistical differences | - | - | - | - | - | - | - | - |
| Main activity electricity plants | -2 | -1099 | - | - | - | - | - | - |
| Autoproducer electricity plants | - | - | - | -64 | - | - | - | - |
| Main activity CHP plants | - | - | - | - | - | - | - | -118 |
| Autoproducer CHP plants | - | - | - | - | - | - | - | -334 |
| Main heat plants | - | - | - | - | -5 | -35 | - | -7 |
| Autoproducer heat plants | - | - | - | - | - | - | - | -46 |
| Charcoal production plants | - | - | - | - | - | - | - | - |
| Other transformation | - | - | - | - | - | - | - | - |
| Energy Industry own use | - | - | - | - | - | - | - | - |
| Losses | - | - | - | - | - | - | - | - |
| TFC | - | - | - | - | - | 14 | - | 27 |
| Industry | - | - | - | - | - | - | - | 20 |
| Iron and steel | - | - | - | - | - | - | - | - |
| Chemical and petrochemical | - | - | - | - | - | - | - | - |
| Non-ferrous metals | - | - | - | - | - | - | - | - |
| Non-metallc minerals | - | - | - | - | - | - | - | 19 |
| Transport equipment | - | - | - | - | - | - | - | - |
| Machinery | - | - | - | - | - | - | - | - |
| Mining and quarrying | - | - | - | - | - | - | - | - |
| Food and tobacco | - | - | - | - | - | - | - | 1 |
| Paper, pulp and print | - | - | - | - | - | - | - | - |
| Wood and wood products | - | - | - | - | - | - | - | - |
| Construction | - | - | - | - | - | - | - | - |
| Textile and leather | - | - | - | - | - | - | - | - |
| Non-specified | - | - | - | - | - | - | - | - |
| Transport | - | - | - | - | - | - | - | - |
| Road | - | - | - | - | - | - | - | - |
| Other | - | - | - | - | - | - | - | - |
| Other | - | - | - | - | - | 14 | - | 8 |
| Residential | - | - | - | - | - | 12 | - | - |
| Commercial and public services | - | - | - | - | - | 2 | - | 8 |
| Agriculture/forestry | - | - | - | - | - | - | - | - |
| Fishing | - | - | - | - | - | - | - | - |
| Non-specified | - | - | - | - | - | - | - | - |
| Electricity generated - GWh | 19 | 12782 | - | 744 | - | - | - | 863 |
| <i>Electricity plants</i> | 19 | 12782 | - | 744 | - | - | - | - |
| <i>CHP plants</i> | - | - | - | - | - | - | - | 863 |
| Heat generated - TJ | - | - | - | - | 112 | 1483 | - | 15379 |
| <i>CHP plants</i> | - | - | - | - | - | - | - | 13456 |
| <i>Heat plants</i> | - | - | - | - | 112 | 1483 | - | 1923 |

1. Hydro does not include pumped hydro.

Source: IEA/OECD *World Energy Balances*.

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Table 6. Renewable and waste balance for 2016 (continued)

| Mun. waste non-ren. | Wood/wood waste | Charcoal | Bio-gases | Bio-gasoline | Bio-diesel | Other liquid biofuels | Total renew. & waste sources ² | Share in total energy sources ³ |
|---------------------|-----------------|----------|-------------|--------------|------------|-----------------------|---|--|
| 376 | 1588 | - | 218 | - | c | 6 | 3867 | 25.7% |
| 59 | 1205 | - | - | c | 254 | - | 1590 | 8.7% |
| - | - | - | - | c | -29 | - | -29 | 0.2% |
| - | - | - | - | c | 13 | - | 13 | x |
| 435 | 2793 | - | 218 | - | 239 | 6 | 5442 | 32.9% |
| - | - | - | 2 | - | -4 | 1 | -1 | x |
| - | - | - | - | - | - | - | -1101 | x |
| - | - | - | - | - | - | - | -64 | x |
| -96 | -1070 | - | -92 | - | - | - | -1376 | x |
| -274 | -24 | - | -35 | - | - | - | -667 | x |
| -5 | -467 | - | -14 | - | - | -6 | -539 | x |
| -37 | -22 | - | -1 | - | - | -1 | -107 | x |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | -4 | - | - | - | -4 | x |
| - | - | - | - | - | - | - | - | - |
| 22 | 1210 | - | 74 | - | 236 | - | 1583 | 11.5% |
| 16 | 113 | - | 35 | - | - | - | 184 | 8.6% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| 15 | 2 | - | - | - | - | - | 36 | 7.8% |
| - | 1 | - | - | - | - | - | 1 | 6.2% |
| - | 17 | - | - | - | - | - | 17 | 7.7% |
| - | 30 | - | - | - | - | - | 30 | 39.8% |
| - | - | - | 34 | - | - | - | 35 | 5.8% |
| - | 3 | - | - | - | - | - | 3 | 4.1% |
| - | 48 | - | - | - | - | - | 48 | 65.8% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | 12 | - | - | - | - | - | 12 | 11.3% |
| - | - | - | - | - | 236 | - | 236 | 5.7% |
| - | - | - | - | c | 236 | - | 236 | 6.2% |
| - | - | - | - | c | - | - | c | c |
| 6 | 1097 | - | 40 | - | - | - | 1165 | 16.2% |
| - | 1012 | - | 19 | - | - | - | 1043 | 23.4% |
| 6 | 33 | - | 16 | - | - | - | 65 | 3.3% |
| - | 52 | - | 5 | - | - | - | 57 | 9.1% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| 706 | 3481 | - | 573 | - | - | - | 19168 | 62.8% |
| - | - | - | 1 | - | - | - | 13546 | 99.9% |
| 706 | 3481 | - | 572 | - | - | - | 5622 | 33.1% |
| 12582 | 47584 | - | 3439 | - | - | 239 | 80818 | 59.1% |
| 11009 | 27798 | - | 2848 | - | - | - | 55111 | 60.5% |
| 1573 | 19786 | - | 591 | - | - | 239 | 25707 | 56.4% |

2. Total includes non-renewable waste.

3. Share of renewables on TFC excludes electricity and heat generated from renewable sources.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|--|------|-------|-------|-------|-------|-------|-------|---|
| Geothermal (TJ) | | | | | | | | |
| Production | 48 | 58 | 212 | 166 | 140 | 225 | 360 | 8.8 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 48 | 58 | 212 | 166 | 140 | 225 | 360 | 8.8 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | 48 | 58 | 212 | 166 | 140 | 225 | .. | 8.8 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Solar thermal (TJ) | | | | | | | | |
| Production | 100 | 335 | 657 | 1300 | 1538 | 2071 | 2287 | 12.1 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 100 | 335 | 657 | 1300 | 1538 | 2071 | 2287 | 12.1 |
| Statistical differences | - | - | - | 1 | -1 | 1 | .. | - |
| Transformation processes | 6 | 24 | 143 | 736 | 956 | 1483 | .. | 29.4 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 94 | 311 | 514 | 565 | 581 | 589 | .. | 4.1 |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 94 | 311 | 514 | 565 | 581 | 589 | .. | 4.1 |
| Industrial waste (TJ) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Municipal waste - renewables (TJ) | | | | | | | | |
| Production | 8524 | 16715 | 20788 | 19399 | 18944 | 19239 | 21211 | 0.9 |
| Net imports ¹ | - | - | - | 1899 | 2886 | 3020 | 3330 | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 8524 | 16715 | 20788 | 21298 | 21830 | 22259 | 24541 | 1.8 |
| Statistical differences | 2 | - | 170 | - | 1 | 1 | .. | - |
| Transformation processes | 8007 | 15850 | 19810 | 20067 | 20781 | 21114 | .. | 1.8 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 519 | 865 | 1148 | 1231 | 1050 | 1146 | .. | 1.8 |
| <i>Industry</i> | 16 | 87 | 926 | 822 | 822 | 822 | .. | 15.1 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 503 | 778 | 222 | 409 | 228 | 324 | .. | -5.3 |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics (continued)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|--|-------|-------|--------|--------|--------|--------|--------|-------------------------------------|
| Municipal waste - non-renewables (TJ) | | | | | | | | |
| Production | 6975 | 13676 | 17008 | 15872 | 15500 | 15741 | 17355 | 0.9 |
| Net imports ¹ | - | - | - | 1554 | 2361 | 2471 | 2724 | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 6975 | 13676 | 17008 | 17426 | 17861 | 18212 | 20079 | 1.8 |
| Statistical differences | - | - | 140 | 1 | 1 | 1 | .. | - |
| Transformation processes | 6551 | 12969 | 16207 | 16419 | 17003 | 17275 | .. | 1.8 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 424 | 707 | 941 | 1008 | 859 | 938 | .. | 1.8 |
| <i>Industry</i> | 13 | 71 | 759 | 673 | 673 | 673 | .. | 15.1 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 411 | 636 | 182 | 335 | 186 | 265 | .. | -5.3 |
| Solid Biofuel excluding charcoal (TJ) | | | | | | | | |
| Production | 31472 | 37324 | 71309 | 57463 | 68289 | 66497 | 82073 | 3.7 |
| Net imports ¹ | - | 2466 | 35480 | 43622 | 39915 | 50447 | 62263 | 20.8 |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 31472 | 39790 | 106789 | 101085 | 108204 | 116944 | 144336 | 7.0 |
| Statistical differences | -1 | -1 | - | -1 | 1 | -1 | .. | - |
| Transformation processes | 9033 | 14583 | 57287 | 59182 | 59282 | 66268 | .. | 9.9 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 22438 | 25206 | 49502 | 41902 | 48923 | 50675 | .. | 4.5 |
| <i>Industry</i> | 4715 | 4450 | 6573 | 3711 | 5194 | 4732 | .. | 0.4 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 17723 | 20756 | 42929 | 38191 | 43729 | 45943 | .. | 5.1 |
| Charcoal (kt) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Biogases (TJ) | | | | | | | | |
| Production | 752 | 2912 | 4362 | 5561 | 6415 | 9146 | 10122 | 7.4 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 752 | 2912 | 4362 | 5561 | 6415 | 9146 | 10122 | 7.4 |
| Statistical differences | - | -23 | -19 | 7 | 22 | 68 | .. | - |
| Transformation processes | 528 | 2443 | 3599 | 4685 | 5132 | 5947 | .. | 5.7 |
| Energy industry own use | - | 41 | - | 58 | 104 | 148 | .. | 8.4 |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 224 | 405 | 744 | 825 | 1201 | 3119 | .. | 13.6 |
| <i>Industry</i> | 24 | 12 | 163 | 342 | 534 | 1447 | .. | 34.9 |
| <i>Transport</i> | - | - | - | - | 1 | 4 | .. | - |
| <i>Other</i> | 200 | 393 | 581 | 483 | 666 | 1668 | .. | 9.5 |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics (continued)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|-----------------------------------|------|------|------|------|------|------|-------|---|
| Biogasoline (kt) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | 42 | c | c | c | c | .. |
| Stock changes | - | - | - | c | c | c | c | .. |
| Gross consumption | - | - | 42 | c | c | c | c | .. |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | 42 | c | c | c | .. | .. |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | 42 | c | c | c | .. | .. |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Biodiesel (kt) | | | | | | | | |
| Production | - | - | 77 | c | c | c | c | .. |
| Net imports ¹ | - | - | -76 | 269 | 265 | 252 | 256 | - |
| Stock changes | - | - | - | 5 | - | 15 | 15 | - |
| Gross consumption | - | - | 1 | 274 | 265 | 267 | 271 | - |
| Statistical differences | - | - | 1 | -16 | -6 | -4 | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | 2 | 258 | 259 | 263 | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | 258 | 259 | 263 | .. | - |
| <i>Other</i> | - | - | 2 | - | - | - | .. | - |
| Other liquid biofuels (kt) | | | | | | | | |
| Production | - | 1 | 52 | 21 | 15 | 7 | 7 | 12.9 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | 1 | 52 | 21 | 15 | 7 | 7 | 12.9 |
| Statistical differences | - | - | - | - | - | 1 | .. | - |
| Transformation processes | - | 1 | 52 | 21 | 15 | 8 | .. | 13.9 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

ESTONIA

Figure 1. Contribution of renewables in 1990

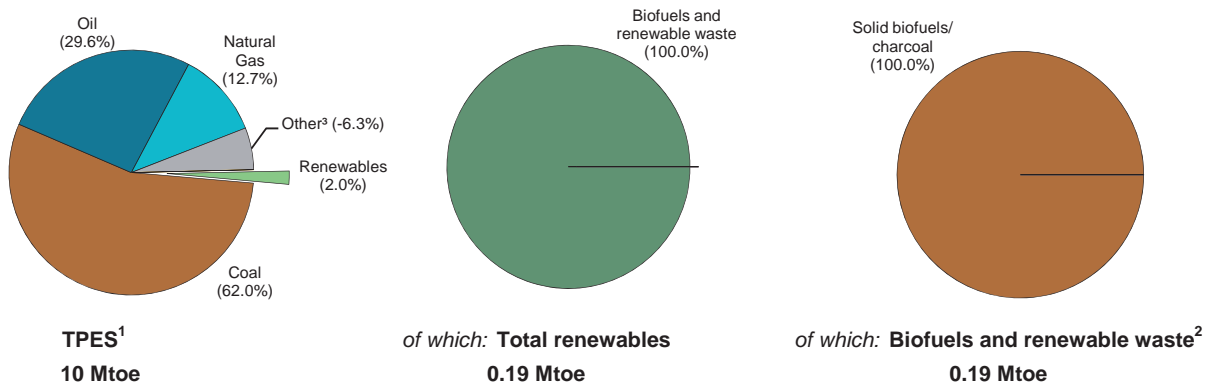


Figure 2. Contribution of renewables in 2017 provisional

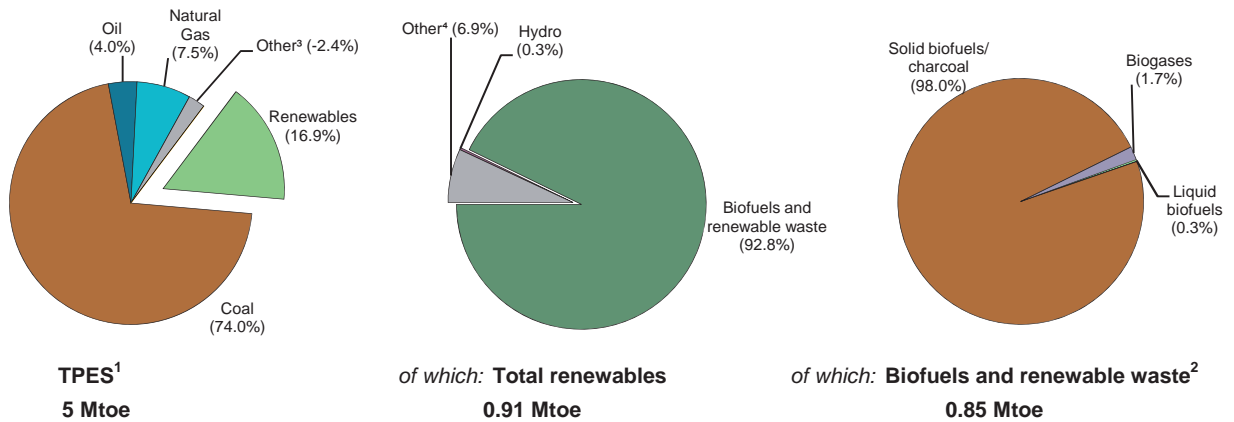
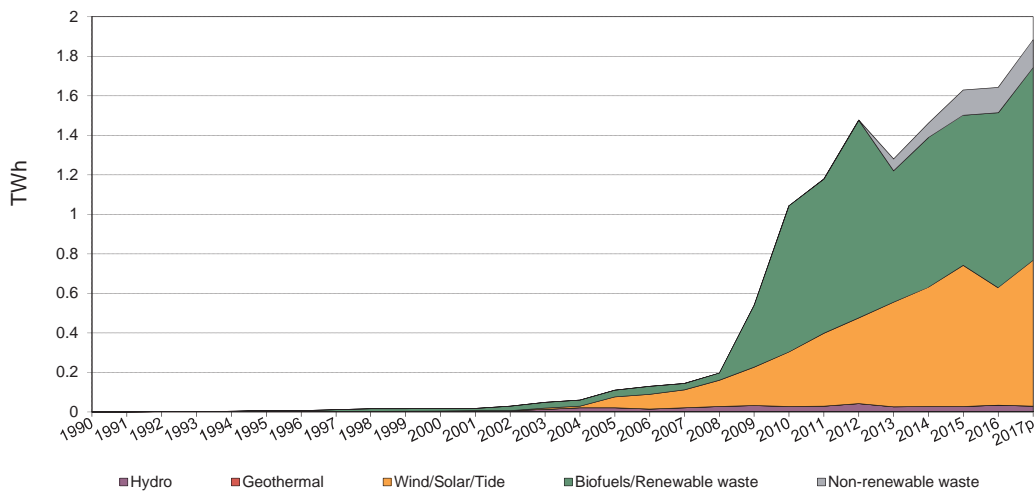


Figure 3. Electricity production by renewables and waste energy source



1. Total primary energy supply includes electricity trade.
 2. Biofuels and renewable waste include solid biofuels, liquid biofuels, biogases, and renewable municipal waste.
 3. Includes non-renewable municipal waste, industrial waste, peat, shale oil, electricity trade, and other sources of primary energy. (In the case of negative values, the net exports of electricity are greater than the other products in this category).
 4. Includes geothermal, solar, wind and tide.

Note: Totals may not sum due to rounding.
Source: IEA/OECD World Energy Balances.

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Table 1. Energy supply, GDP and population

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|---|-------|-------|-------|-------|-------|-------|-------|--|
| TPES (Mtoe) | 9.59 | 4.72 | 5.62 | 5.78 | 5.47 | 5.52 | 5.41 | 0.8 |
| of which: Renewables (Mtoe) ¹ | 0.19 | 0.51 | 0.85 | 0.86 | 0.91 | 0.97 | 0.91 | 3.5 |
| Renewables/TPES(%) | 2.0 | 10.9 | 15.1 | 14.9 | 16.5 | 17.5 | 16.9 | 2.6 |
| GDP (billion 2010 US dollars) | 14.96 | 14.13 | 19.50 | 22.96 | 23.34 | 23.82 | 24.98 | 3.4 |
| TPES/GDP ² | 0.64 | 0.33 | 0.29 | 0.25 | 0.23 | 0.23 | 0.22 | -2.5 |
| TPES/GDP (year 2010 = 100) | 222 | 116 | 100 | 87 | 81 | 80 | 75 | -2.5 |
| Population (millions) | 1.59 | 1.40 | 1.33 | 1.32 | 1.31 | 1.32 | 1.32 | -0.4 |
| TPES/population (toe per capita) | 6.04 | 3.37 | 4.22 | 4.39 | 4.17 | 4.19 | 4.11 | 1.2 |
| Electricity generation (TWh) ³ | 17.2 | 8.5 | 13.0 | 12.4 | 10.4 | 12.2 | 13.2 | 2.6 |
| of which: Renewables (TWh) ^{1,3} | - | 0.02 | 1.04 | 1.39 | 1.50 | 1.51 | 1.74 | 30.9 |
| Renew./Total Elec.(%) ^{1,4} | - | 0.2 | 8.1 | 11.2 | 14.4 | 12.4 | 13.2 | 27.6 |
| Road energy consumption (Mtoe) | 0.7 | 0.5 | 0.7 | 0.7 | 0.7 | 0.8 | .. | .. |
| of which: Liquid biofuels (Mtoe) | - | - | - | 0.01 | 0.00 | 0.00 | .. | .. |
| Liq. biofuels/road tr.(%) ⁵ | - | - | - | 0.8 | 0.4 | 0.3 | - | - |

1. Renewables do not include industrial waste, non-renewable municipal waste and pumped storage production.

2. In units of toe per thousand 2010 US dollars.

3. Electricity generation = gross production - amount of electricity produced in pumped storage plants.

4. Electricity share generated from renewables over the total electricity production.

5. Energy from liquid biofuels consumed in road transport over the total energy consumed in road transport.

Source: IEA/OECD World Energy Balances and OECD Main Economic Indicators.

Table 2. Net generating capacity of renewable and waste sources (MWe)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | Average annual percent change 00-16 |
|---|------|------|------|------|------|------|--|
| Total capacity | - | 2 | 256 | 663 | 692 | 702 | 44.2 |
| Hydro | - | 2 | 6 | 5 | 6 | 6 | 7.1 |
| Hydro <1MW | - | 2 | 6 | 5 | 6 | 6 | 7.1 |
| Hydro 1-10MW | - | - | - | - | - | - | - |
| Hydro 10+MW | - | - | - | - | - | - | - |
| Mixed plants | - | - | - | - | - | - | - |
| Pure pumped storage | - | - | - | - | - | - | - |
| Geothermal | - | - | - | - | - | - | - |
| Solar photovoltaic | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - |
| Tide, wave, ocean | - | - | - | - | - | - | - |
| Wind | - | - | 108 | 275 | 300 | 310 | - |
| Industrial waste | - | - | - | - | - | - | - |
| Municipal waste | - | - | - | 210 | 210 | 210 | - |
| Solid biofuels | - | - | 138 | 165 | 165 | 165 | - |
| Biogases | - | - | 4 | 8 | 11 | 11 | - |
| Liquid biofuels | - | - | - | - | - | - | - |
| Solar collectors surface (1000 m ²) | - | - | - | - | - | - | - |
| Cap. of solar collectors (MW _{th}) ¹ | - | - | - | - | - | - | - |

1. Converted at 0.7 kW_{th}/m² of solar collector area, as estimated by the IEA Solar Heating & Cooling Programme.

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Table 3. Capacity factors (%)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 |
|--|------|-------|-------|-------|-------|-------|
| Total plants¹ | - | x | 46.55 | 25.17 | 26.88 | 26.72 |
| Hydro | - | 28.54 | 51.14 | 61.72 | 50.61 | 66.59 |
| <i>of which: <1MW</i> | - | 28.54 | 51.14 | 61.72 | 50.61 | 66.59 |
| <i>of which: 1-10MW</i> | - | - | - | - | - | - |
| <i>of which: 10+MW</i> | - | - | - | - | - | - |
| <i>of which: pure pumped storage²</i> | - | - | - | - | - | - |
| Geothermal | - | - | - | - | - | - |
| Solar photovoltaic | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - |
| Tide, wave and ocean | - | - | - | - | - | - |
| Wind | - | - | 29.28 | 25.06 | 27.21 | 21.87 |
| Industrial waste | - | - | - | - | - | - |
| Municipal waste | - | - | - | 3.97 | 6.96 | 7.01 |
| Solid biofuels | - | - | 60.37 | 50.57 | 49.12 | 58.12 |
| Biogases | - | - | 29.08 | 38.53 | 51.89 | 46.70 |
| Biodiesels | - | - | - | - | - | - |
| Other liquid biofuels | - | - | - | - | - | - |

1. The capacity factor is defined as: the annual gross electricity generation divided by the reported net capacity times 365 (days/year) times 24 (hours/day).

2. In case a country has at least one mixed hydro plants, it is impossible to calculate capacity factor thus it is shown as 'not applicable'.

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Table 4. Gross electricity production from renewable and waste sources (GWh)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|--------------------------------------|------|-----------|-------------|-------------|-------------|-------------|-------------|---|
| Total electricity¹ | - | 18 | 1044 | 1462 | 1630 | 1643 | 1883 | 31.5 |
| Hydro | - | 5 | 27 | 27 | 27 | 35 | 30 | 11.1 |
| <i>of which: pumped storage</i> | - | - | - | - | - | - | - | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar photovoltaic | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Tide, wave, ocean | - | - | - | - | - | - | - | - |
| Wind | - | - | 277 | 604 | 715 | 594 | 737 | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | 73 | 128 | 129 | 141 | - |
| Solid biofuels | - | 13 | 730 | 731 | 710 | 840 | 933 | 28.6 |
| Biogases | - | - | 10 | 27 | 50 | 45 | 42 | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| <i>of which:</i> | | | | | | | | |
| Electricity only plants | - | 5 | 535 | 692 | 811 | 828 | .. | - |
| Hydro | - | 5 | 27 | 27 | 27 | 35 | .. | - |
| <i>of which: pumped storage</i> | - | - | - | - | - | - | - | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar photovoltaic | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Tide, wave, ocean | - | - | - | - | - | - | - | - |
| Wind | - | - | 277 | 604 | 715 | 594 | .. | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | - | - | 72 | .. | - |
| Solid biofuels | - | - | 231 | 61 | 69 | 127 | .. | - |
| Biogases | - | - | - | - | - | - | - | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| CHP plants | - | 13 | 509 | 770 | 819 | 815 | .. | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | 73 | 128 | 57 | .. | - |
| Solid biofuels | - | 13 | 499 | 670 | 641 | 713 | .. | - |
| Biogases | - | - | 10 | 27 | 50 | 45 | .. | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |

1. **Total electricity** includes the electricity produced from industrial waste, non-renewable municipal waste and pumped storage. Electricity from renewable sources does *not* include the electricity produced from industrial waste, non-renewable municipal waste and pumped storage production.

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Table 5A. Heat production¹ from renewable and waste sources in the transformation sector (TJ)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|----------------------------|------|------|------|------|-------|-------|-------|--|
| Total heat | - | 2681 | 5956 | 8565 | 10082 | 13975 | 13975 | 10.2 |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | 893 | 970 | 1073 | 1073 | - |
| Solid biofuels | - | 2620 | 5892 | 7616 | 9000 | 12877 | 12877 | 9.8 |
| Biogases | - | 61 | 64 | 56 | 112 | 25 | 25 | -5.1 |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| <i>of which:</i> | | | | | | | | |
| CHP plants | - | - | 3244 | 6506 | 6948 | 7393 | .. | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | 893 | 970 | 1073 | .. | - |
| Solid biofuels | - | - | 3183 | 5557 | 5866 | 6295 | .. | - |
| Biogases | - | - | 61 | 56 | 112 | 25 | .. | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| Heat only plants | - | 2681 | 2712 | 2059 | 3134 | 6582 | .. | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | - | - | - | - | - |
| Solid biofuels | - | 2620 | 2709 | 2059 | 3134 | 6582 | .. | - |
| Biogases | - | 61 | 3 | - | - | - | - | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |

1. Waste heat and heat production from heat pumps are not included and are reported separately in Table 5B.

Table 5B. Heat production from heat pumps and waste heat (TJ)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|----------------------------|------|------|------|------|------|------|-------|--|
| Total heat | - | - | - | - | - | - | - | - |
| Heat pumps ¹ | - | - | - | - | - | - | - | - |
| (-) Input to heat pumps | - | - | - | - | - | - | - | - |
| Other sources ² | - | - | - | - | - | - | - | - |

1. Installations producing heat for own use are not included.

2. Refers to production from hydrogen, purchased steam from industry, and waste heat.

Source: IEA/OECD *Electricity Statistics*.

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Table 6. Renewable and waste balance for 2016

| thousand tonnes of oil equivalent | Hydro ¹ | Wind | Tide wave ocean | Solar PV | Geo-thermal | Solar thermal | Industrial waste | Mun. waste renew. |
|------------------------------------|--------------------|------------|-----------------|----------|-------------|---------------|------------------|-------------------|
| Production | 3 | 51 | - | - | - | - | - | - |
| Imports | - | - | - | - | - | - | - | - |
| Exports | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| TPES | 3 | 51 | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | - | - |
| Main activity electricity plants | -3 | -50 | - | - | - | - | - | - |
| Autoproducer electricity plants | - | -1 | - | - | - | - | - | - |
| Main activity CHP plants | - | - | - | - | - | - | - | - |
| Autoproducer CHP plants | - | - | - | - | - | - | - | - |
| Main heat plants | - | - | - | - | - | - | - | - |
| Autoproducer heat plants | - | - | - | - | - | - | - | - |
| Charcoal production plants | - | - | - | - | - | - | - | - |
| Other transformation | - | - | - | - | - | - | - | - |
| Energy Industry own use | - | - | - | - | - | - | - | - |
| Losses | - | - | - | - | - | - | - | - |
| TFC | - | - | - | - | - | - | - | - |
| Industry | - | - | - | - | - | - | - | - |
| Iron and steel | - | - | - | - | - | - | - | - |
| Chemical and petrochemical | - | - | - | - | - | - | - | - |
| Non-ferrous metals | - | - | - | - | - | - | - | - |
| Non-metallc minerals | - | - | - | - | - | - | - | - |
| Transport equipment | - | - | - | - | - | - | - | - |
| Machinery | - | - | - | - | - | - | - | - |
| Mining and quarrying | - | - | - | - | - | - | - | - |
| Food and tobacco | - | - | - | - | - | - | - | - |
| Paper, pulp and print | - | - | - | - | - | - | - | - |
| Wood and wood products | - | - | - | - | - | - | - | - |
| Construction | - | - | - | - | - | - | - | - |
| Textile and leather | - | - | - | - | - | - | - | - |
| Non-specified | - | - | - | - | - | - | - | - |
| Transport | - | - | - | - | - | - | - | - |
| Road | - | - | - | - | - | - | - | - |
| Other | - | - | - | - | - | - | - | - |
| Other | - | - | - | - | - | - | - | - |
| Residential | - | - | - | - | - | - | - | - |
| Commercial and public services | - | - | - | - | - | - | - | - |
| Agriculture/forestry | - | - | - | - | - | - | - | - |
| Fishing | - | - | - | - | - | - | - | - |
| Non-specified | - | - | - | - | - | - | - | - |
| Electricity generated - GWh | 35 | 594 | - | - | - | - | - | - |
| <i>Electricity plants</i> | 35 | 594 | - | - | - | - | - | - |
| <i>CHP plants</i> | - | - | - | - | - | - | - | - |
| Heat generated - TJ | - | - | - | - | - | - | - | - |
| <i>CHP plants</i> | - | - | - | - | - | - | - | - |
| <i>Heat plants</i> | - | - | - | - | - | - | - | - |

1. Hydro does not include pumped hydro.

Source: IEA/OECD *World Energy Balances*.

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Table 6. Renewable and waste balance for 2016 (continued)

| Mun. waste non-ren. | Wood/wood waste | Charcoal | Bio-gases | Bio-gasoline | Bio-diesel | Other liquid biofuels | Total renew. & waste sources ² | Share in total energy sources ³ |
|---------------------|-----------------|----------|-----------|--------------|------------|-----------------------|---|--|
| 70 | 1396 | - | 11 | - | - | - | 1531 | 32.7% |
| - | 12 | - | - | 3 | - | - | 15 | 0.6% |
| - | -509 | - | - | - | - | - | -509 | 24.1% |
| - | - | - | - | - | - | - | - | - |
| 71 | 898 | - | 11 | 3 | - | - | 1037 | 18.8% |
| - | - | - | - | - | - | - | - | - |
| -8 | -14 | - | - | - | - | - | -75 | x |
| - | - | - | - | - | - | - | -1 | x |
| -38 | -253 | - | -5 | - | - | - | -296 | x |
| - | -3 | - | -1 | - | - | - | -4 | x |
| - | -208 | - | - | - | - | - | -208 | x |
| - | -16 | - | - | - | - | - | -16 | x |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| -11 | -1 | - | - | - | - | - | -12 | x |
| - | - | - | - | - | - | - | - | - |
| 13 | 404 | - | 5 | 3 | - | - | 425 | 14.7% |
| 13 | 8 | - | 3 | - | - | - | 24 | 5.3% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| 13 | - | - | - | - | - | - | 13 | 18.5% |
| - | - | - | - | - | - | - | - | - |
| - | 1 | - | - | - | - | - | 1 | 2.7% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | 3 | - | - | - | 3 | 4.9% |
| - | 5 | - | - | - | - | - | 5 | 8.6% |
| - | 1 | - | - | - | - | - | 1 | 1.7% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | 3 | - | - | 3 | 0.4% |
| - | - | - | - | 3 | - | - | 3 | 0.4% |
| - | - | - | - | - | - | - | - | - |
| - | 395 | - | 2 | - | - | - | 397 | 25.6% |
| - | 384 | - | - | - | - | - | 384 | 41.3% |
| - | 9 | - | 2 | - | - | - | 11 | 2.2% |
| - | 3 | - | - | - | - | - | 3 | 2.3% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| 129 | 840 | - | 45 | - | - | - | 1643 | 13.5% |
| 72 | 127 | - | - | - | - | - | 828 | 7.6% |
| 57 | 713 | - | 45 | - | - | - | 815 | 65.4% |
| 1073 | 12877 | - | 25 | - | - | - | 13975 | 58.4% |
| 1073 | 6295 | - | 25 | - | - | - | 7393 | 61.8% |
| - | 6582 | - | - | - | - | - | 6582 | 55.0% |

2. Total includes non-renewable waste.

3. Share of renewables on TFC excludes electricity and heat generated from renewable sources.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|--|------|------|------|------|------|------|-------|---|
| Geothermal (TJ) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Solar thermal (TJ) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Industrial waste (TJ) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Municipal waste - renewables (TJ) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics (continued)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|--|------|-------|-------|--------|--------|--------|--------|---|
| Municipal waste - non-renewables (TJ) | | | | | | | | |
| Production | - | - | - | 2851 | 2819 | 2944 | 4500 | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | 7 | -3 | 8 | - | - |
| Gross consumption | - | - | - | 2858 | 2816 | 2952 | 4500 | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | 1455 | 1760 | 1945 | .. | - |
| Energy industry own use | - | - | - | 696 | 543 | 459 | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | 707 | 513 | 548 | .. | - |
| <i>Industry</i> | - | - | - | 707 | 513 | 548 | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Solid Biofuel excluding charcoal (TJ) | | | | | | | | |
| Production | 7865 | 21343 | 40096 | 46980 | 50632 | 58441 | 60000 | 6.5 |
| Net imports ¹ | - | -190 | -6439 | -13525 | -15668 | -20826 | -25230 | 34.1 |
| Stock changes | - | 225 | 535 | -410 | -407 | -3 | - | - |
| Gross consumption | 7865 | 21378 | 34192 | 33045 | 34557 | 37612 | 34770 | 3.6 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | 3574 | 11141 | 13210 | 14524 | 20659 | .. | 11.6 |
| Energy industry own use | - | 4 | 44 | 56 | 70 | 50 | .. | 17.1 |
| Losses | - | 12 | - | - | - | - | .. | - |
| Final energy consumption | 7865 | 17788 | 23007 | 19779 | 19963 | 16903 | .. | -0.3 |
| <i>Industry</i> | 264 | 3318 | 4370 | 3673 | 4260 | 350 | .. | -13.1 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 7601 | 14470 | 18637 | 16106 | 15703 | 16553 | .. | 0.8 |
| Charcoal (kt) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Biogases (TJ) | | | | | | | | |
| Production | - | 76 | 155 | 403 | 550 | 448 | 620 | 11.7 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | 76 | 155 | 403 | 550 | 448 | 620 | 11.7 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | 76 | 115 | 191 | 367 | 233 | .. | 7.3 |
| Energy industry own use | - | - | - | 12 | 9 | 8 | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | 40 | 200 | 174 | 207 | .. | - |
| <i>Industry</i> | - | - | - | 62 | 90 | 116 | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | 40 | 138 | 84 | 91 | .. | - |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics (continued)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|-----------------------------------|------|------|------|------|------|------|-------|---|
| Biogasoline (kt) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | 9 | 5 | 4 | 4 | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | 9 | 5 | 4 | 4 | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | 9 | 5 | 4 | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | 9 | 5 | 4 | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Biodiesel (kt) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Other liquid biofuels (kt) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Figure 1. Contribution of renewables in 1990

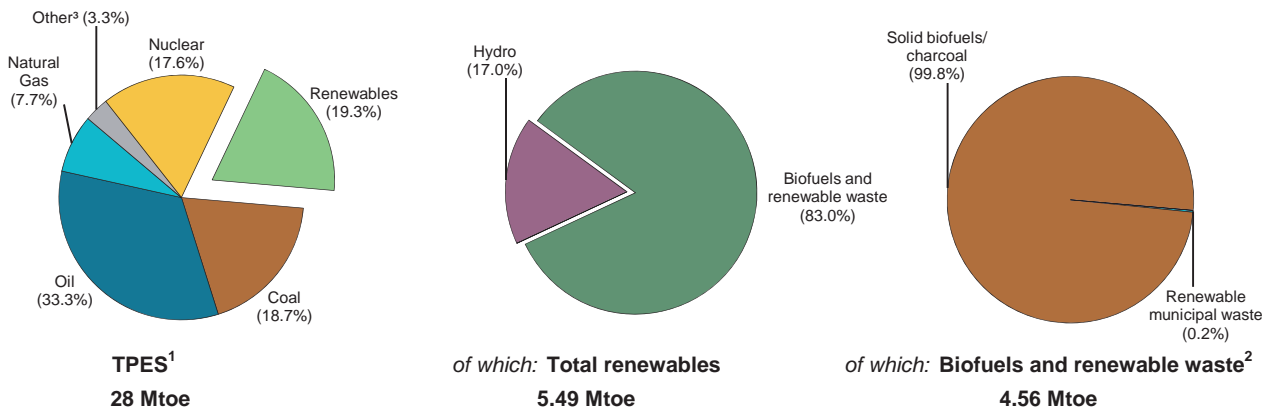


Figure 2. Contribution of renewables in 2017 provisional

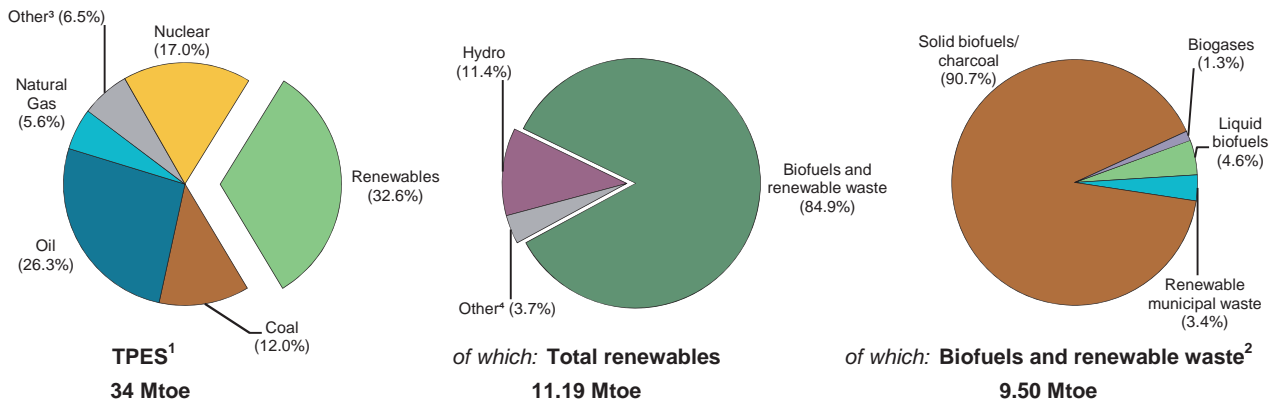
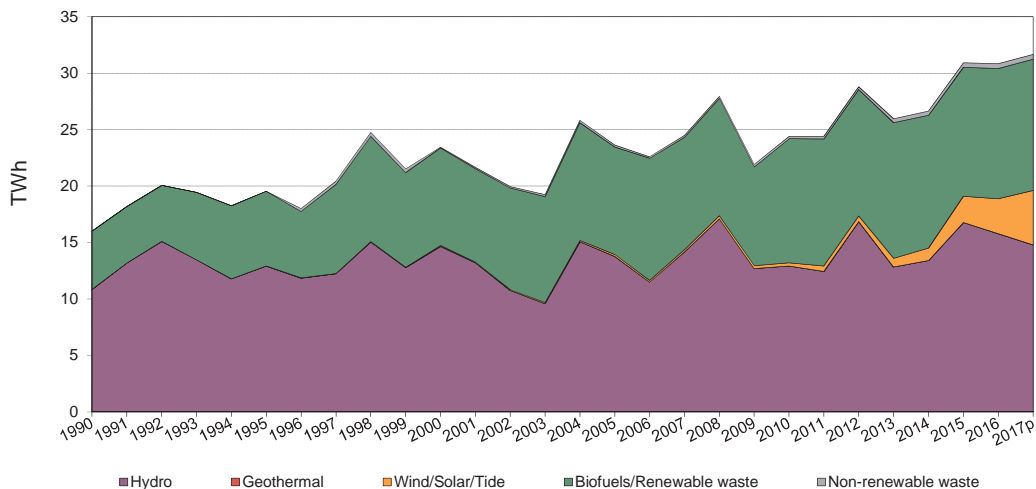


Figure 3. Electricity production by renewables and waste energy source



1. Total primary energy supply includes electricity trade.
 2. Biofuels and renewable waste include solid biofuels, liquid biofuels, biogases, and renewable municipal waste.
 3. Includes non-renewable municipal waste, industrial waste, peat, shale oil, electricity trade, and other sources of primary energy. (In the case of negative values, the net exports of electricity are greater than the other products in this category).
 4. Includes geothermal, solar, wind and tide.

Note: Totals may not sum due to rounding.
Source: IEA/OECD World Energy Balances.

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Table 1. Energy supply, GDP and population

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|---|--------|--------|--------|--------|--------|--------|--------|--|
| TPES (Mtoe) | 28.38 | 32.39 | 36.60 | 34.11 | 32.61 | 34.02 | 34.36 | 0.3 |
| of which: Renewables (Mtoe) ¹ | 5.49 | 7.75 | 9.34 | 10.30 | 10.49 | 10.61 | 11.19 | 2.2 |
| Renewables/TPES(%) | 19.3 | 23.9 | 25.5 | 30.2 | 32.2 | 31.2 | 32.6 | 1.8 |
| GDP (billion 2010 US dollars) | 167.12 | 209.38 | 247.80 | 247.08 | 247.41 | 252.69 | 259.35 | 1.3 |
| TPES/GDP ² | 0.17 | 0.15 | 0.15 | 0.14 | 0.13 | 0.13 | 0.13 | -0.9 |
| TPES/GDP (year 2010 = 100) | 115 | 105 | 100 | 93 | 89 | 91 | 90 | -0.9 |
| Population (millions) | 4.99 | 5.18 | 5.36 | 5.46 | 5.48 | 5.50 | 5.51 | 0.4 |
| TPES/population (toe per capita) | 5.69 | 6.26 | 6.82 | 6.24 | 5.95 | 6.19 | 6.24 | -0.0 |
| Electricity generation (TWh) ³ | 54.4 | 70.0 | 80.7 | 68.1 | 68.6 | 68.8 | 67.4 | -0.2 |
| of which: Renewables (TWh) ^{1,3} | 16.02 | 23.38 | 24.20 | 26.27 | 30.53 | 30.41 | 31.23 | 1.7 |
| Renew./Total Elec.(%) ^{1,4} | 29.5 | 33.4 | 30.0 | 38.6 | 44.5 | 44.2 | 46.3 | 1.9 |
| Road energy consumption (Mtoe) | 3.6 | 3.6 | 4.0 | 3.8 | 3.9 | 4.0 | .. | .. |
| of which: Liquid biofuels (Mtoe) | - | - | 0.13 | 0.50 | 0.50 | 0.18 | .. | .. |
| Liq. biofuels/road tr.(%) ⁵ | - | - | 3.3 | 12.9 | 12.8 | 4.3 | - | - |

1. Renewables do not include industrial waste, non-renewable municipal waste and pumped storage production.

2. In units of toe per thousand 2010 US dollars.

3. Electricity generation = gross production - amount of electricity produced in pumped storage plants.

4. Electricity share generated from renewables over the total electricity production.

5. Energy from liquid biofuels consumed in road transport over the total energy consumed in road transport.

Source: IEA/OECD *World Energy Balances* and OECD *Main Economic Indicators*.

Table 2. Net generating capacity of renewable and waste sources (MWe)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | Average annual percent change 00-16 |
|---|-------------|-------------|-------------|-------------|-------------|-------------|--|
| Total capacity | 3605 | 4422 | 5142 | 5638 | 6021 | 6598 | 2.5 |
| Hydro | 2621 | 2882 | 3155 | 3248 | 3249 | 3250 | 0.8 |
| Hydro <1MW | - | 29 | 32 | 33 | 33 | 34 | 1.0 |
| Hydro 1-10MW | - | 279 | 285 | 273 | 273 | 273 | -0.1 |
| Hydro 10+MW | - | 2574 | 2838 | 2942 | 2943 | 2943 | 0.8 |
| Mixed plants | - | - | - | - | - | - | - |
| Pure pumped storage | - | - | - | - | - | - | - |
| Geothermal | - | - | - | - | - | - | - |
| Solar photovoltaic | 1 | 2 | 7 | 11 | 15 | 35 | 19.6 |
| Solar thermal | - | - | - | - | - | - | - |
| Tide, wave, ocean | - | - | - | - | - | - | - |
| Wind | - | 38 | 197 | 627 | 1005 | 1565 | 26.2 |
| Industrial waste | - | - | - | - | - | - | - |
| Municipal waste | - | - | - | - | - | - | - |
| Solid biofuels | 983 | 1500 | 1783 | 1752 | 1752 | 1748 | 1.0 |
| Biogases | - | - | - | - | - | - | - |
| Liquid biofuels | - | - | - | - | - | - | - |
| Solar collectors surface (1000 m ²) | 6 | 10 | 31 | 45 | 50 | 55 | 11.2 |
| Cap. of solar collectors (MW _{th}) ¹ | 4 | 7 | 22 | 32 | 35 | 39 | 11.3 |

1. Converted at 0.7 kW_{th}/m² of solar collector area, as estimated by the IEA Solar Heating & Cooling Programme.

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Table 3. Capacity factors (%)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 |
|--|--------------|--------------|--------------|--------------|--------------|--------------|
| Total plants¹ | 50.71 | 60.54 | 54.19 | 53.96 | 58.60 | 53.35 |
| Hydro | 47.30 | 58.07 | 46.75 | 47.09 | 58.92 | 55.49 |
| <i>of which: <1MW</i> | - | 52.75 | 40.97 | 39.26 | 49.03 | 47.82 |
| <i>of which: 1-10MW</i> | - | 43.29 | 33.41 | 36.89 | 47.91 | 43.75 |
| <i>of which: 10+MW</i> | - | 59.73 | 48.16 | 48.12 | 60.05 | 56.67 |
| <i>of which: pure pumped storage²</i> | - | - | - | - | - | - |
| Geothermal | - | - | - | - | - | - |
| Solar photovoltaic | 5.19 | 9.00 | 7.73 | 8.04 | 7.25 | 5.81 |
| Solar thermal | - | - | - | - | - | - |
| Tide, wave and ocean | - | - | - | - | - | - |
| Wind | - | 23.43 | 17.05 | 20.16 | 26.44 | 22.38 |
| Industrial waste | - | - | - | - | - | - |
| Municipal waste | - | - | - | - | - | - |
| Solid biofuels | 59.88 e | 64.70 | 67.67 | 71.46 | 68.99 | 69.24 |
| Biogases | - | - | - | - | - | - |
| Biodiesels | - | - | - | - | - | - |
| Other liquid biofuels | - | - | - | - | - | - |

1. The capacity factor is defined as: the annual gross electricity generation divided by the reported net capacity times 365 (days/year) times 24 (hours/day).

2. In case a country has at least one mixed hydro plants, it is impossible to calculate capacity factor thus it is shown as 'not applicable'.

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Table 4. Gross electricity production from renewable and waste sources (GWh)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|--------------------------------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|---|
| Total electricity¹ | 16015 | 23452 | 24409 | 26649 | 30910 | 30836 | 31665 | 1.8 |
| Hydro | 10859 | 14660 | 12922 | 13397 | 16769 | 15799 | 14796 | 0.1 |
| <i>of which: pumped storage</i> | - | - | - | - | - | - | - | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar photovoltaic | - | 2 | 5 | 8 | 9 | 17 | 27 | 16.5 |
| Solar thermal | - | - | - | - | - | - | - | - |
| Tide, wave, ocean | - | - | - | - | - | - | - | - |
| Wind | - | 78 | 294 | 1107 | 2327 | 3068 | 4802 | 27.4 |
| Industrial waste | - | 31 | 29 | 76 | 59 | 59 | 60 | 4.0 |
| Municipal waste renew. | - | 107 | 299 | 441 | 471 | 519 | 535 | 9.9 |
| Municipal waste non-renew. | - | 42 | 185 | 302 | 326 | 370 | 380 | 13.8 |
| Solid biofuels | 5156 | 8501 | 10569 | 10968 | 10589 | 10602 | 10660 | 1.3 |
| Biogases | - | 31 | 106 | 350 | 358 | 398 | 400 | 16.2 |
| Liquid biofuels | - | - | - | - | 2 | 4 | 5 | - |
| of which: | | | | | | | | |
| Electricity only plants | 11348 | 15397 | 14986 | 15929 | 20599 | 20193 | .. | - |
| Hydro | 10859 | 14660 | 12922 | 13397 | 16769 | 15799 | .. | - |
| <i>of which: pumped storage</i> | - | - | - | - | - | - | - | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar photovoltaic | - | 2 | 5 | 8 | 9 | 17 | .. | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Tide, wave, ocean | - | - | - | - | - | - | - | - |
| Wind | - | 78 | 294 | 1107 | 2327 | 3068 | .. | - |
| Industrial waste | - | 2 | 5 | 14 | 13 | 12 | .. | - |
| Municipal waste renew. | - | 9 | 90 | 57 | 35 | 40 | .. | - |
| Municipal waste non-renew. | - | 4 | 68 | 40 | 24 | 29 | .. | - |
| Solid biofuels | 489 | 642 | 1551 | 1074 | 1217 | 1004 | .. | - |
| Biogases | - | - | 51 | 232 | 204 | 223 | .. | - |
| Liquid biofuels | - | - | - | - | 1 | 1 | .. | - |
| CHP plants | 4667 | 8055 | 9423 | 10720 | 10311 | 10643 | .. | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | 29 | 24 | 62 | 46 | 47 | .. | - |
| Municipal waste renew. | - | 98 | 209 | 384 | 436 | 479 | .. | - |
| Municipal waste non-renew. | - | 38 | 117 | 262 | 302 | 341 | .. | - |
| Solid biofuels | 4667 | 7859 | 9018 | 9894 | 9372 | 9598 | .. | - |
| Biogases | - | 31 | 55 | 118 | 154 | 175 | .. | - |
| Liquid biofuels | - | - | - | - | 1 | 3 | .. | - |

1. **Total electricity** includes the electricity produced from industrial waste, non-renewable municipal waste and pumped storage. Electricity from renewable sources does *not* include the electricity produced from industrial waste, non-renewable municipal waste and pumped storage production.

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Table 5A. Heat production¹ from renewable and waste sources in the transformation sector (TJ)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|----------------------------|---------------|--------------|--------------|--------------|--------------|--------------|--------------|--|
| Total heat | 5025 e | 35741 | 68824 | 80586 | 79281 | 87275 | 91080 | 5.7 |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | 425 | 884 | 454 | 399 | 425 | 435 | 0.1 |
| Municipal waste renew. | 423 e | 774 | 2211 | 5024 | 6051 | 7022 | 7330 | 14.1 |
| Municipal waste non-renew. | 282 e | 412 | 1581 | 3892 | 4566 | 5256 | 5440 | 16.4 |
| Solid biofuels | 4320 e | 33964 | 63779 | 70552 | 67482 | 73672 | 76900 | 4.9 |
| Biogases | - | 166 | 369 | 660 | 763 | 831 | 900 | 10.5 |
| Liquid biofuels | - | - | - | 4 | 20 | 69 | 75 | - |
| <i>of which:</i> | | | | | | | | |
| CHP plants | 1275 e | 25106 | 46863 | 52697 | 52488 | 57369 | .. | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | 408 | 384 | 429 | 374 | 399 | .. | - |
| Municipal waste renew. | - | 480 | 1751 | 4401 | 5247 | 6085 | .. | - |
| Municipal waste non-renew. | - | 225 | 1130 | 3368 | 3996 | 4615 | .. | - |
| Solid biofuels | 1275 e | 23972 | 43564 | 44158 | 42383 | 45720 | .. | - |
| Biogases | - | 21 | 34 | 339 | 478 | 540 | .. | - |
| Liquid biofuels | - | - | - | 2 | 10 | 10 | .. | - |
| Heat only plants | 3750 e | 10635 | 21961 | 27889 | 26793 | 29906 | .. | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | 17 | 500 | 25 | 25 | 26 | .. | - |
| Municipal waste renew. | 423 e | 294 | 460 | 623 | 804 | 937 | .. | - |
| Municipal waste non-renew. | 282 e | 187 | 451 | 524 | 570 | 641 | .. | - |
| Solid biofuels | 3045 e | 9992 | 20215 | 26394 | 25099 | 27952 | .. | - |
| Biogases | - | 145 | 335 | 321 | 285 | 291 | .. | - |
| Liquid biofuels | - | - | - | 2 | 10 | 59 | .. | - |

1. Waste heat and heat production from heat pumps are not included and are reported separately in Table 5B.

Table 5B. Heat production from heat pumps and waste heat (TJ)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|----------------------------|----------|------------|-------------|-------------|-------------|-------------|-------------|--|
| Total heat | - | 155 | 1515 | 2387 | 3572 | 3727 | 3986 | 21.0 |
| Heat pumps ¹ | - | 38 | 1246 | 2154 | 3760 | 4029 | 4413 | 32.3 |
| (-) Input to heat pumps | - | 18 | 443 | 727 | 1184 | 1321 | 1447 | 29.4 |
| Other sources ² | - | 135 | 712 | 960 | 996 | 1019 | 1020 | 12.6 |

1. Installations producing heat for own use are not included.

2. Refers to production from hydrogen, purchased steam from industry, and waste heat.

Source: IEA/OECD *Electricity Statistics*.

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Table 6. Renewable and waste balance for 2016

| thousand tonnes of oil equivalent | Hydro ¹ | Wind | Tide wave ocean | Solar PV | Geo-thermal | Solar thermal | Industrial waste | Mun. waste renew. |
|------------------------------------|--------------------|-------------|-----------------|-----------|-------------|---------------|------------------|-------------------|
| Production | 1358 | 264 | - | 1 | - | 2 | 43 | 309 |
| Imports | - | - | - | - | - | - | - | - |
| Exports | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| TPES | 1358 | 264 | - | 1 | - | 2 | 43 | 309 |
| Statistical differences | - | - | - | - | - | - | - | - |
| Main activity electricity plants | -1269 | -264 | - | - | - | - | - | -9 |
| Autoproducer electricity plants | -89 | - | - | -1 | - | - | -4 | -3 |
| Main activity CHP plants | - | - | - | - | - | - | - | -167 |
| Autoproducer CHP plants | - | - | - | - | - | - | -20 | -52 |
| Main heat plants | - | - | - | - | - | - | -1 | -28 |
| Autoproducer heat plants | - | - | - | - | - | - | - | - |
| Charcoal production plants | - | - | - | - | - | - | - | - |
| Other transformation | - | - | - | - | - | - | - | - |
| Energy Industry own use | - | - | - | - | - | - | - | - |
| Losses | - | - | - | - | - | - | - | - |
| TFC | - | - | - | - | - | 2 | 19 | 50 |
| Industry | - | - | - | - | - | - | 19 | 50 |
| Iron and steel | - | - | - | - | - | - | - | - |
| Chemical and petrochemical | - | - | - | - | - | - | 11 | - |
| Non-ferrous metals | - | - | - | - | - | - | - | - |
| Non-metallurgical minerals | - | - | - | - | - | - | - | 22 |
| Transport equipment | - | - | - | - | - | - | - | - |
| Machinery | - | - | - | - | - | - | - | - |
| Mining and quarrying | - | - | - | - | - | - | - | - |
| Food and tobacco | - | - | - | - | - | - | - | - |
| Paper, pulp and print | - | - | - | - | - | - | 6 | 27 |
| Wood and wood products | - | - | - | - | - | - | - | - |
| Construction | - | - | - | - | - | - | - | - |
| Textile and leather | - | - | - | - | - | - | - | - |
| Non-specified | - | - | - | - | - | - | 1 | 1 |
| Transport | - | - | - | - | - | - | - | - |
| Road | - | - | - | - | - | - | - | - |
| Other | - | - | - | - | - | - | - | - |
| Other | - | - | - | - | - | 2 | - | - |
| Residential | - | - | - | - | - | 2 | - | - |
| Commercial and public services | - | - | - | - | - | - | - | - |
| Agriculture/forestry | - | - | - | - | - | - | - | - |
| Fishing | - | - | - | - | - | - | - | - |
| Non-specified | - | - | - | - | - | - | - | - |
| Electricity generated - GWh | 15799 | 3068 | - | 17 | - | - | 59 | 519 |
| <i>Electricity plants</i> | 15799 | 3068 | - | 17 | - | - | 12 | 40 |
| <i>CHP plants</i> | - | - | - | - | - | - | 47 | 479 |
| Heat generated - TJ | - | - | - | - | - | - | 425 | 7022 |
| <i>CHP plants</i> | - | - | - | - | - | - | 399 | 6085 |
| <i>Heat plants</i> | - | - | - | - | - | - | 26 | 937 |

1. Hydro does not include pumped hydro.

Source: IEA/OECD *World Energy Balances*.

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Table 6. Renewable and waste balance for 2016 (continued)

| Mun. waste non-ren. | Wood/wood waste | Charcoal | Bio-gases | Bio-gasoline | Bio-diesel | Other liquid biofuels | Total renew. & waste sources ² | Share in total energy sources ³ |
|---------------------|-----------------|----------|------------|--------------|------------|-----------------------|---|--|
| 227 | 8309 | - | 112 | c | 109 | 52 | 10786 | 60.6% |
| - | 56 | - | - | 72 | c | - | 128 | 0.5% |
| - | -32 | - | - | - | c | - | -32 | 0.3% |
| - | - | - | - | - | - | - | - | - |
| 227 | 8333 | - | 112 | 72 | 109 | 52 | 10882 | 32.0% |
| - | - | - | - | - | - | - | - | - |
| -6 | -126 | - | -34 | - | - | - | -1708 | x |
| -3 | -109 | - | -12 | - | - | - | -221 | x |
| -116 | -1353 | - | -21 | - | - | -1 | -1658 | x |
| -50 | -854 | - | -14 | - | - | - | -990 | x |
| -19 | -723 | - | -4 | - | - | -4 | -779 | x |
| - | -31 | - | -5 | - | - | - | -36 | x |
| - | - | - | - | - | - | - | - | - |
| - | - | - | -7 | - | - | - | -7 | x |
| - | - | - | - | - | - | -45 | -45 | x |
| - | - | - | - | - | - | - | - | - |
| 33 | 5137 | - | 16 | 72 | 109 | 1 | 5439 | 20.9% |
| 33 | 3613 | - | 5 | - | - | 1 | 3721 | 34.9% |
| - | - | - | - | - | - | - | - | - |
| - | 7 | - | - | - | - | - | 18 | 1.7% |
| - | - | - | - | - | - | - | - | - |
| 18 | 3 | - | 2 | - | - | - | 45 | 14.8% |
| - | - | - | - | - | - | - | - | - |
| - | 1 | - | - | - | - | - | 1 | 0.5% |
| - | 3 | - | 2 | - | - | - | 5 | 1.2% |
| 13 | 3369 | - | - | - | - | 1 | 3416 | 56.4% |
| - | 227 | - | - | - | - | - | 227 | 44.0% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| 1 | 2 | - | - | - | - | - | 5 | 2.2% |
| - | - | - | - | 68 | 109 | - | 177 | 4.1% |
| - | - | - | - | 66 | 109 | - | 175 | 4.3% |
| - | - | - | - | 1 | - | - | 1 | 0.4% |
| - | 1524 | - | 12 | 4 | - | - | 1542 | 16.7% |
| - | 1300 | - | - | - | - | - | 1302 | 24.6% |
| - | 75 | - | 11 | - | - | - | 86 | 3.0% |
| - | 148 | - | 1 | 1 | - | - | 150 | 21.9% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | 4 | - | - | 4 | 1.1% |
| 370 | 10602 | - | 398 | - | - | 4 | 30836 | 44.9% |
| 29 | 1004 | - | 223 | - | - | 1 | 20193 | 43.0% |
| 341 | 9598 | - | 175 | - | - | 3 | 10643 | 48.8% |
| 5256 | 73672 | - | 831 | - | - | 69 | 87275 | 44.5% |
| 4615 | 45720 | - | 540 | - | - | 10 | 57369 | 46.0% |
| 641 | 27952 | - | 291 | - | - | 59 | 29906 | 41.8% |

2. Total includes non-renewable waste.

3. Share of renewables on TFC excludes electricity and heat generated from renewable sources.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|--|-------|------|------|-------|-------|-------|-------|---|
| Geothermal (TJ) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Solar thermal (TJ) | | | | | | | | |
| Production | 16 | 16 | 39 | 57 | 62 | 69 | 75 | 9.6 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 16 | 16 | 39 | 57 | 62 | 69 | 75 | 9.6 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 16 | 16 | 39 | 57 | 62 | 69 | .. | 9.6 |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 16 | 16 | 39 | 57 | 62 | 69 | .. | 9.6 |
| Industrial waste (TJ) | | | | | | | | |
| Production | - | 1738 | 1784 | 2219 | 1792 | 1793 | 1800 | 0.2 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | 1738 | 1784 | 2219 | 1792 | 1793 | 1800 | 0.2 |
| Statistical differences | - | - | - | - | 4 | - | .. | - |
| Transformation processes | - | 1180 | 1368 | 1111 | 954 | 1017 | .. | -0.9 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | 558 | 416 | 1108 | 842 | 776 | .. | 2.1 |
| <i>Industry</i> | - | 558 | 416 | 1108 | 842 | 776 | .. | 2.1 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Municipal waste - renewables (TJ) | | | | | | | | |
| Production | 470 e | 2278 | 6089 | 10326 | 11420 | 12939 | 13500 | 11.5 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 470 e | 2278 | 6089 | 10326 | 11420 | 12939 | 13500 | 11.5 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | 470 e | 1455 | 4637 | 8486 | 9569 | 10839 | .. | 13.4 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | 823 | 1452 | 1840 | 1851 | 2100 | .. | 6.0 |
| <i>Industry</i> | - | 823 | 1452 | 1840 | 1851 | 2100 | .. | 6.0 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics (continued)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|--|--------|--------|--------|--------|--------|--------|--------|---|
| Municipal waste - non-renewables (TJ) | | | | | | | | |
| Production | 314 e | 1008 | 4335 | 7623 | 8202 | 9495 | 9900 | 15.0 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 314 e | 1008 | 4335 | 7623 | 8202 | 9495 | 9900 | 15.0 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | 314 e | 691 | 3266 | 6410 | 7006 | 8130 | .. | 16.7 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | 317 | 1069 | 1213 | 1196 | 1365 | .. | 9.6 |
| <i>Industry</i> | - | 317 | 1069 | 1213 | 1196 | 1365 | .. | 9.6 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Solid Biofuel excluding charcoal (TJ) | | | | | | | | |
| Production | 180437 | 268294 | 326228 | 339838 | 330799 | 347879 | 360975 | 1.6 |
| Net imports ¹ | - | - | -1014 | 823 | 1080 | 1017 | .. | - |
| Stock changes | 9847 | - | - | - | - | - | - | - |
| Gross consumption | 190284 | 268294 | 325214 | 340661 | 331879 | 348896 | 360975 | 1.7 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | 42843 | 82108 | 130046 | 137803 | 130068 | 133809 | .. | 3.1 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 147441 | 186186 | 195168 | 202858 | 201811 | 215087 | .. | 0.9 |
| <i>Industry</i> | 102741 | 140824 | 123156 | 139596 | 142563 | 151282 | .. | 0.4 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 44700 | 45362 | 72012 | 63262 | 59248 | 63805 | .. | 2.2 |
| Charcoal (kt) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Biogases (TJ) | | | | | | | | |
| Production | - | 857 | 1692 | 4173 | 4321 | 4694 | 5150 | 11.2 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | 857 | 1692 | 4173 | 4321 | 4694 | 5150 | 11.2 |
| Statistical differences | - | - | - | -3 | -1 | -1 | .. | - |
| Transformation processes | - | 340 | 1105 | 3317 | 3622 | 4008 | .. | 16.7 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | 517 | 587 | 853 | 698 | 685 | .. | 1.8 |
| <i>Industry</i> | - | 107 | 122 | 202 | 172 | 193 | .. | 3.8 |
| <i>Transport</i> | - | - | 2 | 7 | 7 | 8 | .. | - |
| <i>Other</i> | - | 410 | 463 | 644 | 519 | 484 | .. | 1.0 |

1. Net imports = total imports - total exports.

Source: IEA/OECD World Energy Balances.

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Table 7. Aggregated renewables and waste statistics (continued)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|-----------------------------------|------|------|------|------|------|------|-------|---|
| Biogasoline (kt) | | | | | | | | |
| Production | - | - | 5 | 19 | c | c | c | .. |
| Net imports ¹ | - | - | 106 | 93 | 103 | 101 | 122 | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | 111 | 112 | 103 | 101 | 122 | - |
| Statistical differences | - | - | - | 1 | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | 111 | 113 | 103 | 101 | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | 106 | 106 | 97 | 95 | .. | - |
| <i>Other</i> | - | - | 5 | 7 | 6 | 6 | .. | - |
| Biodiesel (kt) | | | | | | | | |
| Production | - | - | 285 | 342 | 418 | 105 | 293 | - |
| Net imports ¹ | - | - | -167 | 108 | c | c | c | .. |
| Stock changes | - | - | - | -10 | c | c | c | - |
| Gross consumption | - | - | 118 | 440 | 418 | 105 | 293 | - |
| Statistical differences | - | - | -58 | -27 | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | 60 | 413 | 418 | 105 | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | 60 | 413 | 418 | 105 | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Other liquid biofuels (kt) | | | | | | | | |
| Production | - | - | 16 | 33 | 35 | 47 | 40 | - |
| Net imports ¹ | - | - | 37 | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | 53 | 33 | 35 | 47 | 40 | - |
| Statistical differences | - | - | 1 | - | - | - | .. | - |
| Transformation processes | - | - | - | - | 2 | 5 | .. | - |
| Energy industry own use | - | - | 16 | 33 | 32 | 41 | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | 38 | - | 1 | 1 | .. | - |
| <i>Industry</i> | - | - | 7 | - | 1 | 1 | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | 31 | - | - | - | .. | - |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Figure 1. Contribution of renewables in 1990

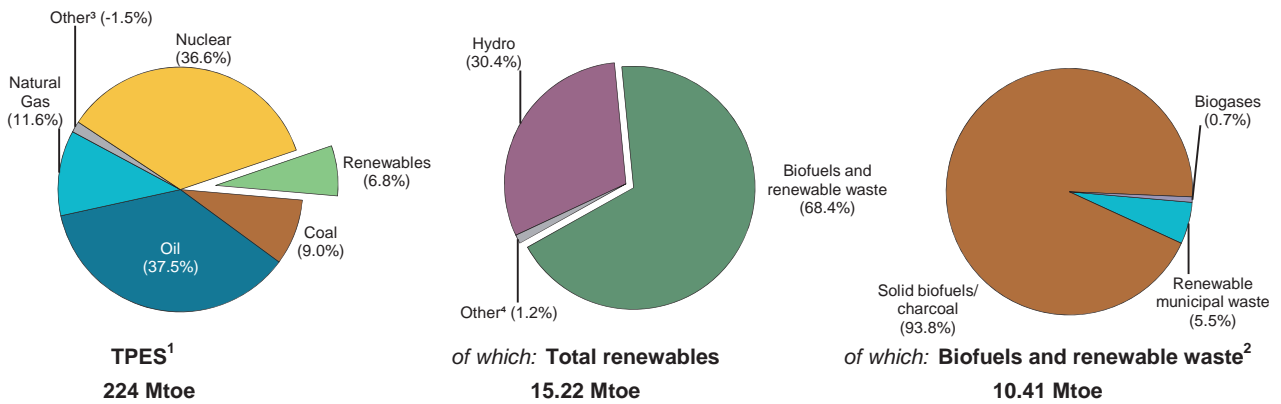


Figure 2. Contribution of renewables in 2017 provisional

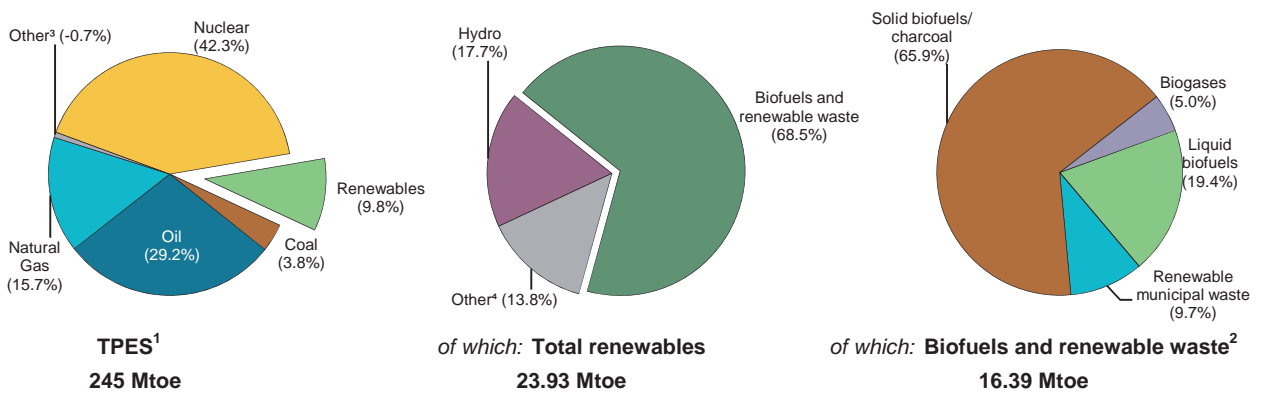
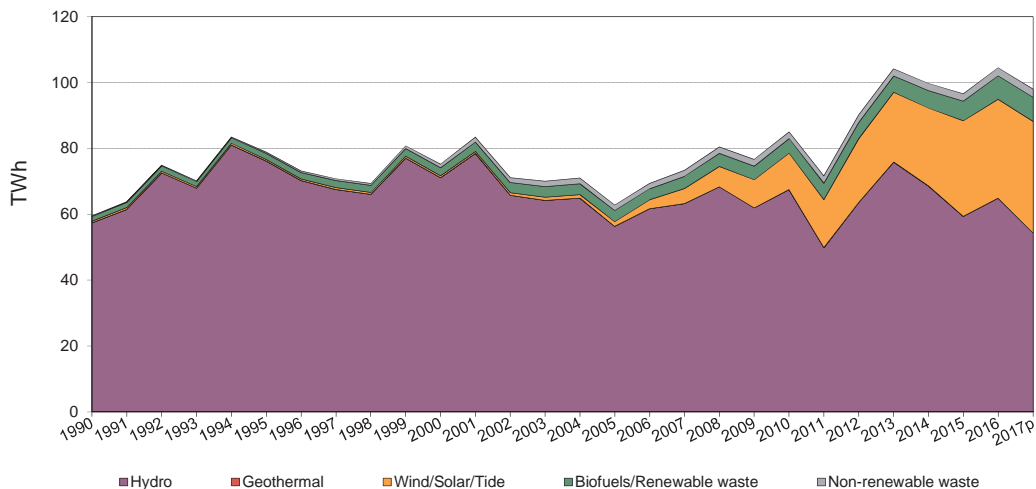


Figure 3. Electricity production by renewables and waste energy source



1. Total primary energy supply includes electricity trade.
2. Biofuels and renewable waste include solid biofuels, liquid biofuels, biogases, and renewable municipal waste.
3. Includes non-renewable municipal waste, industrial waste, peat, shale oil, electricity trade, and other sources of primary energy. (In the case of negative values, the net exports of electricity are greater than the other products in this category).
4. Includes geothermal, solar, wind and tide.

Note: Totals may not sum due to rounding.
Source: IEA/OECD *World Energy Balances*.

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Table 1. Energy supply, GDP and population

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|---|---------|---------|---------|---------|---------|---------|---------|--|
| TPES (Mtoe) | 223.84 | 251.74 | 263.31 | 244.64 | 248.59 | 244.26 | 245.28 | -0.2 |
| of which: Renewables (Mtoe) ¹ | 15.22 | 15.74 | 21.22 | 21.79 | 22.36 | 24.58 | 23.93 | 2.5 |
| Renewables/TPES(%) | 6.8 | 6.3 | 8.1 | 8.9 | 9.0 | 10.1 | 9.8 | 2.7 |
| GDP (billion 2010 US dollars) | 1907.28 | 2346.48 | 2646.84 | 2748.20 | 2777.54 | 2810.53 | 2861.66 | 1.2 |
| TPES/GDP ² | 0.12 | 0.11 | 0.10 | 0.09 | 0.09 | 0.09 | 0.09 | -1.3 |
| TPES/GDP (year 2010 = 100) | 118 | 108 | 100 | 89 | 90 | 87 | 86 | -1.3 |
| Population (millions) | 58.23 | 60.87 | 64.97 | 66.29 | 66.59 | 66.86 | 67.13 | 0.6 |
| TPES/population (toe per capita) | 3.84 | 4.14 | 4.05 | 3.69 | 3.73 | 3.65 | 3.65 | -0.7 |
| Electricity generation (TWh) ³ | 417.2 | 535.2 | 564.5 | 558.4 | 565.4 | 551.3 | 548.9 | 0.1 |
| of which: Renewables (TWh) ^{1,3} | 55.78 | 69.40 | 78.20 | 91.81 | 89.41 | 97.24 | 90.45 | 1.6 |
| Renew./Total Elec.(%) ^{1,4} | 13.4 | 13.0 | 13.9 | 16.4 | 15.8 | 17.6 | 16.5 | 1.4 |
| Road energy consumption (Mtoe) | 36.3 | 42.1 | 41.2 | 41.0 | 41.5 | 41.5 | .. | .. |
| of which: Liquid biofuels (Mtoe) | - | 0.33 | 2.42 | 2.94 | 3.00 | 3.11 | .. | .. |
| Liq. biofuels/road tr.(%) ⁵ | - | 0.8 | 5.9 | 7.2 | 7.2 | 7.5 | - | - |

1. Renewables do not include industrial waste, non-renewable municipal waste and pumped storage production.

2. In units of toe per thousand 2010 US dollars.

3. Electricity generation = gross production - amount of electricity produced in pumped storage plants.

4. Electricity share generated from renewables over the total electricity production.

5. Energy from liquid biofuels consumed in road transport over the total energy consumed in road transport.

Source: IEA/OECD World Energy Balances and OECD Main Economic Indicators.

Table 2. Net generating capacity of renewable and waste sources (MWe)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | Average annual percent change 00-16 |
|---|--------------|--------------|--------------|--------------|--------------|--------------|--|
| Total capacity | 24913 | 26060 | 33991 | 41852 | 44127 | 46388 | 3.7 |
| Hydro | 24673 | 25154 | 25425 | 25315 | 25299 | 25517 | 0.1 |
| Hydro <1MW | 366 | 372 | 447 | 416 | 427 | 443 | 1.1 |
| Hydro 1-10MW | 1442 | 1462 | 1621 | 1614 | 1638 | 1653 | 0.8 |
| Hydro 10+MW | 15909 | 15812 | 16088 | 16100 | 16098 | 16286 | 0.2 |
| Mixed plants | 5164 | 5651 | 5461 | 5457 | 5408 | 5407 | -0.3 |
| Pure pumped storage | 1792 | 1857 | 1808 | 1728 | 1728 | 1728 | -0.4 |
| Geothermal | - | - | - | 2 | 2 | 2 | - |
| Solar photovoltaic | - | 7 | 1044 | 5669 | 6755 | 7320 | 54.4 |
| Solar thermal | - | - | - | - | - | - | - |
| Tide, wave, ocean | 240 | 213 | 216 | 220 | 218 | 220 | 0.2 |
| Wind | - | 38 | 5912 | 9068 | 10217 | 11467 | 42.9 |
| Industrial waste | - | - | 63 | 97 | 116 | 98 | - |
| Municipal waste | - | 432 | 807 | 837 | 774 | 859 | 4.4 |
| Solid biofuels | - | 182 | 353 | 354 | 423 | 548 | 7.1 |
| Biogases | - | 34 | 171 | 290 | 320 | 353 | 15.7 |
| Liquid biofuels | - | - | - | - | 3 | 4 | - |
| Solar collectors surface (1000 m ²) | 571 | 513 | 1447 | 2096 | 2171 | 2219 | 9.6 |
| Cap. of solar collectors (MW _{th}) ¹ | 400 | 359 | 1013 | 1467 | 1520 | 1553 | 9.6 |

1. Converted at 0.7 kW_{th}/m² of solar collector area, as estimated by the IEA Solar Heating & Cooling Programme.

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Table 3. Capacity factors (%)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 |
|--|--------------|--------------|--------------|--------------|--------------|--------------|
| Total plants¹ | 27.29 | 32.97 | 28.56 | 27.21 | 24.99 | 25.72 |
| Hydro | 26.57 | 32.28 | 30.32 | 30.95 | 26.80 | 29.03 |
| <i>of which: <1MW</i> | - | 44.79 | 42.99 | 41.44 | 34.81 | 39.07 |
| <i>of which: 1-10MW</i> | - | 41.12 | 36.48 | 37.51 | 31.00 | 34.77 |
| <i>of which: 10+MW</i> | 38.65 | 43.06 | 39.63 | 39.72 | 34.53 | 37.49 |
| <i>of which: pure pumped storage²</i> | x | x | x | x | x | x |
| Geothermal | - | - | - | - | - | 24.42 |
| Solar photovoltaic | - | 8.52 | 6.78 | 11.91 | 12.27 | 12.73 |
| Solar thermal | - | - | - | - | - | - |
| Tide, wave and ocean | 23.91 | 27.19 | 25.18 | 24.93 | 25.52 | 25.97 |
| Wind | - | 14.47 | 19.20 | 21.71 | 23.74 | 21.30 |
| Industrial waste | - | - | 10.36 | 20.79 | 24.69 | 29.53 |
| Municipal waste | - | 57.13 | 55.82 | 53.76 | 58.90 | 57.48 |
| Solid biofuels | - | 68.37 | 47.30 | 55.75 | 57.99 | 63.94 |
| Biogases | - | x | 67.13 | 64.43 | 64.88 | 61.46 |
| Biodiesels | - | - | - | - | - | - |
| Other liquid biofuels | - | - | - | - | 3.83 | 4.61 |

1. The capacity factor is defined as: the annual gross electricity generation divided by the reported net capacity times 365 (days/year) times 24 (hours/day).

2. In case a country has at least one mixed hydro plants, it is impossible to calculate capacity factor thus it is shown as 'not applicable'.

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Table 4. Gross electricity production from renewable and waste sources (GWh)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|--------------------------------------|--------------|--------------|--------------|--------------|--------------|---------------|--------------|---|
| Total electricity¹ | 59552 | 75253 | 85038 | 99754 | 96612 | 104504 | 98063 | 1.6 |
| Hydro | 57418 | 71133 | 67526 | 68627 | 59401 | 64889 | 54365 | -1.6 |
| <i>of which: pumped storage</i> | 3552 | 4770 | 4812 | 5797 | 4957 | 4846 | 5134 | 0.4 |
| Geothermal | - | - | - | - | - | 4 | 8 | - |
| Solar photovoltaic | - | 5 | 620 | 5913 | 7262 | 8160 | 9163 | 55.6 |
| Solar thermal | - | - | - | - | - | - | - | - |
| Tide, wave, ocean | 503 | 507 | 476 | 481 | 487 | 501 | 410 | -1.2 |
| Wind | - | 48 | 9945 | 17249 | 21249 | 21400 | 24317 | 44.2 |
| Industrial waste | - | - | 57 | 176 | 250 | 253 | 259 | - |
| Municipal waste renew. | 222 | 1081 | 1973 | 1971 | 1997 | 2163 | 2220 | 4.3 |
| Municipal waste non-renew. | 221 | 1081 | 1973 | 1971 | 1997 | 2163 | 2220 | 4.3 |
| Solid biofuels | 1116 | 1090 | 1463 | 1730 | 2149 | 3070 | 3150 | 6.4 |
| Biogases | 72 | 308 | 1005 | 1636 | 1819 | 1900 | 1950 | 11.5 |
| Liquid biofuels | - | - | - | - | 1 | 1 | 1 | - |
| of which: | | | | | | | | |
| Electricity only plants | 58396 | 73200 | 82055 | 95412 | 91668 | 98494 | .. | - |
| Hydro | 57418 | 71133 | 67526 | 68627 | 59401 | 64889 | .. | - |
| <i>of which: pumped storage</i> | 3552 | 4770 | 4812 | 5797 | 4957 | 4846 | .. | - |
| Geothermal | - | - | - | - | - | 4 | .. | - |
| Solar photovoltaic | - | 5 | 620 | 5913 | 7262 | 8160 | .. | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Tide, wave, ocean | 503 | 507 | 476 | 481 | 487 | 501 | .. | - |
| Wind | - | 48 | 9945 | 17249 | 21249 | 21400 | .. | - |
| Industrial waste | - | - | - | 109 | 173 | 178 | .. | - |
| Municipal waste renew. | 222 | 487 | 1196 | 1113 | 1142 | 1157 | .. | - |
| Municipal waste non-renew. | 221 | 487 | 1196 | 1113 | 1142 | 1157 | .. | - |
| Solid biofuels | - | 278 | 374 | 98 | 98 | 406 | .. | - |
| Biogases | 32 | 255 | 722 | 709 | 713 | 641 | .. | - |
| Liquid biofuels | - | - | - | - | 1 | 1 | .. | - |
| CHP plants | 1156 | 2053 | 2983 | 4342 | 4944 | 6010 | .. | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | 57 | 67 | 77 | 75 | .. | - |
| Municipal waste renew. | - | 594 | 777 | 858 | 855 | 1006 | .. | - |
| Municipal waste non-renew. | - | 594 | 777 | 858 | 855 | 1006 | .. | - |
| Solid biofuels | 1116 | 812 | 1089 | 1632 | 2051 | 2664 | .. | - |
| Biogases | 40 | 53 | 283 | 927 | 1106 | 1259 | .. | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |

1. **Total electricity** includes the electricity produced from industrial waste, non-renewable municipal waste and pumped storage. Electricity from renewable sources does *not* include the electricity produced from industrial waste, non-renewable municipal waste and pumped storage production.

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Table 5A. Heat production¹ from renewable and waste sources in the transformation sector (TJ)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|----------------------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--|
| Total heat | 19997 | 23992 | 60304 | 76453 | 82438 | 95338 | 98705 | 8.7 |
| Geothermal | .. | .. | 3199 | 3747 | 3857 | 4397 | 4973 | .. |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | 202 | 214 | 215 | 308 | 318 | - |
| Municipal waste renew. | 9999 | 11996 | 21409 | 22923 | 23342 | 25203 | 25977 | 4.6 |
| Municipal waste non-renew. | 9998 | 11996 | 21409 | 22923 | 23342 | 25203 | 25976 | 4.6 |
| Solid biofuels | - | - | 13719 | 25681 | 30245 | 38529 | 39711 | - |
| Biogases | - | - | 366 | 965 | 1437 | 1698 | 1750 | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| <i>of which:</i> | | | | | | | | |
| CHP plants | - | 17814 | 25886 | 34774 | 35790 | 44084 | .. | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | 202 | 214 | 215 | 308 | .. | - |
| Municipal waste renew. | - | 8907 | 8063 | 9421 | 8801 | 10694 | .. | - |
| Municipal waste non-renew. | - | 8907 | 8063 | 9421 | 8801 | 10694 | .. | - |
| Solid biofuels | - | - | 9311 | 14853 | 16646 | 20811 | .. | - |
| Biogases | - | - | 247 | 865 | 1327 | 1577 | .. | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| Heat only plants | 19997 | 6178 | 34418 | 41679 | 46648 | 51254 | .. | - |
| Geothermal | .. | .. | 3199 | 3747 | 3857 | 4397 | .. | .. |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | 9999 | 3089 | 13346 | 13502 | 14541 | 14509 | .. | - |
| Municipal waste non-renew. | 9998 | 3089 | 13346 | 13502 | 14541 | 14509 | .. | - |
| Solid biofuels | - | - | 4408 | 10828 | 13599 | 17718 | .. | - |
| Biogases | - | - | 119 | 100 | 110 | 121 | .. | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |

1. Waste heat and heat production from heat pumps are not included and are reported separately in Table 5B.

Table 5B. Heat production from heat pumps and waste heat (TJ)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|----------------------------|----------|----------|------------|-------------|-------------|-------------|-------------|--|
| Total heat | - | - | 364 | 3078 | 3436 | 4500 | 3497 | - |
| Heat pumps ¹ | - | - | 55 | 243 | 499 | 509 | 407 | - |
| (-) Input to heat pumps | - | - | 14 | 281 | 515 | 511 | 511 | - |
| Other sources ² | - | - | 323 | 3116 | 3452 | 4502 | 3601 | - |

1. Installations producing heat for own use are not included.

2. Refers to production from hydrogen, purchased steam from industry, and waste heat.

Source: IEA/OECD *Electricity Statistics*.

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Table 6. Renewable and waste balance for 2016

| thousand tonnes of oil equivalent | Hydro ¹ | Wind | Tide wave ocean | Solar PV | Geo-thermal | Solar thermal | Industrial waste | Mun. waste renew. |
|------------------------------------|--------------------|--------------|-----------------|-------------|-------------|---------------|------------------|-------------------|
| Production | 5163 | 1840 | 43 | 702 | 243 | 101 | 110 | 1541 |
| Imports | - | - | - | - | - | - | - | - |
| Exports | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| TPES | 5163 | 1840 | 43 | 702 | 243 | 101 | 110 | 1541 |
| Statistical differences | - | - | - | - | - | - | - | - |
| Main activity electricity plants | -5106 | -1740 | -43 | -358 | -4 | - | - | -2 |
| Autoproducer electricity plants | -57 | -100 | - | -343 | - | - | -78 | -453 |
| Main activity CHP plants | - | - | - | - | - | - | -2 | -88 |
| Autoproducer CHP plants | - | - | - | - | - | - | -26 | -435 |
| Main heat plants | - | - | - | - | -183 | - | - | -301 |
| Autoproducer heat plants | - | - | - | - | -27 | - | - | -104 |
| Charcoal production plants | - | - | - | - | - | - | - | - |
| Other transformation | - | - | - | - | - | - | - | - |
| Energy Industry own use | - | - | - | - | - | - | - | -34 |
| Losses | - | - | - | - | - | - | - | - |
| TFC | - | - | - | - | 30 | 101 | 4 | 123 |
| Industry | - | - | - | - | - | - | - | 1 |
| Iron and steel | - | - | - | - | - | - | - | - |
| Chemical and petrochemical | - | - | - | - | - | - | - | - |
| Non-ferrous metals | - | - | - | - | - | - | - | - |
| Non-metallurgical minerals | - | - | - | - | - | - | - | - |
| Transport equipment | - | - | - | - | - | - | - | - |
| Machinery | - | - | - | - | - | - | - | - |
| Mining and quarrying | - | - | - | - | - | - | - | - |
| Food and tobacco | - | - | - | - | - | - | - | - |
| Paper, pulp and print | - | - | - | - | - | - | - | - |
| Wood and wood products | - | - | - | - | - | - | - | - |
| Construction | - | - | - | - | - | - | - | 1 |
| Textile and leather | - | - | - | - | - | - | - | - |
| Non-specified | - | - | - | - | - | - | - | - |
| Transport | - | - | - | - | - | - | - | - |
| Road | - | - | - | - | - | - | - | - |
| Other | - | - | - | - | - | - | - | - |
| Other | - | - | - | - | 30 | 100 | 3 | 122 |
| Residential | - | - | - | - | - | 87 | - | - |
| Commercial and public services | - | - | - | - | 17 | 12 | 3 | 122 |
| Agriculture/forestry | - | - | - | - | 5 | 2 | - | - |
| Fishing | - | - | - | - | 8 | - | - | - |
| Non-specified | - | - | - | - | - | - | - | - |
| Electricity generated - GWh | 60043 | 21400 | 501 | 8160 | 4 | - | 253 | 2163 |
| <i>Electricity plants</i> | 60043 | 21400 | 501 | 8160 | 4 | - | 178 | 1157 |
| <i>CHP plants</i> | - | - | - | - | - | - | 75 | 1006 |
| Heat generated - TJ | - | - | - | - | 4397 | - | 308 | 25203 |
| <i>CHP plants</i> | - | - | - | - | - | - | 308 | 10694 |
| <i>Heat plants</i> | - | - | - | - | 4397 | - | - | 14509 |

1. Hydro does not include pumped hydro.

Source: IEA/OECD *World Energy Balances*.

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Table 6. Renewable and waste balance for 2016 (continued)

| Mun. waste non-ren. | Wood/wood waste | Charcoal | Bio-gases | Bio-gasoline | Bio-diesel | Other liquid biofuels | Total renew. & waste sources ² | Share in total energy sources ³ |
|---------------------|-----------------|----------|-------------|--------------|-------------|-----------------------|---|--|
| 1541 | 11097 | - | 760 | 386 | 2020 | 1 | 25548 | 19.4% |
| - | - | - | - | 115 | 797 | - | 912 | 0.6% |
| - | - | - | - | -28 | -175 | - | -203 | 0.7% |
| - | - | - | - | -1 | -22 | - | -23 | x |
| 1541 | 11097 | - | 760 | 472 | 2619 | 1 | 26233 | 10.7% |
| - | - | - | - | 4 | 11 | - | 15 | x |
| -2 | -56 | - | -14 | - | - | - | -7325 | x |
| -453 | -289 | - | -214 | - | - | -1 | -1988 | x |
| -88 | -881 | - | -159 | - | - | - | -1218 | x |
| -435 | -470 | - | -169 | - | - | - | -1535 | x |
| -301 | -447 | - | -1 | - | - | - | -1233 | x |
| -104 | -52 | - | -2 | - | - | - | -289 | x |
| - | - | - | - | - | - | - | - | - |
| - | - | - | -17 | - | - | - | -17 | x |
| -34 | - | - | -3 | - | - | - | -71 | x |
| - | - | - | - | - | - | - | - | - |
| 123 | 8902 | - | 181 | 476 | 2630 | - | 12570 | 8.3% |
| 1 | 1493 | - | 80 | - | - | - | 1575 | 5.9% |
| - | - | - | - | - | - | - | - | - |
| - | 127 | - | 32 | - | - | - | 159 | 3.6% |
| - | - | - | - | - | - | - | - | - |
| - | 142 | - | 4 | - | - | - | 146 | 4.4% |
| - | 7 | - | - | - | - | - | 7 | 0.7% |
| - | 4 | - | - | - | - | - | 4 | 0.2% |
| - | 3 | - | 8 | - | - | - | 11 | 2.9% |
| - | 129 | - | 23 | - | - | - | 152 | 3.2% |
| - | 735 | - | 12 | - | - | - | 747 | 31.5% |
| - | 311 | - | - | - | - | - | 311 | 54.6% |
| 1 | - | - | 1 | - | - | - | 3 | 0.2% |
| - | - | - | - | - | - | - | - | - |
| - | 35 | - | - | - | - | - | 35 | 1.4% |
| - | - | - | - | 476 | 2630 | - | 3106 | 7.1% |
| - | - | - | - | 476 | 2630 | - | 3106 | 7.5% |
| - | - | - | - | - | - | - | - | - |
| 122 | 7409 | - | 101 | - | - | - | 7887 | 11.6% |
| - | 6952 | - | - | - | - | - | 7039 | 17.7% |
| 122 | 326 | - | 89 | - | - | - | 691 | 3.0% |
| - | 131 | - | 13 | - | - | - | 151 | 3.6% |
| - | - | - | - | - | - | - | 8 | 2.8% |
| - | - | - | - | - | - | - | - | - |
| 2163 | 3070 | - | 1900 | - | - | 1 | 99658 | 18.1% |
| 1157 | 406 | - | 641 | - | - | 1 | 93648 | 17.6% |
| 1006 | 2664 | - | 1259 | - | - | - | 6010 | 32.0% |
| 25203 | 38529 | - | 1698 | - | - | - | 95338 | 53.0% |
| 10694 | 20811 | - | 1577 | - | - | - | 44084 | 47.5% |
| 14509 | 17718 | - | 121 | - | - | - | 51254 | 58.9% |

2. Total includes non-renewable waste.

3. Share of renewables on TFC excludes electricity and heat generated from renewable sources.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|--|-------|-------|-------|-------|-------|-------|-------|---|
| Geothermal (TJ) | | | | | | | | |
| Production | 4624 | 5275 | 7309 | 9162 | 8952 | 10187 | 11806 | 4.2 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 4624 | 5275 | 7309 | 9162 | 8952 | 10187 | 11806 | 4.2 |
| Statistical differences | - | - | - | -388 | -1 | - | .. | - |
| Transformation processes | - | - | 6398 | 7494 | 7714 | 8950 | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 4624 | 5275 | 911 | 1280 | 1237 | 1237 | .. | -8.7 |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 4624 | 5275 | 911 | 1280 | 1237 | 1237 | .. | -8.7 |
| Solar thermal (TJ) | | | | | | | | |
| Production | 1015 | 866 | 2694 | 3993 | 4146 | 4219 | 4305 | 10.4 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 1015 | 866 | 2694 | 3993 | 4146 | 4219 | 4305 | 10.4 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 1015 | 866 | 2694 | 3993 | 4146 | 4219 | .. | 10.4 |
| <i>Industry</i> | - | - | 5 | 17 | 19 | 19 | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 1015 | 866 | 2689 | 3976 | 4127 | 4200 | .. | 10.4 |
| Industrial waste (TJ) | | | | | | | | |
| Production | - | - | 975 | 3058 | 5584 | 4595 | 5293 | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | 975 | 3058 | 5584 | 4595 | 5293 | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | 975 | 2917 | 5427 | 4427 | .. | - |
| Energy industry own use | - | - | - | - | - | 5 | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | 141 | 157 | 163 | .. | - |
| <i>Industry</i> | - | - | - | 19 | 26 | 17 | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | 122 | 131 | 146 | .. | - |
| Municipal waste - renewables (TJ) | | | | | | | | |
| Production | 23991 | 38877 | 60475 | 60560 | 63266 | 64526 | 66831 | 3.2 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 23991 | 38877 | 60475 | 60560 | 63266 | 64526 | 66831 | 3.2 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | 23991 | 32519 | 55913 | 53668 | 56988 | 57932 | .. | 3.7 |
| Energy industry own use | - | - | 426 | 1618 | 1025 | 1443 | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | 6358 | 4136 | 5274 | 5253 | 5151 | .. | -1.3 |
| <i>Industry</i> | - | - | 8 | - | - | 33 | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | 6358 | 4128 | 5274 | 5253 | 5118 | .. | -1.3 |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics (continued)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|--|--------|--------|--------|--------|--------|--------|--------|---|
| Municipal waste - non-renewables (TJ) | | | | | | | | |
| Production | 23991 | 38877 | 60475 | 60560 | 63266 | 64526 | 66831 | 3.2 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 23991 | 38877 | 60475 | 60560 | 63266 | 64526 | 66831 | 3.2 |
| Statistical differences | - | - | - | - | - | - | .. | .. |
| Transformation processes | 23991 | 32519 | 55913 | 53668 | 56988 | 57932 | .. | 3.7 |
| Energy industry own use | - | - | 426 | 1618 | 1025 | 1443 | .. | - |
| Losses | - | - | - | - | - | - | .. | .. |
| Final energy consumption | - | 6358 | 4136 | 5274 | 5253 | 5151 | .. | -1.3 |
| <i>Industry</i> | - | - | 8 | - | - | 33 | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | 6358 | 4128 | 5274 | 5253 | 5118 | .. | -1.3 |
| Solid Biofuel excluding charcoal (TJ) | | | | | | | | |
| Production | 409016 | 353091 | 432833 | 380204 | 404738 | 464592 | 452241 | 1.7 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 409016 | 353091 | 432833 | 380204 | 404738 | 464592 | 452241 | 1.7 |
| Statistical differences | 1 | - | - | - | - | - | .. | .. |
| Transformation processes | 6780 | 7019 | 58680 | 57100 | 60831 | 91892 | .. | 17.4 |
| Energy industry own use | - | - | 320 | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | .. |
| Final energy consumption | 402237 | 346072 | 373833 | 323104 | 343907 | 372700 | .. | 0.5 |
| <i>Industry</i> | 62328 | 64700 | 60391 | 52544 | 54784 | 62513 | .. | -0.2 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 339909 | 281372 | 313442 | 270560 | 289123 | 310187 | .. | 0.6 |
| Charcoal (kt) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | .. |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | .. |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Biogases (TJ) | | | | | | | | |
| Production | 3035 | 6248 | 18389 | 25272 | 30370 | 31822 | 34253 | 10.7 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 3035 | 6248 | 18389 | 25272 | 30370 | 31822 | 34253 | 10.7 |
| Statistical differences | - | - | - | - | - | - | .. | .. |
| Transformation processes | 712 | 2834 | 15848 | 20027 | 24043 | 24131 | .. | 14.3 |
| Energy industry own use | - | - | - | 30 | 86 | 118 | .. | - |
| Losses | - | - | - | - | - | - | .. | .. |
| Final energy consumption | 2323 | 3414 | 2541 | 5215 | 6241 | 7573 | .. | 5.1 |
| <i>Industry</i> | 315 | 738 | 843 | 1973 | 2344 | 3332 | .. | 9.9 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 2008 | 2676 | 1698 | 3242 | 3897 | 4241 | .. | 2.9 |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics (continued)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|-----------------------------------|------|------|------|------|------|------|-------|---|
| Biogasoline (kt) | | | | | | | | |
| Production | - | 93 | 744 | 729 | 593 | 567 | 624 | 12.0 |
| Net imports ¹ | - | - | -133 | -93 | 67 | 128 | 169 | - |
| Stock changes | - | -2 | 7 | -3 | 2 | -2 | -2 | |
| Gross consumption | - | 91 | 618 | 633 | 662 | 693 | 791 | 13.5 |
| Statistical differences | - | - | - | 2 | -4 | 6 | .. | |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | |
| Final energy consumption | - | 91 | 618 | 635 | 658 | 699 | .. | 13.6 |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | 91 | 618 | 635 | 658 | 699 | .. | 13.6 |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Biodiesel (kt) | | | | | | | | |
| Production | - | 300 | 2018 | 2360 | 2434 | 2256 | 2280 | 13.4 |
| Net imports ¹ | - | 8 | 273 | 497 | 439 | 695 | 673 | 32.2 |
| Stock changes | - | -5 | -10 | -52 | -37 | -25 | -6 | |
| Gross consumption | - | 303 | 2281 | 2805 | 2836 | 2926 | 2947 | 15.2 |
| Statistical differences | - | - | - | 39 | 40 | 12 | .. | |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | |
| Final energy consumption | - | 303 | 2281 | 2844 | 2876 | 2938 | .. | 15.3 |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | 303 | 2281 | 2844 | 2876 | 2938 | .. | 15.3 |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Other liquid biofuels (kt) | | | | | | | | |
| Production | - | - | - | - | 1 | 1 | 1 | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | |
| Gross consumption | - | - | - | - | 1 | 1 | 1 | - |
| Statistical differences | - | - | - | - | - | - | .. | |
| Transformation processes | - | - | - | - | 1 | 1 | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Figure 1. Contribution of renewables in 1990

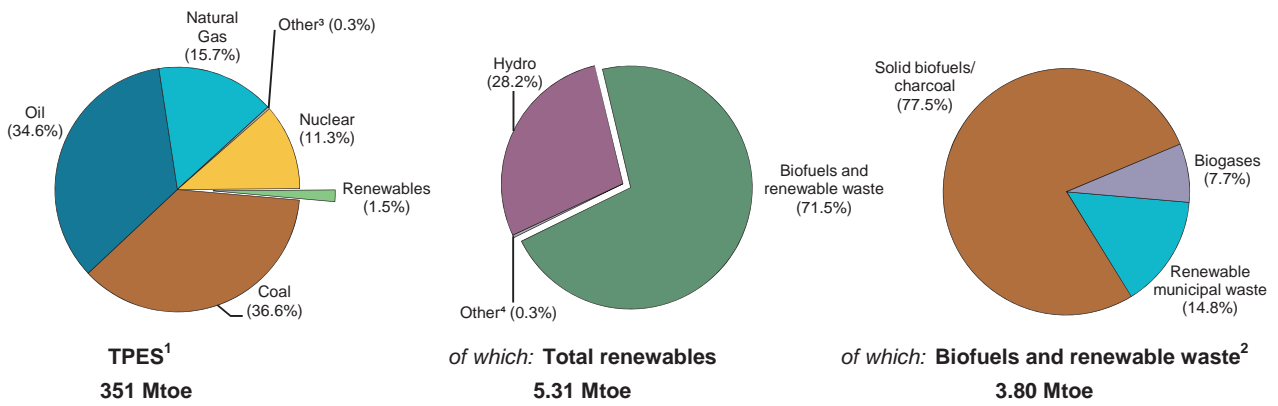


Figure 2. Contribution of renewables in 2017 provisional

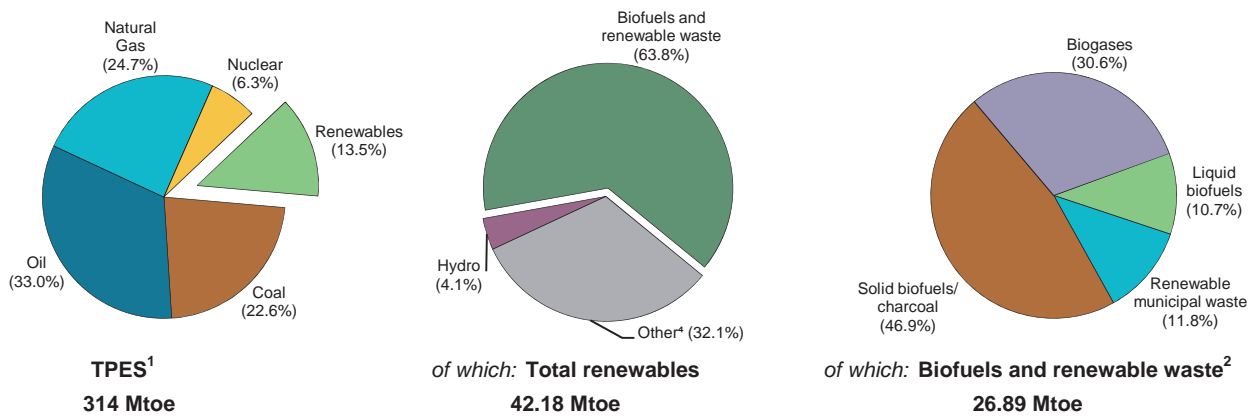
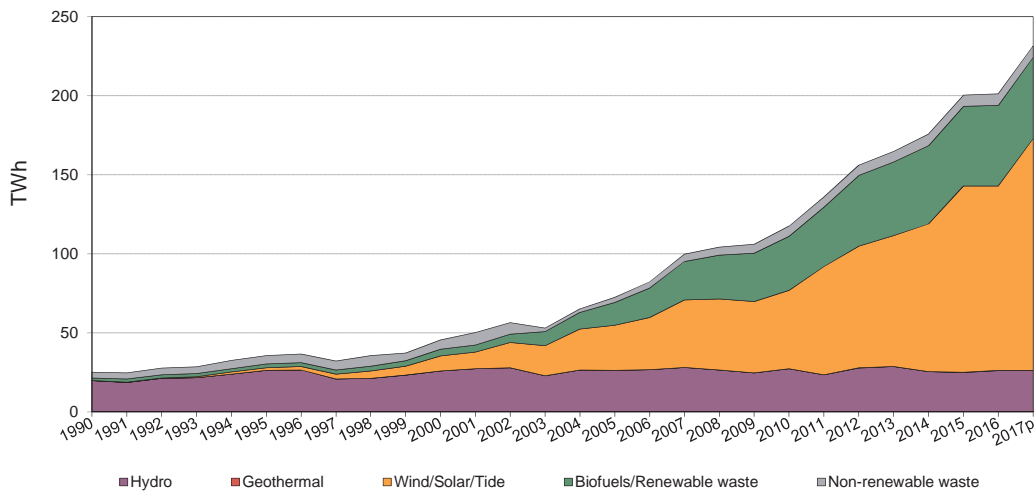


Figure 3. Electricity production by renewables and waste energy source



1. Total primary energy supply includes electricity trade.
2. Biofuels and renewable waste include solid biofuels, liquid biofuels, biogases, and renewable municipal waste.
3. Includes non-renewable municipal waste, industrial waste, peat, shale oil, electricity trade, and other sources of primary energy. (In the case of negative values, the net exports of electricity are greater than the other products in this category).
4. Includes geothermal, solar, wind and tide.

Note: Totals may not sum due to rounding.
Source: IEA/OECD *World Energy Balances*.

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Table 1. Energy supply, GDP and population

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|---|---------|---------|---------|---------|---------|---------|---------|--|
| TPES (Mtoe) | 351.23 | 336.60 | 326.36 | 306.06 | 308.17 | 310.12 | 313.54 | -0.4 |
| of which: Renewables (Mtoe) ¹ | 5.31 | 8.98 | 27.57 | 35.41 | 38.35 | 38.92 | 42.18 | 9.5 |
| Renewables/TPES(%) | 1.5 | 2.7 | 8.4 | 11.6 | 12.4 | 12.5 | 13.5 | 10.0 |
| GDP (billion 2010 US dollars) | 2568.63 | 3123.91 | 3417.10 | 3646.04 | 3709.60 | 3781.70 | 3865.76 | 1.3 |
| TPES/GDP ² | 0.14 | 0.11 | 0.10 | 0.08 | 0.08 | 0.08 | 0.08 | -1.7 |
| TPES/GDP (year 2010 = 100) | 143 | 113 | 100 | 88 | 87 | 86 | 85 | -1.7 |
| Population (millions) | 79.36 | 81.46 | 80.28 | 80.98 | 81.69 | 82.35 | 82.68 | 0.1 |
| TPES/population (toe per capita) | 4.43 | 4.13 | 4.07 | 3.78 | 3.77 | 3.77 | 3.79 | -0.5 |
| Electricity generation (TWh) ³ | 547.7 | 572.3 | 626.6 | 621.9 | 641.0 | 643.5 | 649.0 | 0.7 |
| of which: Renewables (TWh) ^{1,3} | 19.09 | 35.48 | 104.81 | 162.51 | 187.37 | 188.34 | 218.28 | 11.3 |
| Renew./Total Elec.(%) ^{1,4} | 3.5 | 6.2 | 16.7 | 26.1 | 29.2 | 29.3 | 33.6 | 10.5 |
| Road energy consumption (Mtoe) | 50.5 | 56.3 | 50.3 | 52.2 | 53.0 | 54.0 | .. | .. |
| of which: Liquid biofuels (Mtoe) | - | 0.24 | 2.87 | 2.77 | 2.55 | 2.55 | .. | .. |
| Liq. biofuels/road tr.(%) ⁵ | - | 0.4 | 5.7 | 5.3 | 4.8 | 4.7 | - | - |

1. Renewables do not include industrial waste, non-renewable municipal waste and pumped storage production.

2. In units of toe per thousand 2010 US dollars.

3. Electricity generation = gross production - amount of electricity produced in pumped storage plants.

4. Electricity share generated from renewables over the total electricity production.

5. Energy from liquid biofuels consumed in road transport over the total energy consumed in road transport.

Source: IEA/OECD World Energy Balances and OECD Main Economic Indicators.

Table 2. Net generating capacity of renewable and waste sources (MWe)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | Average annual percent change 00-16 |
|---|-------------|--------------|--------------|--------------|---------------|---------------|--|
| Total capacity | 9146 | 17638 | 64346 | 97871 | 105594 | 112217 | 12.3 |
| Hydro | 8182 | 9485 | 11218 | 11234 | 11399 | 11300 | 1.1 |
| Hydro <1MW | 374 | 558 | 616 | 599 | 612 | 608 | 0.5 |
| Hydro 1-10MW | 912 | 872 | 532 | 684 | 715 | 718 | -1.2 |
| Hydro 10+MW | 2024 | 2656 | 3104 | 3141 | 3250 | 3247 | 1.3 |
| Mixed plants | 672 | 745 | 1155 | 1156 | 1156 | 1187 | 3.0 |
| Pure pumped storage | 4200 | 4654 | 5811 | 5654 | 5666 | 5540 | 1.1 |
| Geothermal | - | - | 8 | 24 | 26 | 29 | - |
| Solar photovoltaic | 2 | 114 | 18005 | 37898 | 39243 | 40714 | 44.4 |
| Solar thermal | - | - | 2 | 2 | 2 | 2 | - |
| Tide, wave, ocean | - | - | - | - | - | - | - |
| Wind | 48 | 6095 | 26903 | 38614 | 44580 | 49592 | 14.0 |
| Industrial waste | 253 | 885 | 1226 | 953 | 953 | 953 | 0.5 |
| Municipal waste | 550 | 585 | 1526 | 1888 | 1924 | 1957 | 7.8 |
| Solid biofuels | 22 | 129 | 1500 | 1589 | 1592 | 1600 | 17.0 |
| Biogases | 89 | 345 | 3548 | 5437 | 5643 | 5839 | 19.3 |
| Liquid biofuels | - | - | 410 | 232 | 232 | 231 | - |
| Solar collectors surface (1000 m ²) | 348 | 3251 | 14044 | 17987 | 18625 | 19122 | 11.7 |
| Cap. of solar collectors (MW _{th}) ¹ | 244 | 2276 | 9831 | 12591 | 13038 | 13385 | 11.7 |

1. Converted at 0.7 kW_{th}/m² of solar collector area, as estimated by the IEA Solar Heating & Cooling Programme.

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Table 3. Capacity factors (%)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 |
|--|--------------|--------------|--------------|--------------|--------------|--------------|
| Total plants¹ | 31.26 | 29.44 | 20.86 | 20.51 | 21.66 | 20.47 |
| Hydro | 27.61 | 31.25 | 27.83 | 25.86 | 24.93 | 26.40 |
| <i>of which: <1MW</i> | 41.08 | 51.74 | 42.54 | 39.00 | 36.98 | 40.29 |
| <i>of which: 1-10MW</i> | 62.25 | 63.71 | 62.89 | 46.32 | 42.94 | 46.37 |
| <i>of which: 10+MW</i> | 62.64 | 61.62 | 57.84 | 53.66 | 50.25 | 54.44 |
| <i>of which: pure pumped storage²</i> | x | x | x | x | x | x |
| Geothermal | - | - | 39.53 | 46.68 | 58.89 | 68.76 |
| Solar photovoltaic | 5.71 | 6.01 | 7.44 | 10.86 | 11.27 | 10.68 |
| Solar thermal | - | - | 0.41 | - | - | - |
| Tide, wave and ocean | - | - | - | - | - | - |
| Wind | 16.89 | 17.52 | 16.04 | 16.96 | 20.28 | 18.09 |
| Industrial waste | x | 50.90 | 14.95 | 16.32 | 15.43 | 16.78 |
| Municipal waste | 50.58 | 71.97 | 71.01 | 73.40 | 68.45 | 69.18 |
| Solid biofuels | 66.94 | 71.15 | 81.94 | 85.26 | 79.12 | 77.01 |
| Biogases | 31.68 | 55.69 | 56.08 | 65.32 | 66.90 | 65.89 |
| Biodiesels | - | - | - | - | - | - |
| Other liquid biofuels | - | - | 37.92 | 17.94 | 22.01 | 24.57 |

1. The capacity factor is defined as: the annual gross electricity generation divided by the reported net capacity times 365 (days/year) times 24 (hours/day).

2. In case a country has at least one mixed hydro plants, it is impossible to calculate capacity factor thus it is shown as 'not applicable'.

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Table 4. Gross electricity production from renewable and waste sources (GWh)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|--------------------------------------|--------------|--------------|---------------|---------------|---------------|---------------|---------------|---|
| Total electricity¹ | 25049 | 45495 | 117561 | 175803 | 200343 | 201261 | 231533 | 10.0 |
| Hydro | 19791 | 25962 | 27353 | 25444 | 24898 | 26135 | 26151 | 0.0 |
| <i>of which: pumped storage</i> | 2365 | 4230 | 6400 | 5857 | 5921 | 5588 | 6005 | 2.1 |
| Geothermal | - | - | 28 | 98 | 134 | 175 | 185 | - |
| Solar photovoltaic | 1 | 60 | 11729 | 36056 | 38726 | 38098 | 39895 | 46.6 |
| Solar thermal | - | - | - | - | - | - | - | - |
| Tide, wave, ocean | - | - | - | - | - | - | - | - |
| Wind | 71 | 9352 | 37793 | 57357 | 79206 | 78598 | 106601 | 15.4 |
| Industrial waste | 2373 | 3946 | 1605 | 1363 | 1288 | 1401 | 1301 | -6.3 |
| Municipal waste renew. | 1219 | 1844 | 4747 | 6070 | 5768 | 5930 | 5952 | 7.1 |
| Municipal waste non-renew. | 1218 | 1844 | 4747 | 6070 | 5768 | 5930 | 5952 | 7.1 |
| Solid biofuels | 129 | 804 | 10768 | 11868 | 11034 | 10794 | 10659 | 16.4 |
| Biogases | 247 | 1683 | 17430 | 31113 | 33073 | 33703 | 34300 | 19.4 |
| Liquid biofuels | - | - | 1361 | 364 | 448 | 497 | 537 | - |
| of which: | | | | | | | | |
| Electricity only plants | 25049 | 45495 | 92632 | 141296 | 164487 | 165170 | .. | - |
| Hydro | 19791 | 25962 | 27353 | 25444 | 24898 | 26135 | .. | - |
| <i>of which: pumped storage</i> | 2365 | 4230 | 6400 | 5857 | 5921 | 5588 | .. | - |
| Geothermal | - | - | 28 | 98 | 134 | 175 | .. | - |
| Solar photovoltaic | 1 | 60 | 11729 | 36056 | 38726 | 38098 | .. | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Tide, wave, ocean | - | - | - | - | - | - | - | - |
| Wind | 71 | 9352 | 37793 | 57357 | 79206 | 78598 | .. | - |
| Industrial waste | 2373 | 3946 | 772 | 879 | 735 | 858 | .. | - |
| Municipal waste renew. | 1219 | 1844 | 3182 | 3684 | 3530 | 3601 | .. | - |
| Municipal waste non-renew. | 1218 | 1844 | 3182 | 3684 | 3530 | 3601 | .. | - |
| Solid biofuels | 129 | 804 | 4255 | 5333 | 4796 | 4775 | .. | - |
| Biogases | 247 | 1683 | 4204 | 8745 | 8845 | 9223 | .. | - |
| Liquid biofuels | - | - | 134 | 16 | 87 | 106 | .. | - |
| CHP plants | - | - | 24929 | 34507 | 35856 | 36091 | .. | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | 833 | 484 | 553 | 543 | .. | - |
| Municipal waste renew. | - | - | 1565 | 2386 | 2238 | 2329 | .. | - |
| Municipal waste non-renew. | - | - | 1565 | 2386 | 2238 | 2329 | .. | - |
| Solid biofuels | - | - | 6513 | 6535 | 6238 | 6019 | .. | - |
| Biogases | - | - | 13226 | 22368 | 24228 | 24480 | .. | - |
| Liquid biofuels | - | - | 1227 | 348 | 361 | 391 | .. | - |

1. **Total electricity** includes the electricity produced from industrial waste, non-renewable municipal waste and pumped storage. Electricity from renewable sources does *not* include the electricity produced from industrial waste, non-renewable municipal waste and pumped storage production.

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Table 5A. Heat production¹ from renewable and waste sources in the transformation sector (TJ)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|----------------------------|--------------|--------------|--------------|--------------|---------------|---------------|---------------|--|
| Total heat | 19771 | 19368 | 74198 | 95042 | 102523 | 104356 | 107317 | 10.6 |
| Geothermal | - | - | 225 | 304 | 626 | 797 | 643 | - |
| Solar thermal | - | - | - | 11 | 9 | 6 | 6 | - |
| Industrial waste | - | - | 9009 | 6287 | 7481 | 6987 | 6936 | - |
| Municipal waste renew. | 10874 | 10652 | 23626 | 29611 | 30284 | 30666 | 32363 | 6.8 |
| Municipal waste non-renew. | 8897 | 8716 | 23626 | 29611 | 30284 | 30666 | 32363 | 8.0 |
| Solid biofuels | - | - | 15871 | 22501 | 24417 | 25808 | 25377 | - |
| Biogases | - | - | 1508 | 6581 | 9285 | 9317 | 9501 | - |
| Liquid biofuels | - | - | 333 | 136 | 137 | 109 | 128 | - |
| <i>of which:</i> | | | | | | | | |
| CHP plants | 19771 | 19368 | 47661 | 62681 | 65275 | 66822 | .. | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | 5999 | 4467 | 5119 | 4973 | .. | - |
| Municipal waste renew. | 10874 | 10652 | 15414 | 19378 | 18524 | 19280 | .. | - |
| Municipal waste non-renew. | 8897 | 8716 | 15414 | 19378 | 18524 | 19280 | .. | - |
| Solid biofuels | - | - | 9692 | 15040 | 16719 | 16749 | .. | - |
| Biogases | - | - | 939 | 4305 | 6280 | 6438 | .. | - |
| Liquid biofuels | - | - | 203 | 113 | 109 | 102 | .. | - |
| Heat only plants | - | - | 26537 | 32361 | 37248 | 37534 | .. | - |
| Geothermal | - | - | 225 | 304 | 626 | 797 | .. | - |
| Solar thermal | - | - | - | 11 | 9 | 6 | .. | - |
| Industrial waste | - | - | 3010 | 1820 | 2362 | 2014 | .. | - |
| Municipal waste renew. | - | - | 8212 | 10233 | 11760 | 11386 | .. | - |
| Municipal waste non-renew. | - | - | 8212 | 10233 | 11760 | 11386 | .. | - |
| Solid biofuels | - | - | 6179 | 7461 | 7698 | 9059 | .. | - |
| Biogases | - | - | 569 | 2276 | 3005 | 2879 | .. | - |
| Liquid biofuels | - | - | 130 | 23 | 28 | 7 | .. | - |

1. Waste heat and heat production from heat pumps are not included and are reported separately in Table 5B.

Table 5B. Heat production from heat pumps and waste heat (TJ)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|----------------------------|----------|----------|-------------|-------------|-------------|-------------|-------------|--|
| Total heat | - | - | 6606 | 7043 | 8739 | 7389 | 7494 | - |
| Heat pumps ¹ | - | - | - | - | - | - | - | - |
| (-) Input to heat pumps | - | - | - | - | - | - | - | - |
| Other sources ² | - | - | 6606 | 7043 | 8739 | 7389 | 7494 | - |

1. Installations producing heat for own use are not included.

2. Refers to production from hydrogen, purchased steam from industry, and waste heat.

Source: IEA/OECD *Electricity Statistics*.

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Table 6. Renewable and waste balance for 2016

| thousand tonnes of oil equivalent | Hydro ¹ | Wind | Tide wave ocean | Solar PV | Geo-thermal | Solar thermal | Industrial waste | Mun. waste renew. |
|------------------------------------|--------------------|--------------|-----------------|--------------|-------------|---------------|------------------|-------------------|
| Production | 1767 | 6758 | - | 3276 | 269 | 671 | 1411 | 3102 |
| Imports | - | - | - | - | - | - | - | - |
| Exports | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| TPES | 1767 | 6758 | - | 3276 | 269 | 671 | 1411 | 3102 |
| Statistical differences | - | - | - | - | - | - | - | - |
| Main activity electricity plants | -1752 | -6758 | - | -3276 | -150 | - | -234 | -984 |
| Autoproducer electricity plants | -15 | - | - | - | - | - | -26 | -15 |
| Main activity CHP plants | - | - | - | - | - | - | -261 | -1277 |
| Autoproducer CHP plants | - | - | - | - | - | - | -25 | -42 |
| Main heat plants | - | - | - | - | -38 | - | -84 | -420 |
| Autoproducer heat plants | - | - | - | - | - | - | - | - |
| Charcoal production plants | - | - | - | - | - | - | - | - |
| Other transformation | - | - | - | - | - | - | - | - |
| Energy Industry own use | - | - | - | - | - | - | -12 | - |
| Losses | - | - | - | - | - | - | - | - |
| TFC | - | - | - | - | 81 | 671 | 768 | 364 |
| Industry | - | - | - | - | - | - | 768 | 364 |
| Iron and steel | - | - | - | - | - | - | - | - |
| Chemical and petrochemical | - | - | - | - | - | - | 275 | 24 |
| Non-ferrous metals | - | - | - | - | - | - | 6 | - |
| Non-metallurgical minerals | - | - | - | - | - | - | 472 | 272 |
| Transport equipment | - | - | - | - | - | - | - | - |
| Machinery | - | - | - | - | - | - | 1 | - |
| Mining and quarrying | - | - | - | - | - | - | - | - |
| Food and tobacco | - | - | - | - | - | - | - | - |
| Paper, pulp and print | - | - | - | - | - | - | 14 | 68 |
| Wood and wood products | - | - | - | - | - | - | - | - |
| Construction | - | - | - | - | - | - | - | - |
| Textile and leather | - | - | - | - | - | - | - | - |
| Non-specified | - | - | - | - | - | - | - | - |
| Transport | - | - | - | - | - | - | - | - |
| Road | - | - | - | - | - | - | - | - |
| Other | - | - | - | - | - | - | - | - |
| Other | - | - | - | - | 81 | 671 | - | - |
| Residential | - | - | - | - | 31 | 632 | - | - |
| Commercial and public services | - | - | - | - | 50 | 39 | - | - |
| Agriculture/forestry | - | - | - | - | - | - | - | - |
| Fishing | - | - | - | - | - | - | - | - |
| Non-specified | - | - | - | - | - | - | - | - |
| Electricity generated - GWh | 20547 | 78598 | - | 38098 | 175 | - | 1401 | 5930 |
| <i>Electricity plants</i> | 20547 | 78598 | - | 38098 | 175 | - | 858 | 3601 |
| <i>CHP plants</i> | - | - | - | - | - | - | 543 | 2329 |
| Heat generated - TJ | - | - | - | - | 797 | 6 | 6987 | 30666 |
| <i>CHP plants</i> | - | - | - | - | - | - | 4973 | 19280 |
| <i>Heat plants</i> | - | - | - | - | 797 | 6 | 2014 | 11386 |

1. Hydro does not include pumped hydro.

Source: IEA/OECD *World Energy Balances*.

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Table 6. Renewable and waste balance for 2016 (continued)

| Mun. waste non-ren. | Wood/ wood waste | Charcoal | Bio-gases | Bio-gasoline | Bio-diesel | Other liquid biofuels | Total renew. & waste sources ² | Share in total energy sources ³ |
|---------------------|------------------|----------|--------------|--------------|-------------|-----------------------|---|--|
| 3102 | 12169 | - | 8095 | 442 | 2795 | 137 | 43994 | 38.0% |
| - | - | - | - | 366 | 522 | - | 888 | 0.4% |
| - | - | - | - | -64 | -1391 | - | -1455 | 2.8% |
| - | - | - | - | - | - | - | - | - |
| 3102 | 12169 | - | 8095 | 745 | 1927 | 137 | 43429 | 14.0% |
| - | - | - | - | 1 | - | 1 | 2 | x |
| -984 | -1009 | - | -2125 | - | - | -20 | -17292 | x |
| -15 | -283 | - | -2 | - | - | -2 | -358 | x |
| -1277 | -1041 | - | -3813 | - | - | -53 | -7722 | x |
| -42 | -568 | - | -31 | - | - | -5 | -713 | x |
| -420 | -309 | - | -113 | - | - | - | -1384 | x |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | -10 | - | -504 | - | - | -9 | -535 | x |
| - | - | - | -23 | - | - | - | -23 | x |
| 364 | 8949 | - | 1485 | 745 | 1927 | 49 | 15403 | 6.9% |
| 364 | 2324 | - | 64 | - | - | 22 | 3906 | 7.0% |
| - | - | - | - | - | - | - | - | - |
| 24 | 90 | - | 11 | - | - | 7 | 431 | 2.9% |
| - | - | - | - | - | - | - | 6 | 0.3% |
| 272 | 133 | - | 1 | - | - | 7 | 1157 | 17.7% |
| - | 6 | - | - | - | - | 1 | 7 | 0.2% |
| - | 89 | - | 9 | - | - | 2 | 101 | 1.9% |
| - | 19 | - | 1 | - | - | 1 | 21 | 5.5% |
| - | 39 | - | 16 | - | - | 1 | 56 | 1.1% |
| 68 | 508 | - | 22 | - | - | 3 | 683 | 12.3% |
| - | 1328 | - | - | - | - | 1 | 1329 | 69.1% |
| - | - | - | - | - | - | - | - | - |
| - | 2 | - | - | - | - | - | 2 | 0.4% |
| - | 110 | - | 3 | - | - | - | 113 | 4.3% |
| - | - | - | 32 | 745 | 1792 | 2 | 2571 | 4.5% |
| - | - | - | 32 | 745 | 1775 | 2 | 2554 | 4.7% |
| - | - | - | - | - | 17 | - | 17 | 0.6% |
| - | 6625 | - | 1389 | - | 134 | 25 | 8925 | 9.9% |
| - | 5846 | - | - | - | - | - | 6509 | 11.6% |
| - | 779 | - | 1389 | - | 134 | 25 | 2416 | 7.1% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| 5930 | 10794 | - | 33703 | - | - | 497 | 195673 | 30.4% |
| 3601 | 4775 | - | 9223 | - | - | 106 | 159582 | 30.7% |
| 2329 | 6019 | - | 24480 | - | - | 391 | 36091 | 29.0% |
| 30666 | 25808 | - | 9317 | - | - | 109 | 104356 | 22.2% |
| 19280 | 16749 | - | 6438 | - | - | 102 | 66822 | 19.6% |
| 11386 | 9059 | - | 2879 | - | - | 7 | 37534 | 29.1% |

2. Total includes non-renewable waste.

3. Share of renewables on TFC excludes electricity and heat generated from renewable sources.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|--|---------|---------|-------|--------|--------|--------|--------|---|
| Geothermal (TJ) | | | | | | | | |
| Production | .. | .. | 3611 | 7629 | 8943 | 11276 | 11546 | .. |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | .. | .. | 3611 | 7629 | 8943 | 11276 | 11546 | .. |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | 1447 | 4142 | 6080 | 7882 | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | .. | .. | 2164 | 3487 | 2863 | 3394 | .. | .. |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | .. | .. | 2164 | 3487 | 2863 | 3394 | .. | .. |
| Solar thermal (TJ) | | | | | | | | |
| Production | 468 | 4644 | 20269 | 26232 | 28100 | 28085 | 28706 | 11.9 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 468 | 4644 | 20269 | 26232 | 28100 | 28085 | 28706 | 11.9 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | 1 | 11 | 9 | 6 | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 468 | 4644 | 20268 | 26221 | 28091 | 28079 | .. | 11.9 |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 468 | 4644 | 20268 | 26221 | 28091 | 28079 | .. | 11.9 |
| Industrial waste (TJ) | | | | | | | | |
| Production | 20526 e | 43047 e | 65840 | 52968 | 52659 | 59095 | 56000 | 2.0 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 20526 e | 43047 e | 65840 | 52968 | 52659 | 59095 | 56000 | 2.0 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | 20526 e | 43047 e | 30412 | 25434 | 25601 | 26401 | .. | -3.0 |
| Energy industry own use | - | - | - | - | - | 521 | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | 35428 | 27534 | 27058 | 32173 | .. | - |
| <i>Industry</i> | - | - | 35428 | 27534 | 27058 | 32173 | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Municipal waste - renewables (TJ) | | | | | | | | |
| Production | 23512 | 29674 | 97702 | 127155 | 125360 | 129875 | 133000 | 9.7 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 23512 | 29674 | 97702 | 127155 | 125360 | 129875 | 133000 | 9.7 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | 23512 | 29674 | 93218 | 111899 | 108937 | 114636 | .. | 8.8 |
| Energy industry own use | - | - | - | 178 | 515 | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | 4484 | 15078 | 15908 | 15239 | .. | - |
| <i>Industry</i> | - | - | 3612 | 15078 | 15908 | 15239 | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | 872 | - | - | - | .. | - |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics (continued)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|--|--------|--------|--------|--------|--------|--------|--------|---|
| Municipal waste - non-renewables (TJ) | | | | | | | | |
| Production | 21323 | 27344 | 97702 | 127155 | 125360 | 129875 | 133000 | 10.2 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 21323 | 27344 | 97702 | 127155 | 125360 | 129875 | 133000 | 10.2 |
| Statistical differences | - | - | - | - | - | - | .. | .. |
| Transformation processes | 21323 | 27344 | 93218 | 111899 | 108937 | 114636 | .. | 9.4 |
| Energy industry own use | - | - | - | 178 | 515 | - | .. | - |
| Losses | - | - | - | - | - | - | .. | .. |
| Final energy consumption | - | - | 4484 | 15078 | 15908 | 15239 | .. | - |
| <i>Industry</i> | - | - | 3612 | 15078 | 15908 | 15239 | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | 872 | - | - | - | .. | - |
| Solid Biofuel excluding charcoal (TJ) | | | | | | | | |
| Production | 123259 | 196434 | 460975 | 478330 | 504993 | 509507 | 528000 | 6.1 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 123259 | 196434 | 460975 | 478330 | 504993 | 509507 | 528000 | 6.1 |
| Statistical differences | - | - | - | - | - | - | .. | .. |
| Transformation processes | 4644 | 13805 | 123512 | 149548 | 140822 | 134401 | .. | 15.3 |
| Energy industry own use | - | - | 387 | 653 | 1117 | 420 | .. | - |
| Losses | - | - | - | - | - | - | .. | .. |
| Final energy consumption | 118615 | 182629 | 337076 | 328129 | 363054 | 374686 | .. | 4.6 |
| <i>Industry</i> | 27337 | 14000 | 78368 | 95508 | 90388 | 97312 | .. | 12.9 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 91278 | 168629 | 258708 | 232621 | 272666 | 277374 | .. | 3.2 |
| Charcoal (kt) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | .. |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | .. |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Biogases (TJ) | | | | | | | | |
| Production | 12231 | 23341 | 177346 | 311259 | 328840 | 338922 | 345000 | 18.2 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 12231 | 23341 | 177346 | 311259 | 328840 | 338922 | 345000 | 18.2 |
| Statistical differences | - | - | - | - | - | - | .. | .. |
| Transformation processes | 6360 | 18360 | 123186 | 232451 | 246435 | 254724 | .. | 17.9 |
| Energy industry own use | - | - | 18638 | 19717 | 20428 | 21085 | .. | - |
| Losses | - | - | 918 | 907 | 964 | 954 | .. | .. |
| Final energy consumption | 5871 | 4981 | 34604 | 58184 | 61013 | 62159 | .. | 17.1 |
| <i>Industry</i> | 5871 | 4981 | 6513 | 2216 | 2521 | 2677 | .. | -3.8 |
| <i>Transport</i> | - | - | 583 | 2088 | 1251 | 1332 | .. | - |
| <i>Other</i> | - | - | 27508 | 53880 | 57241 | 58150 | .. | - |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics (continued)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|-----------------------------------|------|------|------|-------|------|------|-------|---|
| Biogasoline (kt) | | | | | | | | |
| Production | - | - | 619 | 709 | 688 | 698 | 673 | - |
| Net imports ¹ | - | - | 546 | 520 | 486 | 477 | 483 | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | 1165 | 1229 | 1174 | 1175 | 1156 | - |
| Statistical differences | - | - | - | - | - | 1 | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | 1165 | 1229 | 1174 | 1176 | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | 1165 | 1229 | 1174 | 1176 | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Biodiesel (kt) | | | | | | | | |
| Production | - | 250 | 3084 | 3352 | 3085 | 3119 | 3000 | 17.1 |
| Net imports ¹ | - | - | -555 | -1037 | -937 | -969 | -781 | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | 250 | 2529 | 2315 | 2148 | 2150 | 2219 | 14.4 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | 250 | 2529 | 2315 | 2148 | 2150 | .. | 14.4 |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | 250 | 2372 | 2156 | 1999 | 2000 | .. | 13.9 |
| <i>Other</i> | - | - | 157 | 159 | 149 | 150 | .. | - |
| Other liquid biofuels (kt) | | | | | | | | |
| Production | - | 16 | 730 | 178 | 195 | 251 | 264 | 18.8 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | 16 | 730 | 178 | 195 | 251 | 264 | 18.8 |
| Statistical differences | - | - | - | - | -1 | 1 | .. | - |
| Transformation processes | - | - | 416 | 96 | 122 | 146 | .. | - |
| Energy industry own use | - | - | - | - | - | 16 | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | 16 | 314 | 82 | 72 | 90 | .. | 11.4 |
| <i>Industry</i> | - | - | 94 | 38 | 31 | 41 | .. | - |
| <i>Transport</i> | - | 16 | 61 | 6 | 2 | 4 | .. | -8.3 |
| <i>Other</i> | - | - | 159 | 38 | 39 | 45 | .. | - |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Figure 1. Contribution of renewables in 1990

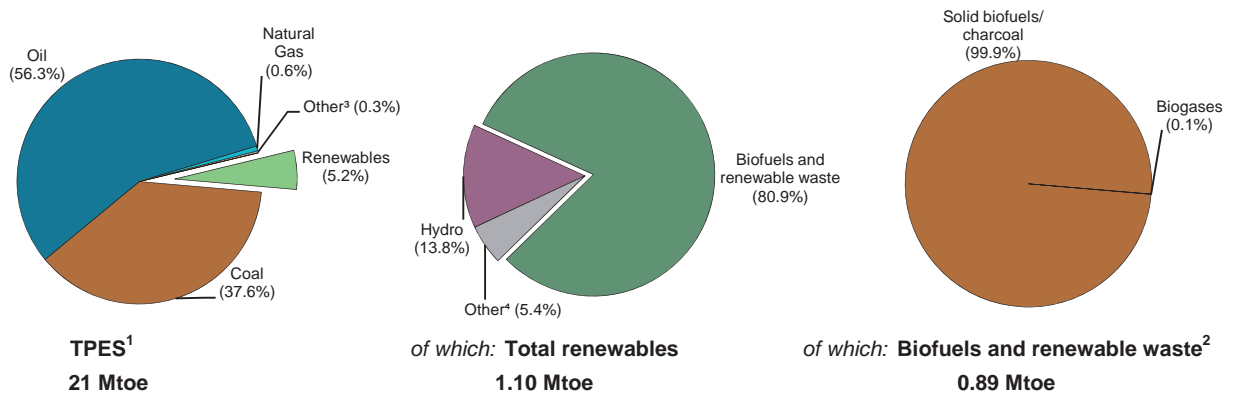


Figure 2. Contribution of renewables in 2017 provisional

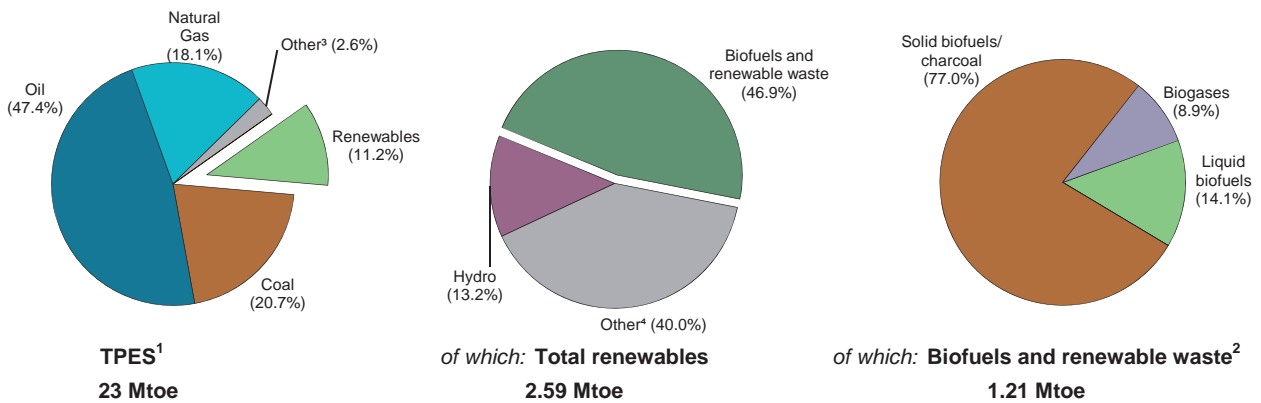
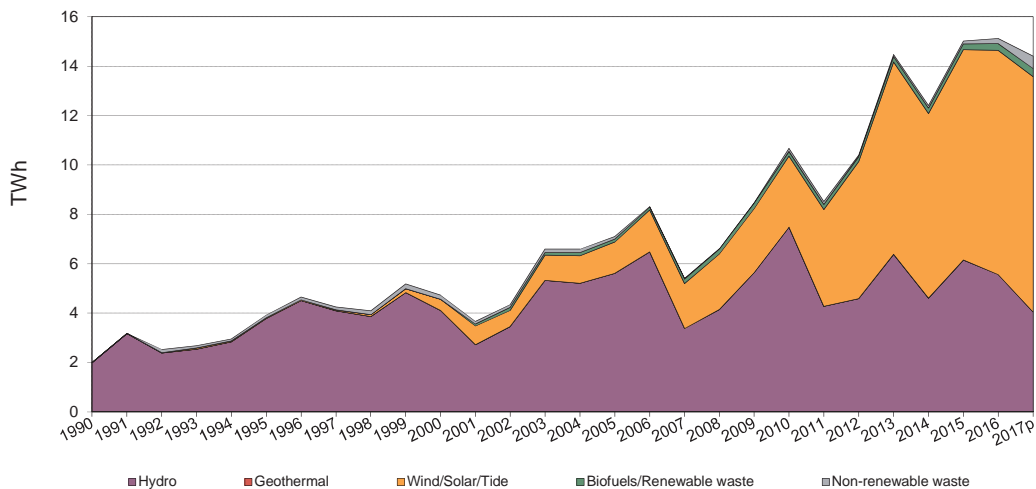


Figure 3. Electricity production by renewables and waste energy source



1. Total primary energy supply includes electricity trade.
2. Biofuels and renewable waste include solid biofuels, liquid biofuels, biogases, and renewable municipal waste.
3. Includes non-renewable municipal waste, industrial waste, peat, shale oil, electricity trade, and other sources of primary energy. (In the case of negative values, the net exports of electricity are greater than the other products in this category).
4. Includes geothermal, solar, wind and tide.

Note: Totals may not sum due to rounding.
Source: IEA/OECD World Energy Balances.

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Table 1. Energy supply, GDP and population

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|---|--------|--------|--------|--------|--------|--------|--------|--|
| TPES (Mtoe) | 21.44 | 27.09 | 27.61 | 23.13 | 23.19 | 22.67 | 23.19 | -0.9 |
| of which: Renewables (Mtoe) ¹ | 1.10 | 1.40 | 2.13 | 2.44 | 2.78 | 2.64 | 2.59 | 3.7 |
| Renewables/TPES(%) | 5.2 | 5.2 | 7.7 | 10.6 | 12.0 | 11.6 | 11.2 | 4.6 |
| GDP (billion 2010 US dollars) | 197.65 | 251.51 | 299.36 | 245.80 | 245.08 | 244.48 | 247.79 | -0.1 |
| TPES/GDP ² | 0.11 | 0.11 | 0.09 | 0.09 | 0.09 | 0.09 | 0.09 | -0.8 |
| TPES/GDP (year 2010 = 100) | 118 | 117 | 100 | 102 | 103 | 101 | 102 | -0.8 |
| Population (millions) | 10.27 | 10.81 | 11.12 | 10.89 | 10.82 | 10.78 | 10.72 | -0.0 |
| TPES/population (toe per capita) | 2.09 | 2.51 | 2.48 | 2.12 | 2.14 | 2.10 | 2.16 | -0.9 |
| Electricity generation (TWh) ³ | 34.8 | 53.4 | 57.4 | 50.3 | 51.8 | 54.4 | 58.7 | 0.6 |
| of which: Renewables (TWh) ^{1,3} | 1.77 | 4.14 | 10.52 | 12.18 | 14.85 | 14.89 | 13.82 | 7.3 |
| Renew./Total Elec.(%) ^{1,4} | 5.1 | 7.8 | 18.3 | 24.2 | 28.7 | 27.4 | 23.5 | 6.7 |
| Road energy consumption (Mtoe) | 3.9 | 5.3 | 6.5 | 4.9 | 5.0 | 5.1 | .. | .. |
| of which: Liquid biofuels (Mtoe) | - | - | 0.13 | 0.14 | 0.14 | 0.15 | .. | .. |
| Liq. biofuels/road tr.(%) ⁵ | - | - | 2.0 | 2.7 | 2.9 | 3.0 | - | - |

1. Renewables do not include industrial waste, non-renewable municipal waste and pumped storage production.

2. In units of toe per thousand 2010 US dollars.

3. Electricity generation = gross production - amount of electricity produced in pumped storage plants.

4. Electricity share generated from renewables over the total electricity production.

5. Energy from liquid biofuels consumed in road transport over the total energy consumed in road transport.

Source: IEA/OECD *World Energy Balances* and OECD *Main Economic Indicators*.

Table 2. Net generating capacity of renewable and waste sources (MWe)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | Average annual percent change 00-16 |
|---|-------------|-------------|-------------|-------------|-------------|-------------|--|
| Total capacity | 2458 | 3334 | 4799 | 8053 | 8181 | 8467 | 6.0 |
| Hydro | 2408 | 3072 | 3215 | 3389 | 3392 | 3392 | 0.6 |
| Hydro <1MW | - | 14 | 34 | 35 | 35 | 35 | 5.9 |
| Hydro 1-10MW | - | 42 | 163 | 185 | 188 | 188 | 9.8 |
| Hydro 10+MW | 2093 | 2317 | 2319 | 2470 | 2470 | 2470 | 0.4 |
| Mixed plants | 315 | 699 | 699 | 699 | 699 | 699 | - |
| Pure pumped storage | - | - | - | - | - | - | - |
| Geothermal | 2 | - | - | - | - | - | - |
| Solar photovoltaic | - | - | 202 | 2596 | 2604 | 2604 | - |
| Solar thermal | - | - | - | - | - | - | - |
| Tide, wave, ocean | - | - | - | - | - | - | - |
| Wind | 1 | 226 | 1298 | 1978 | 2091 | 2370 | 15.8 |
| Industrial waste | 47 | 35 | 43 | 43 | 43 | 43 | 1.3 |
| Municipal waste | - | - | - | - | - | - | - |
| Solid biofuels | - | - | - | - | 2 | 2 | - |
| Biogases | - | 1 | 41 | 47 | 49 | 56 | 28.6 |
| Liquid biofuels | - | - | - | - | - | - | - |
| Solar collectors surface (1000 m ²) | 1448 | 2941 | 4100 | 4287 | 4390 | 4477 | 2.7 |
| Cap. of solar collectors (MW _{th}) ¹ | 1014 | 2059 | 2870 | 3001 | 3073 | 3134 | 2.7 |

1. Converted at 0.7 kW_{th}/m² of solar collector area, as estimated by the IEA Solar Heating & Cooling Programme.

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Table 3. Capacity factors (%)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 |
|--|-------------|--------------|--------------|--------------|--------------|--------------|
| Total plants¹ | 9.28 | 16.18 | 25.39 | 17.59 | 20.95 | 20.39 |
| Hydro | 9.47 | 15.28 | 26.58 | 15.52 | 20.70 | 18.73 |
| <i>of which: <1MW</i> | - | 21.20 | 48.35 | 42.01 | 43.18 | 41.59 |
| <i>of which: 1-10MW</i> | - | 38.05 | 42.93 | 35.31 | 34.92 | 36.09 |
| <i>of which: 10+MW</i> | 9.65 | 17.38 | 33.00 | 17.45 | 24.91 | 22.28 |
| <i>of which: pure pumped storage²</i> | x | x | x | x | x | x |
| Geothermal | - | - | - | - | - | - |
| Solar photovoltaic | - | - | 8.91 | 16.67 | 17.10 | 17.23 |
| Solar thermal | - | - | - | - | - | - |
| Tide, wave and ocean | - | - | - | - | - | - |
| Wind | 22.83 | 22.78 | 23.87 | 21.29 | 25.23 | 24.79 |
| Industrial waste | - | 53.16 | 34.25 | 26.55 | 29.73 | 54.95 |
| Municipal waste | - | - | - | - | - | - |
| Solid biofuels | - | - | - | - | 6.06 | 26.16 |
| Biogases | - | - | 52.90 | 53.35 | 53.67 | 54.97 |
| Biodiesels | - | - | - | - | - | - |
| Other liquid biofuels | - | - | - | - | - | - |

1. The capacity factor is defined as: the annual gross electricity generation divided by the reported net capacity times 365 (days/year) times 24 (hours/day).

2. In case a country has at least one mixed hydro plants, it is impossible to calculate capacity factor thus it is shown as 'not applicable'.

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Table 4. Gross electricity production from renewable and waste sources (GWh)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|--------------------------------------|-------------|-------------|--------------|--------------|--------------|--------------|--------------|---|
| Total electricity¹ | 1999 | 4725 | 10676 | 12408 | 15014 | 15122 | 14412 | 6.8 |
| Hydro | 1997 | 4111 | 7485 | 4607 | 6150 | 5565 | 4053 | -0.1 |
| <i>of which: pumped storage</i> | 228 | 418 | 25 | 131 | 52 | 22 | 86 | -8.9 |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar photovoltaic | - | - | 158 | 3792 | 3900 | 3930 | 3992 | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Tide, wave, ocean | - | - | - | - | - | - | - | - |
| Wind | 2 | 451 | 2714 | 3689 | 4621 | 5146 | 5537 | 15.9 |
| Industrial waste | - | 163 | 129 | 100 | 112 | 207 | 505 | 6.9 |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | - | - | - | - | - |
| Solid biofuels | - | - | - | - | 1 | 5 | 10 | - |
| Biogases | - | - | 190 | 220 | 230 | 269 | 315 | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| of which: | | | | | | | | |
| Electricity only plants | 1999 | 4562 | 10518 | 12124 | 14706 | 14679 | .. | - |
| Hydro | 1997 | 4111 | 7485 | 4607 | 6150 | 5565 | .. | - |
| <i>of which: pumped storage</i> | 228 | 418 | 25 | 131 | 52 | 22 | .. | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar photovoltaic | - | - | 158 | 3792 | 3900 | 3930 | .. | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Tide, wave, ocean | - | - | - | - | - | - | - | - |
| Wind | 2 | 451 | 2714 | 3689 | 4621 | 5146 | .. | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | - | - | - | - | - |
| Solid biofuels | - | - | - | - | 1 | 5 | .. | - |
| Biogases | - | - | 161 | 36 | 34 | 33 | .. | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| CHP plants | - | 163 | 158 | 284 | 308 | 443 | .. | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | 163 | 129 | 100 | 112 | 207 | .. | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | - | - | - | - | - |
| Solid biofuels | - | - | - | - | - | - | - | - |
| Biogases | - | - | 29 | 184 | 196 | 236 | .. | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |

1. **Total electricity** includes the electricity produced from industrial waste, non-renewable municipal waste and pumped storage. Electricity from renewable sources does *not* include the electricity produced from industrial waste, non-renewable municipal waste and pumped storage production.

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Table 5A. Heat production¹ from renewable and waste sources in the transformation sector (TJ)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|----------------------------|------|------|------|------|------|------|-------|--|
| Total heat | - | - | - | - | - | - | - | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | - | - | - | - | - |
| Solid biofuels | - | - | - | - | - | - | - | - |
| Biogases | - | - | - | - | - | - | - | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| <i>of which:</i> | | | | | | | | |
| CHP plants | - | - | - | - | - | - | - | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | - | - | - | - | - |
| Solid biofuels | - | - | - | - | - | - | - | - |
| Biogases | - | - | - | - | - | - | - | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| Heat only plants | - | - | - | - | - | - | - | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | - | - | - | - | - |
| Solid biofuels | - | - | - | - | - | - | - | - |
| Biogases | - | - | - | - | - | - | - | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |

1. Waste heat and heat production from heat pumps are not included and are reported separately in Table 5B.

Table 5B. Heat production from heat pumps and waste heat (TJ)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|----------------------------|------|------|------|------|------|------|-------|--|
| Total heat | - | - | - | - | - | - | - | - |
| Heat pumps ¹ | - | - | - | - | - | - | - | - |
| (-) Input to heat pumps | - | - | - | - | - | - | - | - |
| Other sources ² | - | - | - | - | - | - | - | - |

1. Installations producing heat for own use are not included.

2. Refers to production from hydrogen, purchased steam from industry, and waste heat.

Source: IEA/OECD *Electricity Statistics*.

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Table 6. Renewable and waste balance for 2016

| thousand tonnes of oil equivalent | Hydro ¹ | Wind | Tide wave ocean | Solar PV | Geo-thermal | Solar thermal | Industrial waste | Mun. waste renew. |
|------------------------------------|--------------------|-------------|-----------------|-------------|-------------|---------------|------------------|-------------------|
| Production | 477 | 442 | - | 338 | 10 | 200 | 60 | - |
| Imports | - | - | - | - | - | - | - | - |
| Exports | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| TPES | 477 | 442 | - | 338 | 10 | 200 | 60 | - |
| Statistical differences | - | - | - | - | - | - | - | - |
| Main activity electricity plants | -477 | -442 | - | -338 | - | - | - | - |
| Autoproducer electricity plants | - | - | - | - | - | - | - | - |
| Main activity CHP plants | - | - | - | - | - | - | - | - |
| Autoproducer CHP plants | - | - | - | - | - | - | -33 | - |
| Main heat plants | - | - | - | - | - | - | - | - |
| Autoproducer heat plants | - | - | - | - | - | - | - | - |
| Charcoal production plants | - | - | - | - | - | - | - | - |
| Other transformation | - | - | - | - | - | - | - | - |
| Energy Industry own use | - | - | - | - | - | - | - | - |
| Losses | - | - | - | - | - | - | - | - |
| TFC | - | - | - | - | 10 | 200 | 28 | - |
| Industry | - | - | - | - | - | 1 | 28 | - |
| Iron and steel | - | - | - | - | - | - | - | - |
| Chemical and petrochemical | - | - | - | - | - | - | 28 | - |
| Non-ferrous metals | - | - | - | - | - | - | - | - |
| Non-metallurgical minerals | - | - | - | - | - | - | - | - |
| Transport equipment | - | - | - | - | - | - | - | - |
| Machinery | - | - | - | - | - | - | - | - |
| Mining and quarrying | - | - | - | - | - | - | - | - |
| Food and tobacco | - | - | - | - | - | - | - | - |
| Paper, pulp and print | - | - | - | - | - | - | - | - |
| Wood and wood products | - | - | - | - | - | - | - | - |
| Construction | - | - | - | - | - | - | - | - |
| Textile and leather | - | - | - | - | - | - | - | - |
| Non-specified | - | - | - | - | - | 1 | - | - |
| Transport | - | - | - | - | - | - | - | - |
| Road | - | - | - | - | - | - | - | - |
| Other | - | - | - | - | - | - | - | - |
| Other | - | - | - | - | 10 | 199 | - | - |
| Residential | - | - | - | - | - | 192 | - | - |
| Commercial and public services | - | - | - | - | 6 | 7 | - | - |
| Agriculture/forestry | - | - | - | - | 4 | - | - | - |
| Fishing | - | - | - | - | - | - | - | - |
| Non-specified | - | - | - | - | - | - | - | - |
| Electricity generated - GWh | 5543 | 5146 | - | 3930 | - | - | 207 | - |
| <i>Electricity plants</i> | 5543 | 5146 | - | 3930 | - | - | - | - |
| <i>CHP plants</i> | - | - | - | - | - | - | 207 | - |
| Heat generated - TJ | - | - | - | - | - | - | - | - |
| <i>CHP plants</i> | - | - | - | - | - | - | - | - |
| <i>Heat plants</i> | - | - | - | - | - | - | - | - |

1. Hydro does not include pumped hydro.

Source: IEA/OECD *World Energy Balances*.

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Table 6. Renewable and waste balance for 2016 (continued)

| Mun. waste non-ren. | Wood/wood waste | Charcoal | Bio-gases | Bio-gasoline | Bio-diesel | Other liquid biofuels | Total renew. & waste sources ² | Share in total energy sources ³ |
|---------------------|-----------------|-----------|------------|--------------|------------|-----------------------|---|--|
| - | 797 e | - | 102 | - | 138 | - | 2564 | 38.2% |
| - | 58 | 46 | - | - | 41 | - | 145 | 0.4% |
| - | -1 | - | - | - | -5 | - | -6 | 0.0% |
| - | - | - | - | - | -4 | - | -4 | x |
| - | 855 | 46 | 102 | - | 170 | - | 2700 | 11.9% |
| - | - | - | - | - | 1 | - | 1 | x |
| - | -3 | - | -9 | - | - | - | -1269 | x |
| - | - | - | - | - | - | - | - | - |
| - | - | - | -63 | - | - | - | -63 | x |
| - | - | - | -14 | - | - | - | -47 | x |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | -3 | 1 | - | - | - | - | -2 | x |
| - | - | - | - | - | - | - | - | - |
| - | - | - | -1 | - | - | - | -1 | x |
| - | - | - | - | - | - | - | - | - |
| - | 849 | 47 | 14 | - | 171 | - | 1319 | 8.0% |
| - | 129 | - | 3 | - | 14 | - | 175 | 5.7% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | 28 | 18.2% |
| - | - | - | - | - | - | - | - | - |
| - | 10 | - | - | - | 1 | - | 11 | 1.4% |
| - | - | - | - | - | 1 | - | 1 | 6.4% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | 3 | - | 3 | 3.7% |
| - | 101 | - | 3 | - | 1 | - | 105 | 23.6% |
| - | 3 | - | - | - | - | - | 3 | 6.3% |
| - | 15 | - | - | - | - | - | 15 | 64.6% |
| - | - | - | - | - | 6 | - | 6 | 4.7% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | 2 | - | 3 | 0.7% |
| - | - | - | - | - | 154 | - | 154 | 2.6% |
| - | - | - | - | - | 151 | - | 151 | 3.0% |
| - | - | - | - | - | 3 | - | 3 | 0.4% |
| - | 720 | 47 | 12 | - | 3 | - | 991 | 14.5% |
| - | 681 | 47 | - | - | - | - | 920 | 21.5% |
| - | 12 | - | 12 | - | 2 | - | 39 | 1.9% |
| - | 27 | - | - | - | - | - | 31 | 11.5% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | 1 | - | 1 | 0.4% |
| - | 4 | - | 270 | - | - | - | 15100 | 27.8% |
| - | 4 | - | 34 | - | - | - | 14657 | 32.6% |
| - | - | - | 236 | - | - | - | 443 | 4.7% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |

2. Total includes non-renewable waste.

3. Share of renewables on TFC excludes electricity and heat generated from renewable sources.

Source: IEA/OECD *World Energy Balances*.

GREECE

Table 7. Aggregated renewables and waste statistics

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|--|------|------|------|------|------|------|-------|---|
| Geothermal (TJ) | | | | | | | | |
| Production | 108 | 67 | 670 | 490 | 415 | 423 | 450 | 12.2 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 108 | 67 | 670 | 490 | 415 | 423 | 450 | 12.2 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 108 | 67 | 670 | 490 | 415 | 423 | .. | 12.2 |
| <i>Industry</i> | - | - | - | 5 | 5 | 5 | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 108 | 67 | 670 | 485 | 410 | 418 | .. | 12.1 |
| Solar thermal (TJ) | | | | | | | | |
| Production | 2363 | 4138 | 7676 | 8029 | 8221 | 8384 | 8602 | 4.5 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 2363 | 4138 | 7676 | 8029 | 8221 | 8384 | 8602 | 4.5 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 2363 | 4138 | 7676 | 8029 | 8221 | 8384 | .. | 4.5 |
| <i>Industry</i> | - | - | - | 44 | 45 | 46 | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 2363 | 4138 | 7676 | 7985 | 8176 | 8338 | .. | 4.5 |
| Industrial waste (TJ) | | | | | | | | |
| Production | - | 2662 | 1341 | 868 | 3732 | 2517 | 2517 | -0.3 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | 2662 | 1341 | 868 | 3732 | 2517 | 2517 | -0.3 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | 2662 | 1341 | 868 | 1030 | 1364 | .. | -4.1 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | 2702 | 1153 | .. | - |
| <i>Industry</i> | - | - | - | - | 2702 | 1153 | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Municipal waste - renewables (TJ) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics (continued)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|--|-------|-------|---------|-------|---------|---------|-------|---|
| Municipal waste - non-renewables (TJ) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Solid Biofuel excluding charcoal (TJ) | | | | | | | | |
| Production | 37384 | 39547 | 30351 e | 36391 | 39880 e | 33372 e | 35000 | -1.1 |
| Net imports ¹ | - | - | 4185 | 2556 | 2550 | 2422 | 2233 | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 37384 | 39547 | 34536 e | 38947 | 42430 | 35794 | 37233 | -0.6 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | 78 e | 124 | 128 | 246 | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 37384 | 39547 | 34458 | 38823 | 42302 | 35548 | .. | -0.7 |
| <i>Industry</i> | 7991 | 9741 | 10248 | 6140 | 7551 | 5405 | .. | -3.6 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 29393 | 29806 | 24210 | 32683 | 34751 | 30143 | .. | 0.1 |
| Charcoal (kt) | | | | | | | | |
| Production | - | - | 1 | 1 | 1 | 1 | 1 | - |
| Net imports ¹ | - | - | 56 | 56 | 61 | 62 | 62 | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | 57 | 57 | 62 | 63 | 63 | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | 57 | 57 | 62 | 63 | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | 57 | 57 | 62 | 63 | .. | - |
| Biogases (TJ) | | | | | | | | |
| Production | 19 | 52 | 2065 | 3640 | 3826 | 4258 | 4500 | 31.7 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 19 | 52 | 2065 | 3640 | 3826 | 4258 | 4500 | 31.7 |
| Statistical differences | - | - | - | -1 | 16 | 15 | .. | - |
| Transformation processes | - | - | 1981 | 2961 | 3138 | 3623 | .. | - |
| Energy industry own use | - | - | - | 60 | 43 | 43 | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 19 | 52 | 84 | 618 | 661 | 607 | .. | 16.6 |
| <i>Industry</i> | 19 | 13 | 27 | 65 | 73 | 111 | .. | 14.3 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | 39 | 57 | 553 | 588 | 496 | .. | 17.2 |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics (continued)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|-----------------------------------|------|------|------|------|------|------|-------|---|
| Biogasoline (kt) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Biodiesel (kt) | | | | | | | | |
| Production | - | - | 124 | 156 | 147 | 152 | 154 | - |
| Net imports ¹ | - | - | 17 | 13 | 27 | 39 | 35 | - |
| Stock changes | - | - | - | 1 | 7 | -4 | - | - |
| Gross consumption | - | - | 141 | 170 | 181 | 187 | 189 | - |
| Statistical differences | - | - | - | 1 | -1 | 1 | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | 141 | 171 | 180 | 188 | .. | - |
| <i>Industry</i> | - | - | - | 16 | 15 | 15 | .. | - |
| <i>Transport</i> | - | - | 141 | 153 | 161 | 170 | .. | - |
| <i>Other</i> | - | - | - | 2 | 4 | 3 | .. | - |
| Other liquid biofuels (kt) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Figure 1. Contribution of renewables in 1990

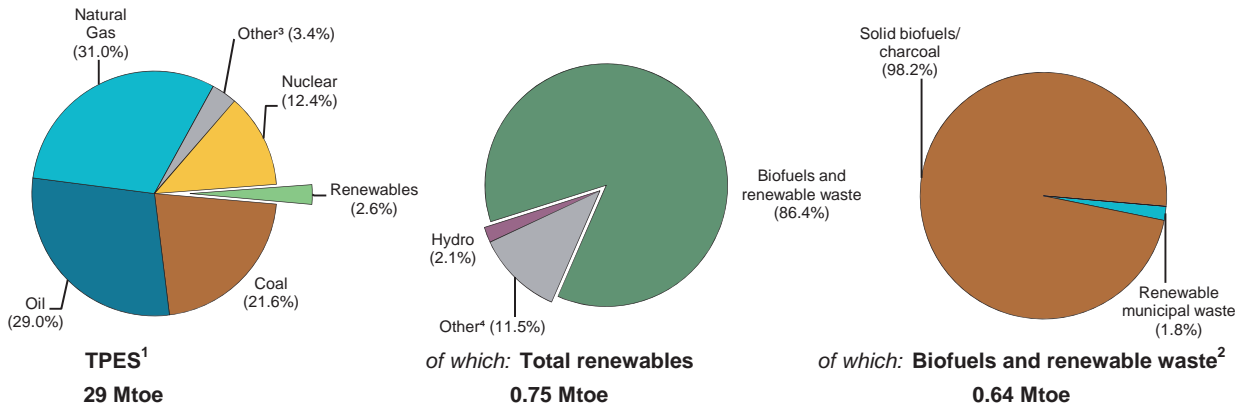


Figure 2. Contribution of renewables in 2017 provisional

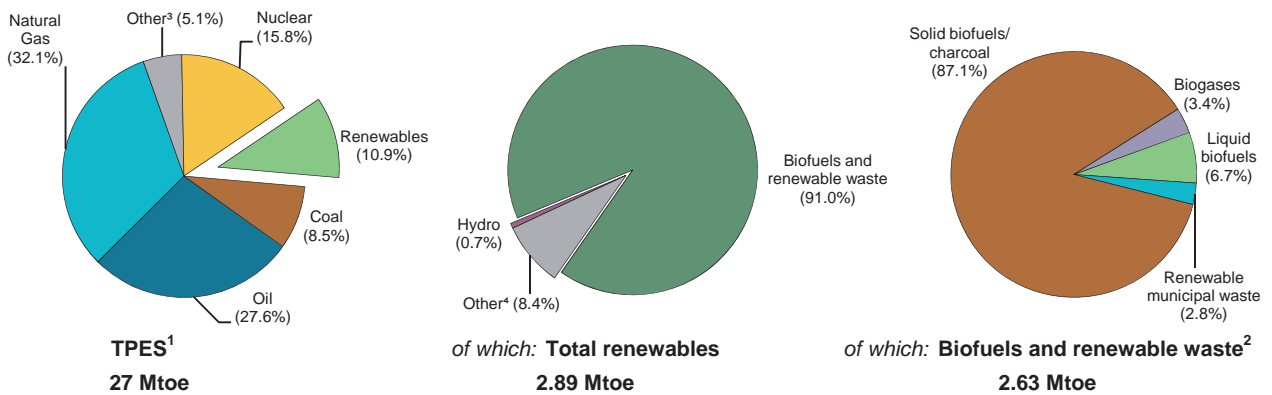
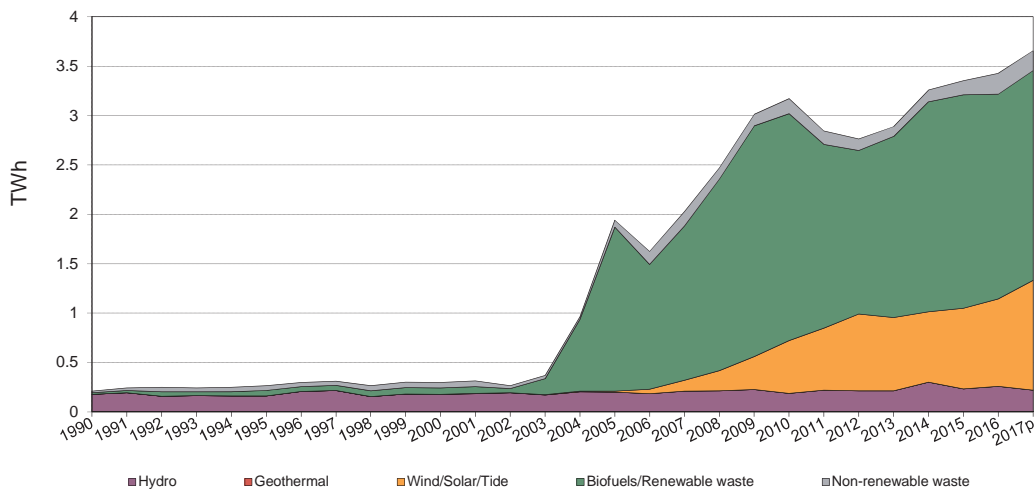


Figure 3. Electricity production by renewables and waste energy source



1. Total primary energy supply includes electricity trade.
2. Biofuels and renewable waste include solid biofuels, liquid biofuels, biogases, and renewable municipal waste.
3. Includes non-renewable municipal waste, industrial waste, peat, shale oil, electricity trade, and other sources of primary energy. (In the case of negative values, the net exports of electricity are greater than the other products in this category).
4. Includes geothermal, solar, wind and tide.

Note: Totals may not sum due to rounding.
Source: IEA/OECD *World Energy Balances*.

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Table 1. Energy supply, GDP and population

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|--|--------|--------|--------|--------|--------|--------|--------|--|
| TPES (Mtoe) | 28.78 | 25.00 | 26.51 | 23.83 | 25.19 | 25.62 | 26.64 | 0.4 |
| <i>of which: Renewables (Mtoe)</i> ¹ | 0.75 | 0.83 | 2.78 | 2.86 | 3.02 | 3.00 | 2.89 | 7.6 |
| <i>Renewables/TPES(%)</i> | 2.6 | 3.3 | 10.5 | 12.0 | 12.0 | 11.7 | 10.9 | 7.2 |
| GDP (billion 2010 US dollars) | 104.22 | 107.12 | 130.92 | 139.31 | 144.00 | 147.18 | 153.05 | 2.1 |
| TPES/GDP ² | 0.28 | 0.23 | 0.20 | 0.17 | 0.17 | 0.17 | 0.17 | -1.7 |
| TPES/GDP (year 2010 = 100) | 136 | 115 | 100 | 84 | 86 | 86 | 86 | -1.7 |
| Population (millions) | 10.37 | 10.21 | 10.00 | 9.87 | 9.84 | 9.81 | 9.78 | -0.3 |
| TPES/population (toe per capita) | 2.78 | 2.45 | 2.65 | 2.42 | 2.56 | 2.61 | 2.72 | 0.6 |
| Electricity generation (TWh) ³ | 28.4 | 35.2 | 37.4 | 29.4 | 30.3 | 31.9 | 32.8 | -0.4 |
| <i>of which: Renewables (TWh)</i> ^{1,3} | 0.20 | 0.24 | 3.02 | 3.14 | 3.21 | 3.22 | 3.46 | 16.9 |
| <i>Renew./Total Elec.(%)</i> ^{1,4} | 0.7 | 0.7 | 8.1 | 10.7 | 10.6 | 10.1 | 10.5 | 17.4 |
| Road energy consumption (Mtoe) | 2.6 | 2.9 | 3.9 | 3.7 | 4.0 | 4.1 | .. | .. |
| <i>of which: Liquid biofuels (Mtoe)</i> | - | - | 0.17 | 0.19 | 0.18 | 0.19 | .. | .. |
| <i>Liq. biofuels/road tr.(%)</i> ⁵ | - | - | 4.4 | 5.1 | 4.3 | 4.5 | - | - |

1. Renewables do not include industrial waste, non-renewable municipal waste and pumped storage production.

2. In units of toe per thousand 2010 US dollars.

3. Electricity generation = gross production - amount of electricity produced in pumped storage plants.

4. Electricity share generated from renewables over the total electricity production.

5. Energy from liquid biofuels consumed in road transport over the total energy consumed in road transport.

Source: IEA/OECD *World Energy Balances* and OECD *Main Economic Indicators*.

Table 2. Net generating capacity of renewable and waste sources (MWe)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | Average annual percent change 00-16 |
|--|-----------|-----------|------------|-------------|-------------|-------------|--|
| Total capacity | 72 | 79 | 885 | 1040 | 1107 | 1080 | 17.8 |
| Hydro | 48 | 48 | 53 | 57 | 57 | 57 | 1.1 |
| <i>Hydro <1MW</i> | 1 | 1 | 4 | 4 | 4 | 4 | 9.1 |
| <i>Hydro 1-10MW</i> | 8 | 8 | 10 | 12 | 12 | 12 | 2.6 |
| <i>Hydro 10+MW</i> | 39 | 39 | 39 | 41 | 41 | 41 | 0.3 |
| <i>Mixed plants</i> | - | - | - | - | - | - | - |
| <i>Pure pumped storage</i> | - | - | - | - | - | - | - |
| Geothermal | - | - | - | - | - | - | - |
| Solar photovoltaic | - | - | 2 | 77 | 168 | 220 | - |
| Solar thermal | - | - | - | - | - | - | - |
| Tide, wave, ocean | - | - | - | - | - | - | - |
| Wind | - | - | 293 | 329 | 329 | 329 | - |
| Industrial waste | - | 1 | 2 | 9 | 10 | 18 | 19.8 |
| Municipal waste | 24 | 24 | 42 | 38 | 49 | 58 | 5.7 |
| Solid biofuels | - | 5 | 469 | 467 | 422 | 322 | 29.7 |
| Biogases | - | 1 | 24 | 63 | 72 | 76 | 31.1 |
| Liquid biofuels | - | - | - | - | - | - | - |
| Solar collectors surface (1000 m ²) | 20 | 36 | 140 | 250 | 280 | 292 | 14.0 |
| <i>Cap. of solar collectors (MW_{th})</i> ¹ | 14 | 25 | 98 | 175 | 196 | 204 | 14.0 |

1. Converted at 0.7 kW_{th}/m² of solar collector area, as estimated by the IEA Solar Heating & Cooling Programme.

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Table 3. Capacity factors (%)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 |
|--|--------------|--------------|--------------|--------------|--------------|--------------|
| Total plants¹ | 33.61 | 43.03 | 40.90 | 35.76 | 34.57 | 36.22 |
| Hydro | 42.33 | 42.33 | 40.58 | 60.38 | 46.81 | 51.93 |
| <i>of which: <1MW</i> | 57.08 | 57.08 | 49.13 | 66.05 | 52.38 | 56.73 |
| <i>of which: 1-10MW</i> | 32.82 | 57.08 | 57.19 | 55.49 | 38.81 | 46.49 |
| <i>of which: 10+MW</i> | 43.91 | 38.93 | 35.44 | 61.25 | 48.60 | 53.06 |
| <i>of which: pure pumped storage²</i> | - | - | - | - | - | - |
| Geothermal | - | - | - | - | - | - |
| Solar photovoltaic | - | - | 4.85 | 8.29 | 8.33 | 10.45 |
| Solar thermal | - | - | - | - | - | - |
| Tide, wave and ocean | - | - | - | - | - | - |
| Wind | - | - | 20.80 | 22.78 | 24.06 | 23.72 |
| Industrial waste | - | - | 38.81 | 20.23 | 53.00 | 70.78 |
| Municipal waste | 16.17 e | 52.32 e | 78.75 | 71.57 | 70.45 | 67.87 |
| Solid biofuels | - | 22.32 | 49.51 | 41.61 | 44.93 | 52.92 |
| Biogases | - | - | 55.80 | 52.13 | 46.45 | 50.06 |
| Biodiesels | - | - | - | - | - | - |
| Other liquid biofuels | - | - | - | - | - | - |

1. The capacity factor is defined as: the annual gross electricity generation divided by the reported net capacity times 365 (days/year) times 24 (hours/day).

2. In case a country has at least one mixed hydro plants, it is impossible to calculate capacity factor thus it is shown as 'not applicable'.

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Table 4. Gross electricity production from renewable and waste sources (GWh)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|--------------------------------------|------------|------------|-------------|-------------|-------------|-------------|-------------|---|
| Total electricity¹ | 212 | 298 | 3171 | 3258 | 3352 | 3427 | 3655 | 15.9 |
| Hydro | 178 | 178 | 188 | 301 | 234 | 259 | 220 | 1.3 |
| <i>of which: pumped storage</i> | - | - | - | - | - | - | - | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar photovoltaic | - | - | 1 | 56 | 123 | 201 | 354 | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Tide, wave, ocean | - | - | - | - | - | - | - | - |
| Wind | - | - | 534 | 657 | 693 | 684 | 758 | - |
| Industrial waste | - | - | 7 | 16 | 46 | 112 | 91 | - |
| Municipal waste renew. | 17 | 55 | 145 | 137 | 208 | 245 | 160 | 6.5 |
| Municipal waste non-renew. | 17 | 55 | 145 | 102 | 95 | 100 | 109 | 4.1 |
| Solid biofuels | - | 10 | 2034 | 1702 | 1660 | 1493 | 1645 | 35.0 |
| Biogases | - | - | 117 | 287 | 293 | 333 | 318 | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| of which: | | | | | | | | |
| Electricity only plants | 178 | 178 | 2768 | 2384 | 2329 | 2347 | .. | - |
| Hydro | 178 | 178 | 188 | 301 | 234 | 259 | .. | - |
| <i>of which: pumped storage</i> | - | - | - | - | - | - | - | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar photovoltaic | - | - | 1 | 56 | 123 | 201 | .. | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Tide, wave, ocean | - | - | - | - | - | - | - | - |
| Wind | - | - | 534 | 657 | 693 | 684 | .. | - |
| Industrial waste | - | - | 3 | 16 | 46 | 74 | .. | - |
| Municipal waste renew. | - | - | 66 | 57 | 131 | 179 | .. | - |
| Municipal waste non-renew. | - | - | 66 | 22 | 19 | 33 | .. | - |
| Solid biofuels | - | - | 1900 | 1210 | 1011 | 827 | .. | - |
| Biogases | - | - | 10 | 65 | 72 | 90 | .. | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| CHP plants | 34 | 120 | 403 | 874 | 1023 | 1080 | .. | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | 4 | - | - | 38 | .. | - |
| Municipal waste renew. | 17 | 55 | 79 | 80 | 77 | 66 | .. | - |
| Municipal waste non-renew. | 17 | 55 | 79 | 80 | 76 | 67 | .. | - |
| Solid biofuels | - | 10 | 134 | 492 | 649 | 666 | .. | - |
| Biogases | - | - | 107 | 222 | 221 | 243 | .. | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |

1. **Total electricity** includes the electricity produced from industrial waste, non-renewable municipal waste and pumped storage. Electricity from renewable sources does *not* include the electricity produced from industrial waste, non-renewable municipal waste and pumped storage production.

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Table 5A. Heat production¹ from renewable and waste sources in the transformation sector (TJ)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|----------------------------|------------|-------------|-------------|-------------|-------------|-------------|-------------|--|
| Total heat | 558 | 1180 | 3798 | 5591 | 7591 | 9741 | 9228 | 12.9 |
| Geothermal | - | 218 | 233 | 1166 | 1769 | 2700 | 3032 | 16.7 |
| Solar thermal | - | - | 5 | - | - | - | - | - |
| Industrial waste | - | - | - | 150 | 302 | 695 | 358 | - |
| Municipal waste renew. | 159 e | 408 e | 538 | 368 | 483 | 505 | 456 | 0.7 |
| Municipal waste non-renew. | 159 e | 407 e | 538 | 367 | 478 | 504 | 453 | 0.6 |
| Solid biofuels | 240 | 147 | 2363 | 3464 | 4428 | 5172 | 4864 | 22.9 |
| Biogases | - | - | 121 | 76 | 131 | 165 | 65 | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| <i>of which:</i> | | | | | | | | |
| CHP plants | 318 | 890 | 3387 | 3073 | 3516 | 4552 | .. | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | - | 150 | 158 | 549 | .. | - |
| Municipal waste renew. | 159 e | 408 e | 538 | 368 | 483 | 505 | .. | - |
| Municipal waste non-renew. | 159 e | 407 e | 538 | 367 | 478 | 504 | .. | - |
| Solid biofuels | - | 75 | 2201 | 2112 | 2320 | 2836 | .. | - |
| Biogases | - | - | 110 | 76 | 77 | 158 | .. | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| Heat only plants | 240 | 290 | 411 | 2518 | 4075 | 5189 | .. | - |
| Geothermal | - | 218 | 233 | 1166 | 1769 | 2700 | .. | - |
| Solar thermal | - | - | 5 | - | - | - | - | - |
| Industrial waste | - | - | - | - | 144 | 146 | .. | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | - | - | - | - | - |
| Solid biofuels | 240 | 72 | 162 | 1352 | 2108 | 2336 | .. | - |
| Biogases | - | - | 11 | - | 54 | 7 | .. | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |

1. Waste heat and heat production from heat pumps are not included and are reported separately in Table 5B.

Table 5B. Heat production from heat pumps and waste heat (TJ)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|----------------------------|----------|----------|----------|-------------|-------------|-------------|-------------|--|
| Total heat | - | - | - | 1736 | 1678 | 2321 | 2474 | - |
| Heat pumps ¹ | - | - | - | - | - | - | - | - |
| (-) Input to heat pumps | - | - | - | - | - | - | - | - |
| Other sources ² | - | - | - | 1736 | 1678 | 2321 | 2474 | - |

1. Installations producing heat for own use are not included.

2. Refers to production from hydrogen, purchased steam from industry, and waste heat.

Source: IEA/OECD *Electricity Statistics*.

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Table 6. Renewable and waste balance for 2016

| thousand tonnes of oil equivalent | Hydro ¹ | Wind | Tide wave ocean | Solar PV | Geo-thermal | Solar thermal | Industrial waste | Mun. waste renew. |
|------------------------------------|--------------------|------------|-----------------|------------|-------------|---------------|------------------|-------------------|
| Production | 22 | 59 | - | 17 | 120 | 11 | 84 | 66 |
| Imports | - | - | - | - | - | - | 22 | 17 |
| Exports | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| TPES | 22 | 59 | - | 17 | 120 | 11 | 106 | 83 |
| Statistical differences | - | - | - | - | - | - | - | - |
| Main activity electricity plants | -22 | -59 | - | - | - | - | -8 | -45 |
| Autoproducer electricity plants | - | - | - | -17 | - | - | -13 | - |
| Main activity CHP plants | - | - | - | - | - | - | -11 | -35 |
| Autoproducer CHP plants | - | - | - | - | - | - | -10 | - |
| Main heat plants | - | - | - | - | -48 | - | - | - |
| Autoproducer heat plants | - | - | - | - | -21 | - | -8 | - |
| Charcoal production plants | - | - | - | - | - | - | - | - |
| Other transformation | - | - | - | - | - | - | - | - |
| Energy Industry own use | - | - | - | - | - | - | - | - |
| Losses | - | - | - | - | - | - | - | - |
| TFC | - | - | - | - | 51 | 11 | 56 | 3 |
| Industry | - | - | - | - | 1 | - | 54 | 3 |
| Iron and steel | - | - | - | - | - | - | - | - |
| Chemical and petrochemical | - | - | - | - | - | - | - | - |
| Non-ferrous metals | - | - | - | - | - | - | - | - |
| Non-metallc minerals | - | - | - | - | - | - | 50 | 3 |
| Transport equipment | - | - | - | - | - | - | - | - |
| Machinery | - | - | - | - | - | - | - | - |
| Mining and quarrying | - | - | - | - | - | - | - | - |
| Food and tobacco | - | - | - | - | 1 | - | - | - |
| Paper, pulp and print | - | - | - | - | - | - | 3 | - |
| Wood and wood products | - | - | - | - | - | - | - | - |
| Construction | - | - | - | - | - | - | - | - |
| Textile and leather | - | - | - | - | - | - | - | - |
| Non-specified | - | - | - | - | - | - | - | - |
| Transport | - | - | - | - | - | - | - | - |
| Road | - | - | - | - | - | - | - | - |
| Other | - | - | - | - | - | - | - | - |
| Other | - | - | - | - | 49 | 11 | 2 | - |
| Residential | - | - | - | - | - | 11 | - | - |
| Commercial and public services | - | - | - | - | 17 | - | 2 | - |
| Agriculture/forestry | - | - | - | - | 33 | - | - | - |
| Fishing | - | - | - | - | - | - | - | - |
| Non-specified | - | - | - | - | - | - | - | - |
| Electricity generated - GWh | 259 | 684 | - | 201 | - | - | 112 | 245 |
| <i>Electricity plants</i> | 259 | 684 | - | 201 | - | - | 74 | 179 |
| <i>CHP plants</i> | - | - | - | - | - | - | 38 | 66 |
| Heat generated - TJ | - | - | - | - | 2700 | - | 695 | 505 |
| <i>CHP plants</i> | - | - | - | - | - | - | 549 | 505 |
| <i>Heat plants</i> | - | - | - | - | 2700 | - | 146 | - |

1. Hydro does not include pumped hydro.

Source: IEA/OECD *World Energy Balances*.

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Table 6. Renewable and waste balance for 2016 (continued)

| Mun. waste non-ren. | Wood/wood waste | Charcoal | Bio-gases | Bio-gasoline | Bio-diesel | Other liquid biofuels | Total renew. & waste sources ² | Share in total energy sources ³ |
|---------------------|-----------------|----------|------------|--------------|------------|-----------------------|---|--|
| 41 | 2399 | - | 89 | 271 | 140 | - | 3319 | 28.9% |
| 11 | 88 | - | - | 46 | 79 | - | 263 | 1.4% |
| - | -77 | - | - | -257 | -102 | - | -436 | 8.6% |
| - | - | - | - | -15 | 27 | - | 12 | x |
| 51 | 2410 | - | 89 | 44 | 143 | - | 3155 | 12.3% |
| - | - | - | - | - | - | - | - | - |
| -8 | -237 | - | -17 | - | - | - | -396 | x |
| - | - | - | -4 | - | - | - | -34 | x |
| -36 | -217 | - | -13 | - | - | - | -312 | x |
| - | -3 | - | -27 | - | - | - | -40 | x |
| - | -61 | - | - | - | - | - | -109 | x |
| - | -4 | - | - | - | - | - | -33 | x |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | -15 | - | - | - | -15 | x |
| - | - | - | - | - | - | - | - | - |
| 8 | 1889 | - | 13 | 44 | 143 | - | 2218 | 11.4% |
| 8 | 126 | - | 9 | - | - | - | 201 | 4.9% |
| - | - | - | - | - | - | - | - | - |
| - | 1 | - | - | - | - | - | 1 | 0.1% |
| - | - | - | - | - | - | - | - | - |
| 8 | 14 | - | - | - | - | - | 75 | 14.2% |
| - | - | - | - | - | - | - | - | - |
| - | 4 | - | - | - | - | - | 4 | 1.0% |
| - | - | - | - | - | - | - | - | - |
| - | 49 | - | 8 | - | - | - | 58 | 9.9% |
| - | 11 | - | 1 | - | - | - | 15 | 7.3% |
| - | 35 | - | - | - | - | - | 35 | 47.4% |
| - | 3 | - | - | - | - | - | 3 | 1.3% |
| - | 1 | - | - | - | - | - | 1 | 2.4% |
| - | 8 | - | - | - | - | - | 8 | 3.0% |
| - | - | - | - | 44 | 143 | - | 187 | 4.3% |
| - | - | - | - | 44 | 143 | - | 187 | 4.5% |
| - | - | - | - | - | - | - | - | - |
| - | 1763 | - | 4 | - | - | - | 1829 | 20.2% |
| - | 1719 | - | - | - | - | - | 1730 | 28.1% |
| - | 28 | - | 3 | - | - | - | 50 | 2.2% |
| - | 15 | - | 1 | - | - | - | 49 | 7.6% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| 100 | 1493 | - | 333 | - | - | - | 3427 | 10.8% |
| 33 | 827 | - | 90 | - | - | - | 2347 | 21.9% |
| 67 | 666 | - | 243 | - | - | - | 1080 | 5.1% |
| 504 | 5172 | - | 165 | - | - | - | 9741 | 18.1% |
| 504 | 2836 | - | 158 | - | - | - | 4552 | 19.5% |
| - | 2336 | - | 7 | - | - | - | 5189 | 16.9% |

2. Total includes non-renewable waste.

3. Share of renewables on TFC excludes electricity and heat generated from renewable sources.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|--|-------|--------|------|------|------|------|-------|---|
| Geothermal (TJ) | | | | | | | | |
| Production | 3600 | 3600 | 4130 | 3795 | 4419 | 5022 | 5602 | 2.1 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 3600 | 3600 | 4130 | 3795 | 4419 | 5022 | 5602 | 2.1 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | 242 | 245 | 1350 | 2180 | 2906 | .. | 16.8 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 3600 | 3358 | 3885 | 2445 | 2239 | 2116 | .. | -2.8 |
| <i>Industry</i> | - | - | 57 | 47 | 53 | 53 | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 3600 | 3358 | 3828 | 2398 | 2186 | 2063 | .. | -3.0 |
| Solar thermal (TJ) | | | | | | | | |
| Production | - | - | 225 | 406 | 448 | 468 | 528 | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | 225 | 406 | 448 | 468 | 528 | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | 5 | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | 220 | 406 | 448 | 468 | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | 220 | 406 | 448 | 468 | .. | - |
| Industrial waste (TJ) | | | | | | | | |
| Production | - | - | 1449 | 2267 | 2520 | 3510 | 4832 | - |
| Net imports ¹ | - | - | - | - | 831 | 922 | 795 | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | 1449 | 2267 | 3351 | 4432 | 5627 | - |
| Statistical differences | - | - | - | 1 | - | - | .. | - |
| Transformation processes | - | - | 115 | 398 | 1210 | 2099 | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | 1334 | 1870 | 2141 | 2333 | .. | - |
| <i>Industry</i> | - | - | 1334 | 1777 | 1960 | 2259 | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | 93 | 181 | 74 | .. | - |
| Municipal waste - renewables (TJ) | | | | | | | | |
| Production | 494 e | 1218 e | 2229 | 1845 | 2756 | 2766 | 1743 | 5.3 |
| Net imports ¹ | - | - | - | 404 | 367 | 716 | 1350 | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 494 e | 1218 e | 2229 | 2249 | 3123 | 3482 | 3093 | 6.8 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | 494 e | 1218 e | 2229 | 2229 | 2992 | 3359 | .. | 6.5 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | 20 | 131 | 123 | .. | - |
| <i>Industry</i> | - | - | - | 20 | 131 | 123 | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics (continued)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|--|-------|--------|-------|-------|--------|--------|-------|---|
| Municipal waste - non-renewables (TJ) | | | | | | | | |
| Production | 494 e | 1218 e | 2229 | 1864 | 1972 | 1704 | 1983 | 2.1 |
| Net imports ¹ | - | - | - | 159 | 217 | 445 | 591 | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 494 e | 1218 e | 2229 | 2023 | 2189 | 2149 | 2574 | 3.6 |
| Statistical differences | - | - | - | - | - | 1 | .. | - |
| Transformation processes | 494 e | 1218 e | 2229 | 1867 | 1835 | 1835 | .. | 2.6 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | 156 | 354 | 315 | .. | - |
| <i>Industry</i> | - | - | - | 156 | 354 | 315 | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Solid Biofuel excluding charcoal (TJ) | | | | | | | | |
| Production | 28331 | 29295 | 98248 | 98928 | 105221 | 100461 | 95206 | 8.0 |
| Net imports ¹ | -1158 | - | 21 | -540 | -1307 | 456 | 801 | - |
| Stock changes | -674 | - | - | - | - | - | - | - |
| Gross consumption | 26499 | 29295 | 98269 | 98388 | 103914 | 100917 | 96007 | 8.0 |
| Statistical differences | - | - | 1 | 1 | - | - | .. | - |
| Transformation processes | 636 | 240 | 27289 | 23144 | 23494 | 21841 | .. | 32.6 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 25863 | 29055 | 70981 | 75245 | 80420 | 79076 | .. | 6.5 |
| <i>Industry</i> | 121 | 2513 | 3561 | 4613 | 4834 | 5273 | .. | 4.7 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 25742 | 26542 | 67420 | 70632 | 75586 | 73803 | .. | 6.6 |
| Charcoal (kt) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Biogases (TJ) | | | | | | | | |
| Production | - | 6 | 1516 | 3323 | 3335 | 3708 | 3695 | 49.4 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | 6 | 1516 | 3323 | 3335 | 3708 | 3695 | 49.4 |
| Statistical differences | - | - | - | - | - | -2 | .. | - |
| Transformation processes | - | - | 858 | 2113 | 2259 | 2536 | .. | - |
| Energy industry own use | - | - | 393 | 389 | 540 | 613 | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | 6 | 265 | 821 | 536 | 557 | .. | 32.7 |
| <i>Industry</i> | - | 6 | 6 | 735 | 402 | 378 | .. | 29.6 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | 259 | 86 | 134 | 179 | .. | - |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics (continued)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|-----------------------------------|------|------|------|------|------|------|-------|---|
| Biogasoline (kt) | | | | | | | | |
| Production | - | - | 24 | 295 | 396 | 426 | 443 | - |
| Net imports ¹ | - | - | 65 | -199 | -311 | -333 | -367 | - |
| Stock changes | - | - | 1 | -1 | -18 | -24 | -2 | - |
| Gross consumption | - | - | 90 | 95 | 67 | 69 | 74 | - |
| Statistical differences | - | - | -1 | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | 89 | 95 | 67 | 69 | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | 89 | 95 | 67 | 69 | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Biodiesel (kt) | | | | | | | | |
| Production | - | - | 141 | 133 | 146 | 156 | 162 | - |
| Net imports ¹ | - | - | -7 | -14 | -5 | -26 | -11 | - |
| Stock changes | - | - | -2 | 24 | 6 | 30 | -7 | - |
| Gross consumption | - | - | 132 | 143 | 147 | 160 | 144 | - |
| Statistical differences | - | - | - | - | 1 | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | 132 | 143 | 148 | 160 | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | 132 | 143 | 148 | 160 | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Other liquid biofuels (kt) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

ICELAND

Figure 1. Contribution of renewables in 1990

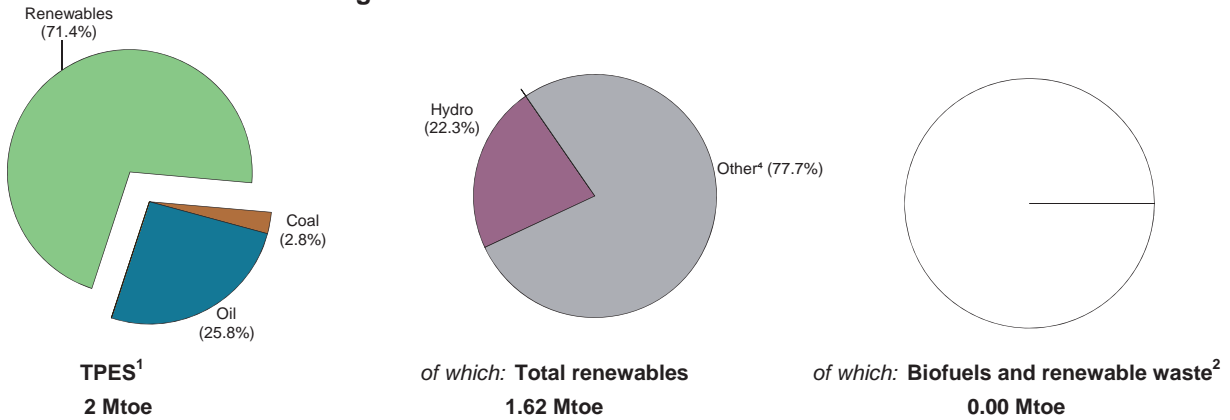


Figure 2. Contribution of renewables in 2017 provisional

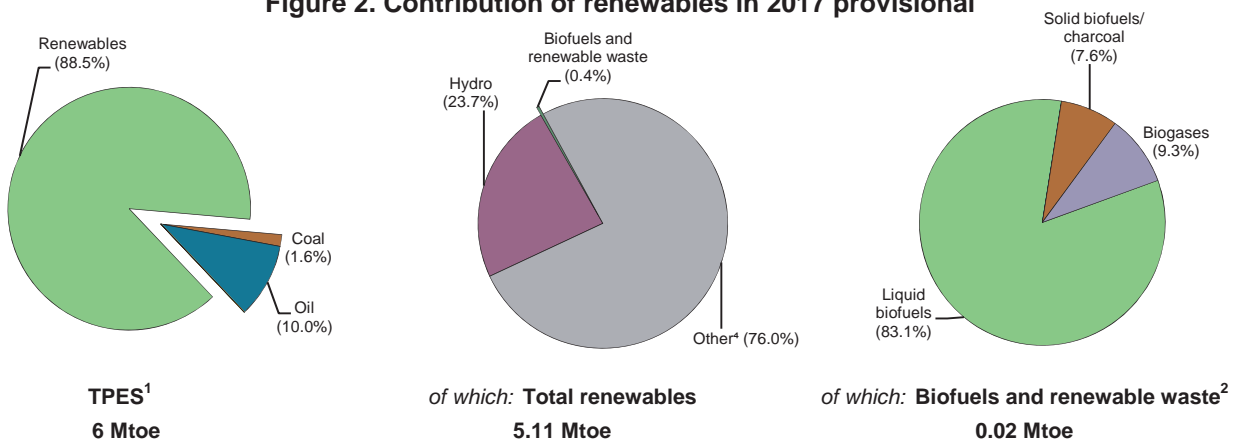
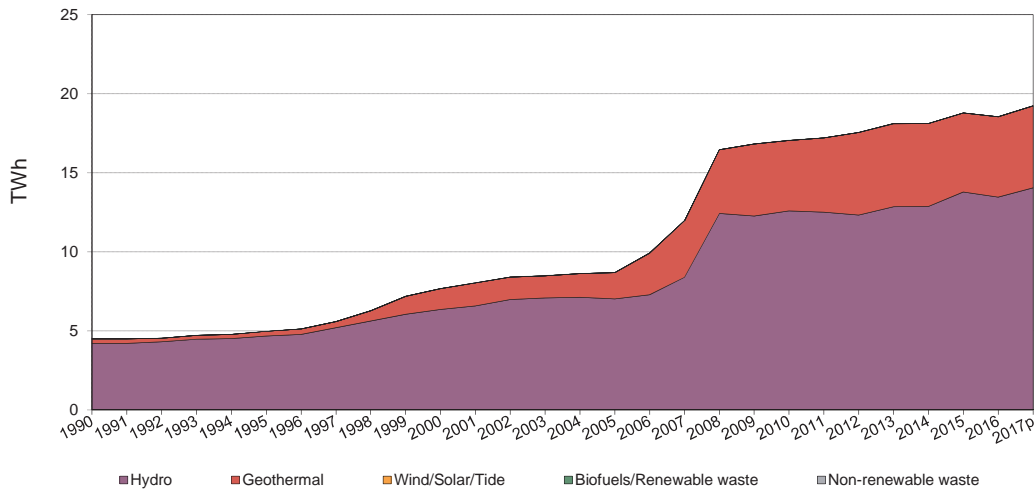


Figure 3. Electricity production by renewables and waste energy source



1. Total primary energy supply includes electricity trade.
 2. Biofuels and renewable waste include solid biofuels, liquid biofuels, biogases, and renewable municipal waste.
 3. Includes non-renewable municipal waste, industrial waste, peat, shale oil, electricity trade, and other sources of primary energy. (In the case of negative values, the net exports of electricity are greater than the other products in this category).
 4. Includes geothermal, solar, wind and tide.

Note: Totals may not sum due to rounding.
Source: IEA/OECD World Energy Balances.

ICELAND

Table 1. Energy supply, GDP and population

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|---|------|-------|-------|-------|-------|-------|-------|--|
| TPES (Mtoe) | 2.27 | 3.12 | 5.41 | 5.87 | 5.58 | 5.29 | 5.78 | 3.7 |
| of which: Renewables (Mtoe) ¹ | 1.62 | 2.41 | 4.79 | 5.22 | 4.93 | 4.61 | 5.11 | 4.5 |
| Renewables/TPES(%) | 71.4 | 77.4 | 88.5 | 89.1 | 88.3 | 87.2 | 88.5 | 0.8 |
| GDP (billion 2010 US dollars) | 7.78 | 10.28 | 13.31 | 14.66 | 15.29 | 16.44 | 17.03 | 3.0 |
| TPES/GDP ² | 0.29 | 0.30 | 0.41 | 0.40 | 0.37 | 0.32 | 0.34 | 0.7 |
| TPES/GDP (year 2010 = 100) | 72 | 75 | 100 | 98 | 90 | 79 | 83 | 0.7 |
| Population (millions) | 0.26 | 0.28 | 0.32 | 0.33 | 0.33 | 0.34 | 0.34 | 1.1 |
| TPES/population (toe per capita) | 8.90 | 11.10 | 17.03 | 17.94 | 16.87 | 15.78 | 17.04 | 2.6 |
| Electricity generation (TWh) ³ | 4.5 | 7.7 | 17.1 | 18.1 | 18.8 | 18.6 | 19.2 | 5.5 |
| of which: Renewables (TWh) ^{1,3} | 4.50 | 7.68 | 17.06 | 18.12 | 18.80 | 18.55 | 19.24 | 5.6 |
| Renew./Total Elec.(%) ^{1,4} | 99.9 | 99.9 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 0.0 |
| Road energy consumption (Mtoe) | 0.2 | 0.2 | 0.3 | 0.3 | 0.3 | 0.3 | .. | .. |
| of which: Liquid biofuels (Mtoe) | - | - | 0.00 | 0.00 | 0.02 | 0.02 | .. | .. |
| Liq. biofuels/road tr.(%) ⁵ | - | - | 0.2 | 1.5 | 5.4 | 5.3 | - | - |

1. Renewables do not include industrial waste, non-renewable municipal waste and pumped storage production.

2. In units of toe per thousand 2010 US dollars.

3. Electricity generation = gross production - amount of electricity produced in pumped storage plants.

4. Electricity share generated from renewables over the total electricity production.

5. Energy from liquid biofuels consumed in road transport over the total energy consumed in road transport.

Source: IEA/OECD World Energy Balances and OECD Main Economic Indicators.

Table 2. Net generating capacity of renewable and waste sources (MWe)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | Average annual percent change 00-16 |
|---|------------|-------------|-------------|-------------|-------------|-------------|--|
| Total capacity | 802 | 1236 | 2458 | 2652 | 2655 | 2655 | 4.9 |
| Hydro | 756 | 1064 | 1883 | 1984 | 1987 | 1987 | 4.0 |
| Hydro <1MW | - | 7 | 9 | 11 | 12 | 12 | 3.4 |
| Hydro 1-10MW | - | 39 | 58 | 52 | 54 | 54 | 2.1 |
| Hydro 10+MW | - | 1018 | 1816 | 1921 | 1921 | 1921 | 4.0 |
| Mixed plants | - | - | - | - | - | - | - |
| Pure pumped storage | - | - | - | - | - | - | - |
| Geothermal | 46 | 172 | 575 | 665 | 665 | 665 | 8.8 |
| Solar photovoltaic | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - |
| Tide, wave, ocean | - | - | - | - | - | - | - |
| Wind | - | - | - | 3 | 3 | 3 | - |
| Industrial waste | - | - | - | - | - | - | - |
| Municipal waste | - | - | - | - | - | - | - |
| Solid biofuels | - | - | - | - | - | - | - |
| Biogases | - | - | - | - | - | - | - |
| Liquid biofuels | - | - | - | - | - | - | - |
| Solar collectors surface (1000 m ²) | - | - | - | - | - | - | - |
| Cap. of solar collectors (MW _{th}) ¹ | - | - | - | - | - | - | - |

1. Converted at 0.7 kW_{th}/m² of solar collector area, as estimated by the IEA Solar Heating & Cooling Programme.

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Table 3. Capacity factors (%)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 |
|--|--------------|--------------|--------------|--------------|--------------|--------------|
| Total plants¹ | 64.11 | 70.92 | 79.22 | 78.00 | 80.81 | 79.74 |
| Hydro | 63.48 | 68.19 | 76.34 | 74.07 | 79.17 | 77.38 |
| <i>of which: <1MW</i> | - | 30.98 | 63.73 | 56.43 | 52.76 | 57.05 |
| <i>of which: 1-10MW</i> | - | 66.74 | 45.14 | 46.81 | 51.52 | 48.60 |
| <i>of which: 10+MW</i> | - | 68.50 | 77.40 | 74.91 | 80.11 | 78.32 |
| <i>of which: pure pumped storage²</i> | - | - | - | - | - | - |
| Geothermal | 74.45 | 87.81 | 88.65 | 89.92 | 85.88 | 86.99 |
| Solar photovoltaic | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - |
| Tide, wave and ocean | - | - | - | - | - | - |
| Wind | - | - | - | 31.91 | 41.45 | 35.05 |
| Industrial waste | - | - | - | - | - | - |
| Municipal waste | - | - | - | - | - | - |
| Solid biofuels | - | - | - | - | - | - |
| Biogases | - | - | - | - | - | - |
| Biodiesels | - | - | - | - | - | - |
| Other liquid biofuels | - | - | - | - | - | - |

1. The capacity factor is defined as: the annual gross electricity generation divided by the reported net capacity times 365 (days/year) times 24 (hours/day).

2. In case a country has at least one mixed hydro plants, it is impossible to calculate capacity factor thus it is shown as 'not applicable'.

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Table 4. Gross electricity production from renewable and waste sources (GWh)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|--------------------------------------|-------------|-------------|--------------|--------------|--------------|--------------|--------------|---|
| Total electricity¹ | 4504 | 7679 | 17057 | 18120 | 18795 | 18547 | 19237 | 5.6 |
| Hydro | 4204 | 6356 | 12592 | 12873 | 13781 | 13470 | 14059 | 4.8 |
| <i>of which: pumped storage</i> | - | - | - | - | - | - | - | - |
| Geothermal | 300 | 1323 | 4465 | 5239 | 5003 | 5068 | 5170 | 8.3 |
| Solar photovoltaic | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Tide, wave, ocean | - | - | - | - | - | - | - | - |
| Wind | - | - | - | 8 | 11 | 9 | 8 | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | - | - | - | - | - |
| Solid biofuels | - | - | - | - | - | - | - | - |
| Biogases | - | - | - | - | - | - | - | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| <i>of which:</i> | | | | | | | | |
| Electricity only plants | 4504 | 6830 | 15587 | 13352 | 14279 | 13977 | .. | - |
| Hydro | 4204 | 6356 | 12592 | 12873 | 13781 | 13470 | .. | - |
| <i>of which: pumped storage</i> | - | - | - | - | - | - | - | - |
| Geothermal | 300 | 474 | 2995 | 471 | 487 | 498 | .. | - |
| Solar photovoltaic | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Tide, wave, ocean | - | - | - | - | - | - | - | - |
| Wind | - | - | - | 8 | 11 | 9 | .. | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | - | - | - | - | - |
| Solid biofuels | - | - | - | - | - | - | - | - |
| Biogases | - | - | - | - | - | - | - | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| CHP plants | - | 849 | 1470 | 4768 | 4516 | 4570 | .. | - |
| Geothermal | - | 849 | 1470 | 4768 | 4516 | 4570 | .. | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | - | - | - | - | - |
| Solid biofuels | - | - | - | - | - | - | - | - |
| Biogases | - | - | - | - | - | - | - | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |

1. **Total electricity** includes the electricity produced from industrial waste, non-renewable municipal waste and pumped storage. Electricity from renewable sources does *not* include the electricity produced from industrial waste, non-renewable municipal waste and pumped storage production.

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Table 5A. Heat production¹ from renewable and waste sources in the transformation sector (TJ)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|----------------------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--|
| Total heat | 15336 | 17643 | 20892 | 22443 | 25873 | 33601 | 34300 | 4.0 |
| Geothermal | 15336 | 17598 | 20864 | 22443 | 25873 | 33601 | 34300 | 4.0 |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | - | 23 e | 14 | - | - | - | - | - |
| Municipal waste non-renew. | - | 22 e | 14 | - | - | - | - | - |
| Solid biofuels | - | - | - | - | - | - | - | - |
| Biogases | - | - | - | - | - | - | - | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| <i>of which:</i> | | | | | | | | |
| CHP plants | 4474 | 5046 | 5750 | 5835 | 6869 | 14945 | .. | - |
| Geothermal | 4474 | 5046 | 5750 | 5835 | 6869 | 14945 | .. | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | - | - | - | - | - |
| Solid biofuels | - | - | - | - | - | - | - | - |
| Biogases | - | - | - | - | - | - | - | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| Heat only plants | 10862 | 12597 | 15142 | 16608 | 19004 | 18656 | .. | - |
| Geothermal | 10862 | 12552 | 15114 | 16608 | 19004 | 18656 | .. | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | - | 23 e | 14 | - | - | - | - | - |
| Municipal waste non-renew. | - | 22 e | 14 | - | - | - | - | - |
| Solid biofuels | - | - | - | - | - | - | - | - |
| Biogases | - | - | - | - | - | - | - | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |

1. Waste heat and heat production from heat pumps are not included and are reported separately in Table 5B.

Table 5B. Heat production from heat pumps and waste heat (TJ)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|----------------------------|------|------|------|------|------|------|-------|--|
| Total heat | - | - | - | - | - | - | - | - |
| Heat pumps ¹ | - | - | - | - | - | - | - | - |
| (-) Input to heat pumps | - | - | - | - | - | - | - | - |
| Other sources ² | - | - | - | - | - | - | - | - |

1. Installations producing heat for own use are not included.

2. Refers to production from hydrogen, purchased steam from industry, and waste heat.

Source: IEA/OECD *Electricity Statistics*.

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Table 6. Renewable and waste balance for 2016

| thousand tonnes of oil equivalent | Hydro ¹ | Wind | Tide wave ocean | Solar PV | Geo- thermal | Solar thermal | Industrial waste | Mun. waste renew. |
|------------------------------------|--------------------|----------|--------------------|----------|-----------------|------------------|---------------------|-------------------------|
| Production | 1158 | 1 | - | - | 3433 | - | - | - |
| Imports | - | - | - | - | - | - | - | - |
| Exports | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| TPES | 1158 | 1 | - | - | 3433 | - | - | - |
| Statistical differences | - | - | - | - | 90 | - | - | - |
| Main activity electricity plants | -1158 | -1 | - | - | -243 | - | - | - |
| Autoproducer electricity plants | - | - | - | - | - | - | - | - |
| Main activity CHP plants | - | - | - | - | -2481 | - | - | - |
| Autoproducer CHP plants | - | - | - | - | - | - | - | - |
| Main heat plants | - | - | - | - | -709 | - | - | - |
| Autoproducer heat plants | - | - | - | - | - | - | - | - |
| Charcoal production plants | - | - | - | - | - | - | - | - |
| Other transformation | - | - | - | - | - | - | - | - |
| Energy Industry own use | - | - | - | - | - | - | - | - |
| Losses | - | - | - | - | -8 | - | - | - |
| TFC | - | - | - | - | 82 | - | - | - |
| Industry | - | - | - | - | 12 | - | - | - |
| Iron and steel | - | - | - | - | - | - | - | - |
| Chemical and petrochemical | - | - | - | - | - | - | - | - |
| Non-ferrous metals | - | - | - | - | - | - | - | - |
| Non-metallc minerals | - | - | - | - | - | - | - | - |
| Transport equipment | - | - | - | - | - | - | - | - |
| Machinery | - | - | - | - | - | - | - | - |
| Mining and quarrying | - | - | - | - | - | - | - | - |
| Food and tobacco | - | - | - | - | - | - | - | - |
| Paper, pulp and print | - | - | - | - | - | - | - | - |
| Wood and wood products | - | - | - | - | - | - | - | - |
| Construction | - | - | - | - | - | - | - | - |
| Textile and leather | - | - | - | - | - | - | - | - |
| Non-specified | - | - | - | - | 12 | - | - | - |
| Transport | - | - | - | - | - | - | - | - |
| Road | - | - | - | - | - | - | - | - |
| Other | - | - | - | - | - | - | - | - |
| Other | - | - | - | - | 70 | - | - | - |
| Residential | - | - | - | - | 13 | - | - | - |
| Commercial and public services | - | - | - | - | 38 | - | - | - |
| Agriculture/forestry | - | - | - | - | 6 | - | - | - |
| Fishing | - | - | - | - | 14 | - | - | - |
| Non-specified | - | - | - | - | - | - | - | - |
| Electricity generated - GWh | 13470 | 9 | - | - | 5068 | - | - | - |
| <i>Electricity plants</i> | 13470 | 9 | - | - | 498 | - | - | - |
| <i>CHP plants</i> | - | - | - | - | 4570 | - | - | - |
| Heat generated - TJ | - | - | - | - | 33601 | - | - | - |
| <i>CHP plants</i> | - | - | - | - | 14945 | - | - | - |
| <i>Heat plants</i> | - | - | - | - | 18656 | - | - | - |

1. Hydro does not include pumped hydro.

Source: IEA/OECD *World Energy Balances*.

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Table 6. Renewable and waste balance for 2016 (continued)

| Mun. waste non-ren. | Wood/wood waste | Charcoal | Bio-gases | Bio-gasoline | Bio-diesel | Other liquid biofuels | Total renew. & waste sources ² | Share in total energy sources ³ |
|---------------------|-----------------|----------|-----------|--------------|------------|-----------------------|---|--|
| - | 1 | - | 2 | - | - | - | 4595 | 100.0% |
| - | - | 1 | - | 3 | 13 | - | 17 | 1.6% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | 1 | 1 | 2 | 3 | 13 | - | 4612 | 87.3% |
| - | - | - | - | 1 | -1 | - | 90 | x |
| - | - | - | - | - | - | - | -1402 | x |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | -2481 | x |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | -709 | x |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | -8 | x |
| - | 1 | 1 | 2 | 3 | 11 | - | 100 | 3.3% |
| - | 1 | 1 | - | - | - | - | 14 | 1.0% |
| - | 1 | 1 | - | - | - | - | 2 | 1.0% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | 12 | 65.5% |
| - | - | - | 2 | 3 | 11 | - | 16 | 4.9% |
| - | - | - | 2 | 3 | 11 | - | 16 | 5.2% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | 70 | 5.8% |
| - | - | - | - | - | - | - | 13 | 2.7% |
| - | - | - | - | - | - | - | 38 | 8.4% |
| - | - | - | - | - | - | - | 6 | 15.4% |
| - | - | - | - | - | - | - | 14 | 6.2% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | 18547 | 100.0% |
| - | - | - | - | - | - | - | 13977 | 100.0% |
| - | - | - | - | - | - | - | 4570 | 100.0% |
| - | - | - | - | - | - | - | 33601 | 97.9% |
| - | - | - | - | - | - | - | 14945 | 100.0% |
| - | - | - | - | - | - | - | 18656 | 96.3% |

2. Total includes non-renewable waste.

3. Share of renewables on TFC excludes electricity and heat generated from renewable sources.

Source: IEA/OECD *World Energy Balances*.

ICELAND

Table 7. Aggregated renewables and waste statistics

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|--|-------|-------|--------|--------|--------|--------|----------|---|
| Geothermal (TJ) | | | | | | | | |
| Production | 52692 | 78118 | 155196 | 172205 | 156152 | 143729 | 162508 e | 3.9 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 52692 | 78118 | 155196 | 172205 | 156152 | 143729 | 162508 e | 3.9 |
| Statistical differences | -1145 | -635 | 92 | -1282 | -989 | 3785 | .. | .. |
| Transformation processes | 48569 | 73788 | 150696 | 167028 | 151398 | 143729 | .. | 4.3 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | 229 | 284 | 359 | 352 | 350 | 350 | .. | .. |
| Final energy consumption | 2749 | 3411 | 4233 | 3543 | 3415 | 3435 | .. | 0.0 |
| <i>Industry</i> | 352 | 434 | 469 | 594 | 594 | 500 | .. | 0.9 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 2397 | 2977 | 3764 | 2949 | 2821 | 2935 | .. | -0.1 |
| Solar thermal (TJ) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | .. |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | .. |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Industrial waste (TJ) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | .. |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | .. |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Municipal waste - renewables (TJ) | | | | | | | | |
| Production | - | 28 e | 18 | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | 28 e | 18 | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | .. |
| Transformation processes | - | 28 e | 18 | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | .. |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics (continued)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|--|------|------|------|------|------|------|-------|---|
| Municipal waste - non-renewables (TJ) | | | | | | | | |
| Production | - | 28 e | 18 | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | 28 e | 18 | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | 28 e | 18 | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Solid Biofuel excluding charcoal (TJ) | | | | | | | | |
| Production | - | - | - | 26 | 27 | 28 | 28 e | - |
| Net imports ¹ | - | - | - | - | - | - | - e | - |
| Stock changes | - | - | - | - | - | - | - e | - |
| Gross consumption | - | - | - | 26 | 27 | 28 | 28 e | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | 26 | 27 | 28 | .. | - |
| <i>Industry</i> | - | - | - | 26 | 27 | 28 | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Charcoal (kt) | | | | | | | | |
| Production | - | - | - | - | - | - | - e | - |
| Net imports ¹ | - | - | - | - | - | 1 | 1 e | - |
| Stock changes | - | - | - | - | - | - | - e | - |
| Gross consumption | - | - | - | - | - | 1 | 1 e | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | 1 | .. | - |
| <i>Industry</i> | - | - | - | - | - | 1 | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Biogases (TJ) | | | | | | | | |
| Production | - | - | 22 | 71 | 69 | 71 | 71 e | - |
| Net imports ¹ | - | - | - | - | - | - | - e | - |
| Stock changes | - | - | - | - | - | - | - e | - |
| Gross consumption | - | - | 22 | 71 | 69 | 71 | 71 e | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | 22 | 71 | 69 | 71 | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | 22 | 71 | 69 | 71 | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics (continued)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|-----------------------------------|------|------|------|------|------|------|-------|---|
| Biogasoline (kt) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | 2 | 4 | 4 | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | 2 | 4 | 4 | - |
| Statistical differences | - | - | - | - | - | 1 | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | 2 | 5 | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | 2 | 5 | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Biodiesel (kt) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | 3 | 12 | 12 | 12 | - |
| Stock changes | - | - | - | -1 | - | - | - | - |
| Gross consumption | - | - | - | 2 | 12 | 12 | 12 | - |
| Statistical differences | - | - | - | - | - | -1 | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | 2 | 12 | 11 | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | 2 | 12 | 11 | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Other liquid biofuels (kt) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Figure 1. Contribution of renewables in 1990

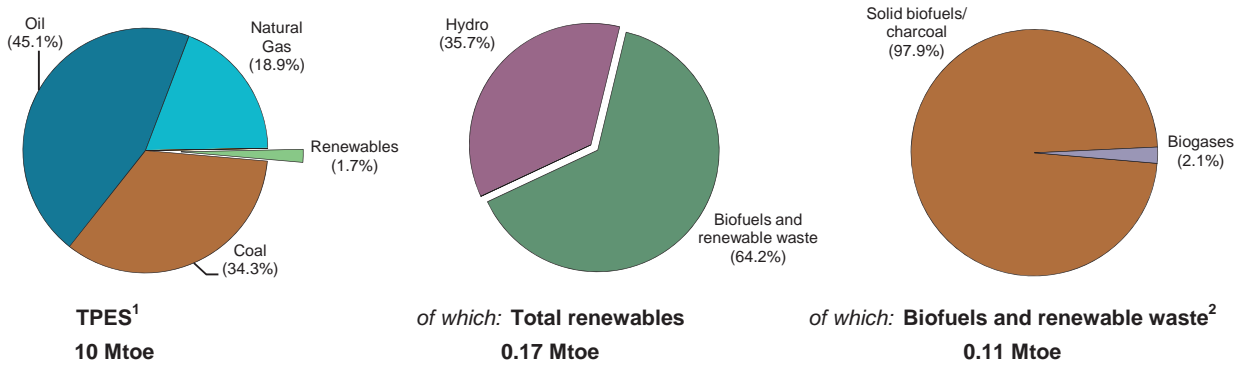


Figure 2. Contribution of renewables in 2017 provisional

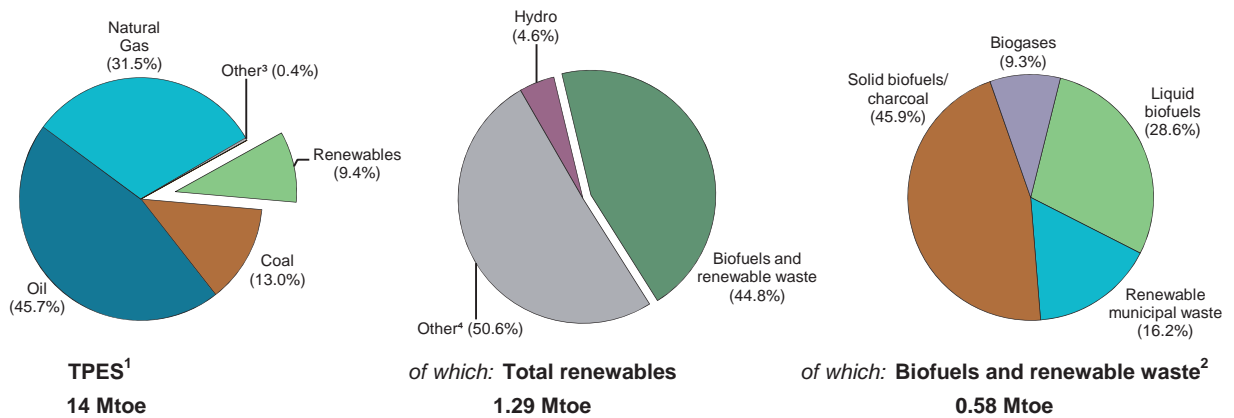
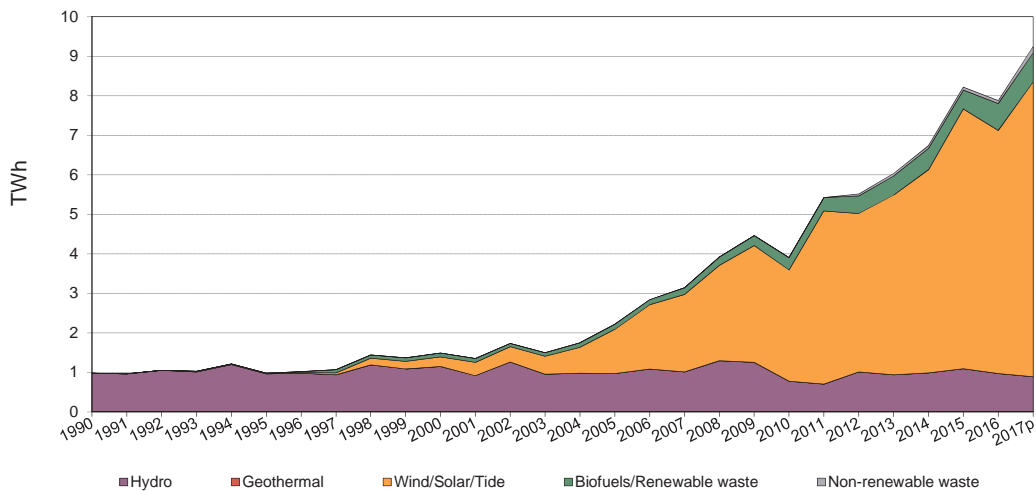


Figure 3. Electricity production by renewables and waste energy source



1. Total primary energy supply includes electricity trade.
2. Biofuels and renewable waste include solid biofuels, liquid biofuels, biogases, and renewable municipal waste.
3. Includes non-renewable municipal waste, industrial waste, peat, shale oil, electricity trade, and other sources of primary energy. (In the case of negative values, the net exports of electricity are greater than the other products in this category).
4. Includes geothermal, solar, wind and tide.

Note: Totals may not sum due to rounding.
Source: IEA/OECD World Energy Balances.

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Table 1. Energy supply, GDP and population

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|--|-------|--------|--------|--------|--------|--------|--------|--|
| TPES (Mtoe) | 9.91 | 13.80 | 14.39 | 12.76 | 13.28 | 13.93 | 13.71 | -0.0 |
| <i>of which: Renewables (Mtoe)</i> ¹ | 0.17 | 0.23 | 0.66 | 0.96 | 1.07 | 1.11 | 1.29 | 10.6 |
| <i>Renewables/TPES(%)</i> | 1.7 | 1.7 | 4.6 | 7.5 | 8.1 | 7.9 | 9.4 | 10.6 |
| GDP (billion 2010 US dollars) | 83.33 | 163.41 | 221.95 | 251.77 | 316.11 | 332.36 | 358.29 | 4.7 |
| TPES/GDP ² | 0.12 | 0.08 | 0.06 | 0.05 | 0.04 | 0.04 | 0.04 | -4.5 |
| TPES/GDP (year 2010 = 100) | 183 | 130 | 100 | 78 | 65 | 65 | 59 | -4.5 |
| Population (millions) | 3.51 | 3.80 | 4.56 | 4.62 | 4.64 | 4.68 | 4.80 | 1.4 |
| TPES/population (toe per capita) | 2.83 | 3.63 | 3.16 | 2.77 | 2.86 | 2.97 | 2.86 | -1.4 |
| Electricity generation (TWh) ³ | 14.2 | 23.7 | 28.2 | 25.8 | 28.1 | 30.1 | 30.7 | 1.5 |
| <i>of which: Renewables (TWh)</i> ^{1,3} | 0.70 | 1.19 | 3.73 | 6.39 | 7.86 | 7.52 | 8.88 | 12.6 |
| <i>Renew./Total Elec.(%)</i> ^{1,4} | 4.9 | 5.0 | 13.2 | 24.8 | 28.0 | 24.9 | 28.9 | 10.9 |
| Road energy consumption (Mtoe) | 1.6 | 3.3 | 3.8 | 3.6 | 3.6 | 3.9 | .. | .. |
| <i>of which: Liquid biofuels (Mtoe)</i> | - | - | 0.09 | 0.09 | 0.09 | 0.12 | .. | .. |
| <i>Liq. biofuels/road tr.(%)</i> ⁵ | - | - | 2.4 | 2.5 | 2.4 | 3.0 | - | - |

1. Renewables do not include industrial waste, non-renewable municipal waste and pumped storage production.

2. In units of toe per thousand 2010 US dollars.

3. Electricity generation = gross production - amount of electricity produced in pumped storage plants.

4. Electricity share generated from renewables over the total electricity production.

5. Energy from liquid biofuels consumed in road transport over the total energy consumed in road transport.

Source: IEA/OECD *World Energy Balances* and OECD *Main Economic Indicators*.

Table 2. Net generating capacity of renewable and waste sources (MWe)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | Average annual percent change 00-16 |
|--|------------|------------|-------------|-------------|-------------|-------------|--|
| Total capacity | 513 | 662 | 1648 | 2822 | 3051 | 3442 | 10.9 |
| Hydro | 513 | 528 | 237 | 529 | 529 | 529 | 0.0 |
| <i>Hydro <1MW</i> | 4 | 8 | 20 | 20 | 20 | 20 | 5.9 |
| <i>Hydro 1-10MW</i> | 23 | 23 | 21 | 21 | 21 | 21 | -0.6 |
| <i>Hydro 10+MW</i> | 196 | 205 | 196 | 196 | 196 | 196 | -0.3 |
| <i>Mixed plants</i> | - | - | - | - | - | - | - |
| <i>Pure pumped storage</i> | 290 | 292 | - | 292 | 292 | 292 | - |
| Geothermal | - | - | - | - | - | - | - |
| Solar photovoltaic | - | - | 1 | 2 | 2 | 6 | - |
| Solar thermal | - | - | - | - | - | - | - |
| Tide, wave, ocean | - | - | - | - | - | - | - |
| Wind | - | 119 | 1374 | 2211 | 2440 | 2827 | 21.9 |
| Industrial waste | - | - | - | - | - | - | - |
| Municipal waste | - | - | - | 22 | 22 | 22 | - |
| Solid biofuels | - | - | 5 | 5 | 5 | 5 | - |
| Biogases | - | 15 | 31 | 53 | 53 | 53 | 8.2 |
| Liquid biofuels | - | - | - | - | - | - | - |
| Solar collectors surface (1000 m ²) | 2 | 4 | 185 | 300 | 320 | 343 | 32.1 |
| <i>Cap. of solar collectors (MW_{th})</i> ¹ | 1 | 3 | 130 | 210 | 224 | 240 | 31.5 |

1. Converted at 0.7 kW_{th}/m² of solar collector area, as estimated by the IEA Solar Heating & Cooling Programme.

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Table 3. Capacity factors (%)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 |
|--|--------------|--------------|--------------|--------------|--------------|--------------|
| Total plants¹ | 21.87 | 25.68 | 27.05 | 27.26 | 30.75 | 26.12 |
| Hydro | 21.87 | 24.86 | 37.38 | 21.31 | 23.62 | 21.00 |
| <i>of which: <1MW</i> | 35.68 | 40.97 | 23.81 | 23.09 | 28.82 | 25.15 |
| <i>of which: 1-10MW</i> | 35.68 | 40.97 | 28.06 | 35.31 | 39.95 | 33.66 |
| <i>of which: 10+MW</i> | 35.68 | 40.91 | 29.46 | 35.13 | 39.75 | 33.49 |
| <i>of which: pure pumped storage²</i> | 11.26 | 11.88 | - | 10.91 | 11.26 | 11.41 |
| Geothermal | - | - | - | - | - | - |
| Solar photovoltaic | - | - | 5.43 | 6.39 | 9.22 | 7.75 |
| Solar thermal | - | - | - | - | - | - |
| Tide, wave and ocean | - | - | - | - | - | - |
| Wind | - | 23.41 | 23.38 | 26.54 | 30.75 | 24.83 |
| Industrial waste | - | - | - | - | - | - |
| Municipal waste | - | - | - | 73.70 | 78.43 | 75.69 |
| Solid biofuels | - | - | x | x | x | x |
| Biogases | - | 72.30 | 75.38 | 43.86 | 43.39 | 45.66 |
| Biodiesels | - | - | - | - | - | - |
| Other liquid biofuels | - | - | - | - | - | - |

1. The capacity factor is defined as: the annual gross electricity generation divided by the reported net capacity times 365 (days/year) times 24 (hours/day).

2. In case a country has at least one mixed hydro plants, it is impossible to calculate capacity factor thus it is shown as 'not applicable'.

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Table 4. Gross electricity production from renewable and waste sources (GWh)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|--------------------------------------|------------|-------------|-------------|-------------|-------------|-------------|-------------|---|
| Total electricity¹ | 983 | 1489 | 3905 | 6739 | 8220 | 7877 | 9243 | 11.3 |
| Hydro | 983 | 1150 | 776 | 988 | 1095 | 973 | 895 | -1.5 |
| <i>of which: pumped storage</i> | 286 | 304 | 177 | 279 | 288 | 292 | 203 | -2.3 |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar photovoltaic | - | - | - | 1 | 2 | 4 | 5 | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Tide, wave, ocean | - | - | - | - | - | - | - | - |
| Wind | - | 244 | 2815 | 5140 | 6573 | 6149 | 7445 | 22.3 |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | - | - | - | 72 | 77 | 76 | 151 | - |
| Municipal waste non-renew. | - | - | - | 70 | 74 | 70 | 159 | - |
| Solid biofuels | - | - | 110 | 265 | 197 | 393 | 382 | - |
| Biogases | - | 95 | 204 | 203 | 202 | 212 | 206 | 4.7 |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| <i>of which:</i> | | | | | | | | |
| Electricity only plants | 983 | 1489 | 3864 | 6689 | 8177 | 7817 | .. | - |
| Hydro | 983 | 1150 | 776 | 988 | 1095 | 973 | .. | - |
| <i>of which: pumped storage</i> | 286 | 304 | 177 | 279 | 288 | 292 | .. | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar photovoltaic | - | - | - | 1 | 2 | 4 | .. | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Tide, wave, ocean | - | - | - | - | - | - | - | - |
| Wind | - | 244 | 2815 | 5140 | 6573 | 6149 | .. | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | - | - | - | 72 | 77 | 76 | .. | - |
| Municipal waste non-renew. | - | - | - | 70 | 74 | 70 | .. | - |
| Solid biofuels | - | - | 91 | 251 | 184 | 377 | .. | - |
| Biogases | - | 95 | 182 | 167 | 172 | 168 | .. | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| CHP plants | - | - | 41 | 50 | 43 | 60 | .. | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | - | - | - | - | - |
| Solid biofuels | - | - | 19 | 14 | 13 | 16 | .. | - |
| Biogases | - | - | 22 | 36 | 30 | 44 | .. | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |

1. **Total electricity** includes the electricity produced from industrial waste, non-renewable municipal waste and pumped storage. Electricity from renewable sources does *not* include the electricity produced from industrial waste, non-renewable municipal waste and pumped storage production.

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Table 5A. Heat production¹ from renewable and waste sources in the transformation sector (TJ)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|----------------------------|------|------|------|------|------|------|-------|--|
| Total heat | - | - | - | - | - | - | - | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | - | - | - | - | - |
| Solid biofuels | - | - | - | - | - | - | - | - |
| Biogases | - | - | - | - | - | - | - | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| <i>of which:</i> | | | | | | | | |
| CHP plants | - | - | - | - | - | - | - | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | - | - | - | - | - |
| Solid biofuels | - | - | - | - | - | - | - | - |
| Biogases | - | - | - | - | - | - | - | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| Heat only plants | - | - | - | - | - | - | - | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | - | - | - | - | - |
| Solid biofuels | - | - | - | - | - | - | - | - |
| Biogases | - | - | - | - | - | - | - | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |

1. Waste heat and heat production from heat pumps are not included and are reported separately in Table 5B.

Table 5B. Heat production from heat pumps and waste heat (TJ)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|----------------------------|------|------|------|------|------|------|-------|--|
| Total heat | - | - | - | - | - | - | - | - |
| Heat pumps ¹ | - | - | - | - | - | - | - | - |
| (-) Input to heat pumps | - | - | - | - | - | - | - | - |
| Other sources ² | - | - | - | - | - | - | - | - |

1. Installations producing heat for own use are not included.

2. Refers to production from hydrogen, purchased steam from industry, and waste heat.

Source: IEA/OECD *Electricity Statistics*.

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Table 6. Renewable and waste balance for 2016

| thousand tonnes of oil equivalent | Hydro ¹ | Wind | Tide wave ocean | Solar PV | Geo-thermal | Solar thermal | Industrial waste | Mun. waste renew. |
|------------------------------------|--------------------|-------------|-----------------|----------|-------------|---------------|------------------|-------------------|
| Production | 59 | 529 | - | - | - | 14 | - | 64 |
| Imports | - | - | - | - | - | - | - | - |
| Exports | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| TPES | 59 | 529 | - | - | - | 14 | - | 64 |
| Statistical differences | - | - | - | - | - | - | - | - |
| Main activity electricity plants | -59 | -529 | - | - | - | - | - | -26 |
| Autoproducer electricity plants | - | - | - | - | - | - | - | - |
| Main activity CHP plants | - | - | - | - | - | - | - | - |
| Autoproducer CHP plants | - | - | - | - | - | - | - | - |
| Main heat plants | - | - | - | - | - | - | - | - |
| Autoproducer heat plants | - | - | - | - | - | - | - | - |
| Charcoal production plants | - | - | - | - | - | - | - | - |
| Other transformation | - | - | - | - | - | - | - | - |
| Energy Industry own use | - | - | - | - | - | - | - | - |
| Losses | - | - | - | - | - | - | - | - |
| TFC | - | - | - | - | - | 14 | - | 38 |
| Industry | - | - | - | - | - | - | - | 38 |
| Iron and steel | - | - | - | - | - | - | - | - |
| Chemical and petrochemical | - | - | - | - | - | - | - | - |
| Non-ferrous metals | - | - | - | - | - | - | - | - |
| Non-metallurgical minerals | - | - | - | - | - | - | - | 38 |
| Transport equipment | - | - | - | - | - | - | - | - |
| Machinery | - | - | - | - | - | - | - | - |
| Mining and quarrying | - | - | - | - | - | - | - | - |
| Food and tobacco | - | - | - | - | - | - | - | - |
| Paper, pulp and print | - | - | - | - | - | - | - | - |
| Wood and wood products | - | - | - | - | - | - | - | - |
| Construction | - | - | - | - | - | - | - | - |
| Textile and leather | - | - | - | - | - | - | - | - |
| Non-specified | - | - | - | - | - | - | - | - |
| Transport | - | - | - | - | - | - | - | - |
| Road | - | - | - | - | - | - | - | - |
| Other | - | - | - | - | - | - | - | - |
| Other | - | - | - | - | - | 14 | - | - |
| Residential | - | - | - | - | - | 14 | - | - |
| Commercial and public services | - | - | - | - | - | - | - | - |
| Agriculture/forestry | - | - | - | - | - | - | - | - |
| Fishing | - | - | - | - | - | - | - | - |
| Non-specified | - | - | - | - | - | - | - | - |
| Electricity generated - GWh | 681 | 6149 | - | 4 | - | - | - | 76 |
| <i>Electricity plants</i> | 681 | 6149 | - | 4 | - | - | - | 76 |
| <i>CHP plants</i> | - | - | - | - | - | - | - | - |
| Heat generated - TJ | - | - | - | - | - | - | - | - |
| <i>CHP plants</i> | - | - | - | - | - | - | - | - |
| <i>Heat plants</i> | - | - | - | - | - | - | - | - |

1. Hydro does not include pumped hydro.

Source: IEA/OECD *World Energy Balances*.

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Table 6. Renewable and waste balance for 2016 (continued)

| Mun. waste non-ren. | Wood/wood waste | Charcoal | Bio-gases | Bio-gasoline | Bio-diesel | Other liquid biofuels | Total renew. & waste sources ² | Share in total energy sources ³ |
|---------------------|-----------------|----------|------------|--------------|------------|-----------------------|---|--|
| 66 | 226 | - | 56 | - | 24 | - | 1038 | 24.7% |
| - | 46 | - | - | 34 | 61 | - | 141 | 1.2% |
| - | - | - | - | - | - | - | - | - |
| - | -1 | - | - | -2 | -4 | - | -7 | x |
| 66 | 271 | - | 56 | 32 | 82 | - | 1173 | 8.4% |
| - | 9 | - | - | -1 | 4 | - | 12 | x |
| -25 | -85 | - | -40 | - | - | - | -764 | x |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | -3 | - | -6 | - | - | - | -9 | x |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| 42 | 192 | - | 10 | 32 | 86 | - | 414 | 3.8% |
| 42 | 133 | - | 2 | - | - | - | 215 | 8.8% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| 42 | 1 | - | - | - | - | - | 81 | 19.1% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | 19 | - | 2 | - | - | - | 21 | 4.6% |
| - | - | - | - | - | - | - | - | - |
| - | 113 | - | - | - | - | - | 113 | 73.0% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | 32 | 86 | - | 118 | 2.9% |
| - | - | - | - | 32 | 86 | - | 118 | 3.0% |
| - | - | - | - | - | - | - | - | - |
| - | 59 | - | 7 | - | - | - | 80 | 1.9% |
| - | 33 | - | - | - | - | - | 47 | 1.8% |
| - | 26 | - | 7 | - | - | - | 33 | 2.5% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| 70 | 393 | - | 212 | - | - | - | 7585 | 25.2% |
| 70 | 377 | - | 168 | - | - | - | 7525 | 26.9% |
| - | 16 | - | 44 | - | - | - | 60 | 2.9% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |

2. Total includes non-renewable waste.

3. Share of renewables on TFC excludes electricity and heat generated from renewable sources.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|--|------|------|------|------|------|------|-------|---|
| Geothermal (TJ) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Solar thermal (TJ) | | | | | | | | |
| Production | 2 | 5 | 314 | 511 | 544 | 584 | 599 | 34.7 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 2 | 5 | 314 | 511 | 544 | 584 | 599 | 34.7 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 2 | 5 | 314 | 511 | 544 | 584 | .. | 34.7 |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 2 | 5 | 314 | 511 | 544 | 584 | .. | 34.7 |
| Industrial waste (TJ) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Municipal waste - renewables (TJ) | | | | | | | | |
| Production | - | - | 267 | 2161 | 2385 | 2695 | 3935 | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | 267 | 2161 | 2385 | 2695 | 3935 | - |
| Statistical differences | - | - | - | 1 | - | - | .. | - |
| Transformation processes | - | - | - | 1069 | 1081 | 1106 | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | 267 | 1093 | 1304 | 1589 | .. | - |
| <i>Industry</i> | - | - | 267 | 1093 | 1304 | 1589 | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics (continued)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|--|------|------|------|-------|------|-------|-------|---|
| Municipal waste - non-renewables (TJ) | | | | | | | | |
| Production | - | - | 358 | 2768 | 2880 | 2772 | 4610 | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | 358 | 2768 | 2880 | 2772 | 4610 | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | 1027 | 1039 | 1026 | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | 358 | 1741 | 1841 | 1746 | .. | - |
| <i>Industry</i> | - | - | 358 | 1741 | 1841 | 1746 | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Solid Biofuel excluding charcoal (TJ) | | | | | | | | |
| Production | 4416 | 4740 | 7968 | 8809 | 8436 | 9470 | 9954 | 4.4 |
| Net imports ¹ | - | - | 447 | 1755 | 1135 | 1908 | 1154 | - |
| Stock changes | - | - | 135 | - | -24 | -47 | 14 | - |
| Gross consumption | 4416 | 4740 | 8550 | 10564 | 9547 | 11331 | 11122 | 5.6 |
| Statistical differences | - | - | 19 | 63 | 342 | 368 | .. | - |
| Transformation processes | - | - | 1020 | 2437 | 1804 | 3675 | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 4416 | 4740 | 7549 | 8190 | 8085 | 8024 | .. | 3.3 |
| <i>Industry</i> | 2545 | 4020 | 5927 | 5951 | 6031 | 5573 | .. | 2.1 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 1871 | 720 | 1622 | 2239 | 2054 | 2451 | .. | 8.0 |
| Charcoal (kt) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Biogases (TJ) | | | | | | | | |
| Production | 95 | 1168 | 2445 | 2187 | 2287 | 2356 | 2247 | 4.5 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 95 | 1168 | 2445 | 2187 | 2287 | 2356 | 2247 | 4.5 |
| Statistical differences | - | - | - | 1 | - | - | .. | - |
| Transformation processes | - | 988 | 2095 | 1846 | 1917 | 1952 | .. | 4.3 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 95 | 180 | 350 | 342 | 370 | 404 | .. | 5.2 |
| <i>Industry</i> | 95 | 180 | 190 | 125 | 141 | 99 | .. | -3.7 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | 160 | 217 | 229 | 305 | .. | - |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics (continued)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|-----------------------------------|------|------|------|------|------|------|-------|---|
| Biogasoline (kt) | | | | | | | | |
| Production | - | - | .. | - | - | - | - | - |
| Net imports ¹ | - | - | 52 | 38 | 38 | 54 | 44 | - |
| Stock changes | - | - | -4 | 2 | - | -3 | 4 | - |
| Gross consumption | - | - | 48 | 40 | 38 | 51 | 48 | - |
| Statistical differences | - | - | - | -1 | - | -1 | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | 48 | 39 | 38 | 50 | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | 48 | 39 | 38 | 50 | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Biodiesel (kt) | | | | | | | | |
| Production | - | - | 71 | 27 | 27 | 27 | 29 | - |
| Net imports ¹ | - | - | .. | 47 | 43 | 69 | 119 | - |
| Stock changes | - | - | -1 | -1 | 1 | -4 | 4 | - |
| Gross consumption | - | - | 70 | 73 | 71 | 92 | 152 | - |
| Statistical differences | - | - | 1 | - | 1 | 5 | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | 71 | 73 | 72 | 97 | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | 71 | 73 | 72 | 97 | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Other liquid biofuels (kt) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Figure 1. Contribution of renewables in 1990

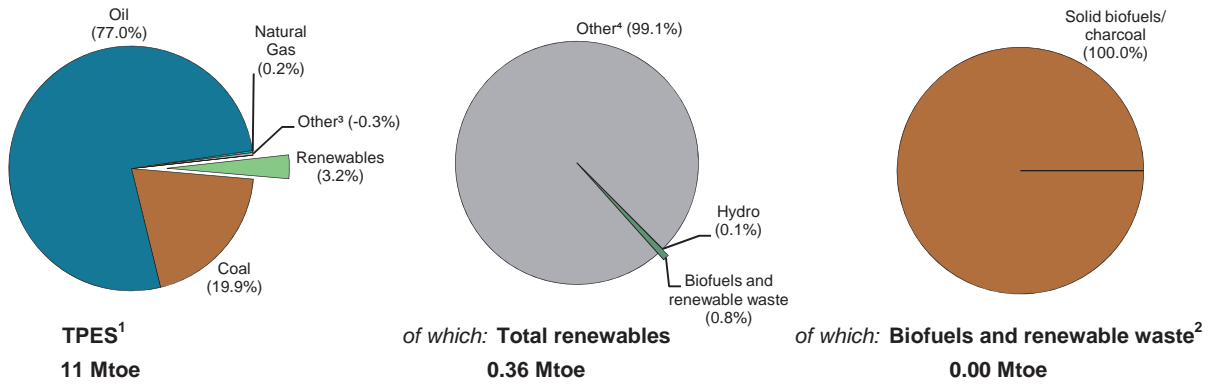


Figure 2. Contribution of renewables in 2017 provisional

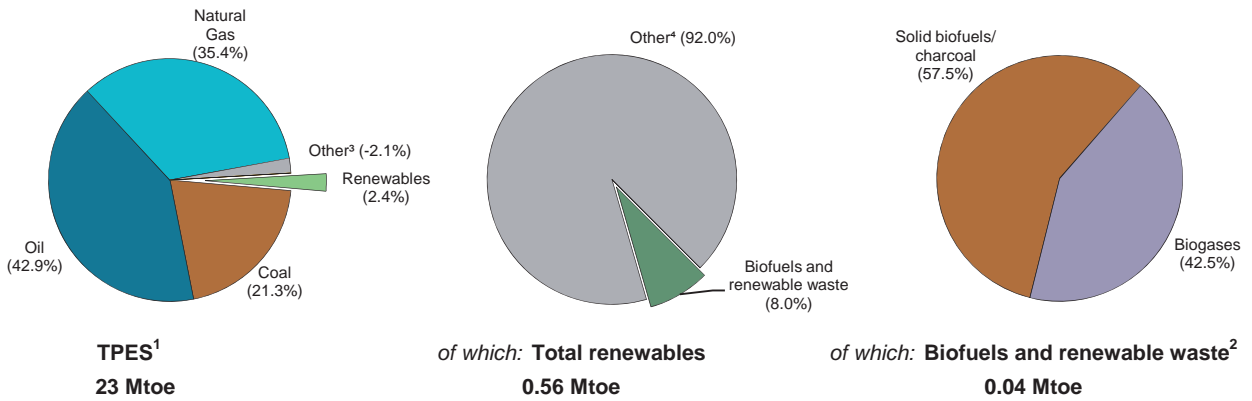
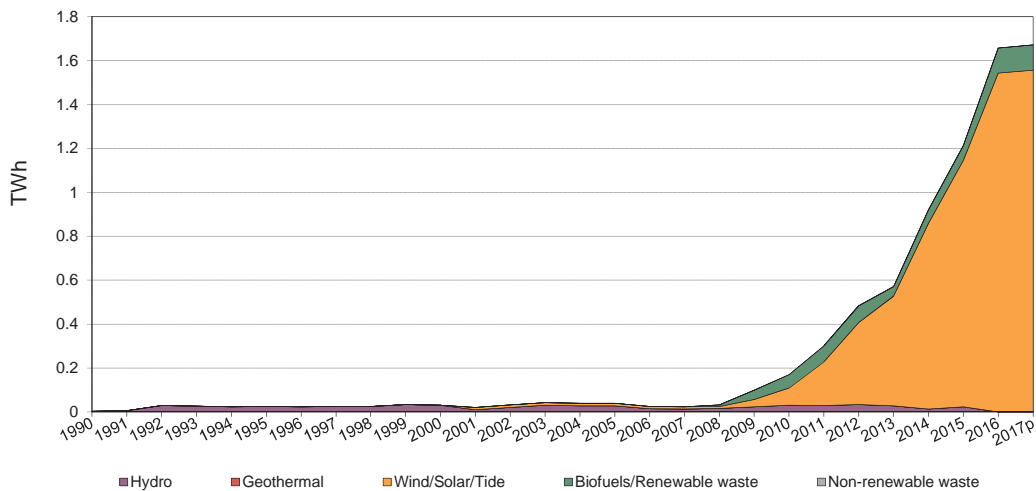


Figure 3. Electricity production by renewables and waste energy source



1. Total primary energy supply includes electricity trade.
2. Biofuels and renewable waste include solid biofuels, liquid biofuels, biogases, and renewable municipal waste.
3. Includes non-renewable municipal waste, industrial waste, peat, shale oil, electricity trade, and other sources of primary energy. (In the case of negative values, the net exports of electricity are greater than the other products in this category).
4. Includes geothermal, solar, wind and tide.

Note: Totals may not sum due to rounding.
Source: IEA/OECD *World Energy Balances*.

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Table 1. Energy supply, GDP and population

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|--|-------|--------|--------|--------|--------|--------|--------|--|
| TPES (Mtoe) | 11.47 | 18.23 | 23.20 | 21.52 | 22.69 | 22.94 | 23.28 | 1.4 |
| <i>of which: Renewables (Mtoe)</i> ¹ | 0.36 | 0.61 | 1.16 | 0.49 | 0.51 | 0.56 | 0.56 | -0.5 |
| <i>Renewables/TPES(%)</i> | 3.2 | 3.3 | 5.0 | 2.3 | 2.3 | 2.4 | 2.4 | -1.9 |
| GDP (billion 2010 US dollars) | 95.46 | 171.00 | 233.61 | 270.86 | 277.98 | 288.99 | 298.62 | 3.3 |
| TPES/GDP ² | 0.12 | 0.11 | 0.10 | 0.08 | 0.08 | 0.08 | 0.08 | -1.8 |
| TPES/GDP (year 2010 = 100) | 121 | 107 | 100 | 80 | 82 | 80 | 78 | -1.8 |
| Population (millions) | 4.66 | 6.30 | 7.62 | 8.21 | 8.38 | 8.54 | 8.71 | 1.9 |
| TPES/population (toe per capita) | 2.46 | 2.89 | 3.04 | 2.62 | 2.71 | 2.69 | 2.67 | -0.5 |
| Electricity generation (TWh) ³ | 20.9 | 42.7 | 58.6 | 60.8 | 64.2 | 67.0 | 67.9 | 2.8 |
| <i>of which: Renewables (TWh)</i> ^{1,3} | 0.00 | 0.03 | 0.17 | 0.92 | 1.21 | 1.66 | 1.67 | 26.4 |
| <i>Renew./Total Elec.(%)</i> ^{1,4} | 0.0 | 0.1 | 0.3 | 1.5 | 1.9 | 2.5 | 2.5 | 23.0 |
| Road energy consumption (Mtoe) | 2.7 | 4.5 | 5.5 | 5.3 | 5.6 | 5.8 | .. | .. |
| <i>of which: Liquid biofuels (Mtoe)</i> | - | - | - | - | - | - | .. | .. |
| <i>Liq. biofuels/road tr.(%)</i> ⁵ | - | - | - | - | - | - | - | - |

1. Renewables do not include industrial waste, non-renewable municipal waste and pumped storage production.

2. In units of toe per thousand 2010 US dollars.

3. Electricity generation = gross production - amount of electricity produced in pumped storage plants.

4. Electricity share generated from renewables over the total electricity production.

5. Energy from liquid biofuels consumed in road transport over the total energy consumed in road transport.

Source: IEA/OECD *World Energy Balances* and OECD *Main Economic Indicators*.

Table 2. Net generating capacity of renewable and waste sources (MWe)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | Average annual percent change 00-16 |
|--|------|------|------|--------|--------|--------|--|
| Total capacity | - | - | 93 | 712 | 776 | 922 | - |
| Hydro | - | - | 7 | 7 | 7 | 7 | - |
| <i>Hydro <1MW</i> | - | - | 2 | 2 | 2 | 2 | - |
| <i>Hydro 1-10MW</i> | - | - | 5 | 5 | 5 | 5 | - |
| <i>Hydro 10+MW</i> | - | - | - | - | - | - | - |
| <i>Mixed plants</i> | - | - | - | - | - | - | - |
| <i>Pure pumped storage</i> | - | - | - | - | - | - | - |
| Geothermal | - | - | - | - | - | - | - |
| Solar photovoltaic | - | - | 70 | 681 | 742 | 862 | - |
| Solar thermal | - | - | - | - | - | - | - |
| Tide, wave, ocean | - | - | - | - | - | - | - |
| Wind | - | - | 6 | 6 | 6 | 27 | - |
| Industrial waste | - | - | - | - | - | - | - |
| Municipal waste | - | - | - | - | - | - | - |
| Solid biofuels | - | - | - | - | - | - | - |
| Biogases | - | - | 10 | 18 | 21 | 26 | - |
| Liquid biofuels | - | - | - | - | - | - | - |
| Solar collectors surface (1000 m ²) | - | 3500 | 4168 | 4528 e | 4563 e | 4563 e | 1.7 |
| <i>Cap. of solar collectors (MW_{th})</i> ¹ | - | 2450 | 2918 | 3170 e | 3194 e | 3194 e | 1.7 |

1. Converted at 0.7 kW_{th}/m² of solar collector area, as estimated by the IEA Solar Heating & Cooling Programme.

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Table 3. Capacity factors (%)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 |
|--|------|------|--------------|--------------|--------------|--------------|
| Total plants¹ | - | - | 20.95 | 14.77 | 17.86 | 20.52 |
| Hydro | - | - | 50.39 | 20.78 | 39.91 | x |
| <i>of which: <1MW</i> | - | - | 25.76 | 27.08 | 51.91 | x |
| <i>of which: 1-10MW</i> | - | - | 18.79 | 18.26 | 35.11 | x |
| <i>of which: 10+MW</i> | - | - | - | - | - | - |
| <i>of which: pure pumped storage²</i> | - | - | - | - | - | - |
| Geothermal | - | - | - | - | - | - |
| Solar photovoltaic | - | - | 11.48 | 14.09 | 17.16 | 20.44 |
| Solar thermal | - | - | - | - | - | - |
| Tide, wave and ocean | - | - | - | - | - | - |
| Wind | - | - | 15.39 | 11.84 | 12.69 | x |
| Industrial waste | - | - | - | - | - | - |
| Municipal waste | - | - | - | - | - | - |
| Solid biofuels | - | - | - | - | - | - |
| Biogases | - | - | 36.53 | 39.39 | 37.00 | 50.02 |
| Biodiesels | - | - | - | - | - | - |
| Other liquid biofuels | - | - | - | - | - | - |

1. The capacity factor is defined as: the annual gross electricity generation divided by the reported net capacity times 365 (days/year) times 24 (hours/day).

2. In case a country has at least one mixed hydro plants, it is impossible to calculate capacity factor thus it is shown as 'not applicable'.

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Table 4. Gross electricity production from renewable and waste sources (GWh)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|---------------------------------------|----------|-----------|------------|------------|-------------|-------------|-------------|---|
| Total electricity¹ | 3 | 31 | 170 | 921 | 1214 | 1658 | 1672 | 26.4 |
| Hydro | 3 | 31 | 31 | 13 | 24 | c | c | c |
| <i>of which: pumped storage</i> | - | - | - | - | - | - | - | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar photovoltaic | - | - | 70 | 840 | 1115 | 1544 | 1557 | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Tide, wave, ocean | - | - | - | - | - | - | - | - |
| Wind | - | - | 8 | 6 | 7 | c | c | c |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | - | - | - | - | - |
| Solid biofuels | - | - | 29 | - | - | - | - | - |
| Biogases | - | - | 32 | 62 | 68 | 114 | 115 | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| <i>of which:</i> | | | | | | | | |
| <i>Electricity only plants</i> | 3 | 31 | 170 | 921 | 1214 | 1658 | .. | - |
| Hydro | 3 | 31 | 31 | 13 | 24 | c | - | c |
| <i>of which: pumped storage</i> | - | - | - | - | - | - | - | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar photovoltaic | - | - | 70 | 840 | 1115 | 1544 | .. | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Tide, wave, ocean | - | - | - | - | - | - | - | - |
| Wind | - | - | 8 | 6 | 7 | c | - | c |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | - | - | - | - | - |
| Solid biofuels | - | - | 29 | - | - | - | - | - |
| Biogases | - | - | 32 | 62 | 68 | 114 | .. | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| <i>CHP plants</i> | | | | | | | | |
| Geothermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | - | - | - | - | - |
| Solid biofuels | - | - | - | - | - | - | - | - |
| Biogases | - | - | - | - | - | - | - | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |

1. **Total electricity** includes the electricity produced from industrial waste, non-renewable municipal waste and pumped storage. Electricity from renewable sources does *not* include the electricity produced from industrial waste, non-renewable municipal waste and pumped storage production.

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Table 5A. Heat production¹ from renewable and waste sources in the transformation sector (TJ)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|----------------------------|------|------|------|------|------|------|-------|--|
| Total heat | - | - | - | - | - | - | - | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | - | - | - | - | - |
| Solid biofuels | - | - | - | - | - | - | - | - |
| Biogases | - | - | - | - | - | - | - | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| <i>of which:</i> | | | | | | | | |
| CHP plants | - | - | - | - | - | - | - | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | - | - | - | - | - |
| Solid biofuels | - | - | - | - | - | - | - | - |
| Biogases | - | - | - | - | - | - | - | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| Heat only plants | - | - | - | - | - | - | - | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | - | - | - | - | - |
| Solid biofuels | - | - | - | - | - | - | - | - |
| Biogases | - | - | - | - | - | - | - | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |

1. Waste heat and heat production from heat pumps are not included and are reported separately in Table 5B.

Table 5B. Heat production from heat pumps and waste heat (TJ)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|----------------------------|------|------|------|------|------|------|-------|--|
| Total heat | - | - | - | - | - | - | - | - |
| Heat pumps ¹ | - | - | - | - | - | - | - | - |
| (-) Input to heat pumps | - | - | - | - | - | - | - | - |
| Other sources ² | - | - | - | - | - | - | - | - |

1. Installations producing heat for own use are not included.

2. Refers to production from hydrogen, purchased steam from industry, and waste heat.

Source: IEA/OECD *Electricity Statistics*.

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Table 6. Renewable and waste balance for 2016

| thousand tonnes of oil equivalent | Hydro ¹ | Wind | Tide wave ocean | Solar PV | Geo-thermal | Solar thermal | Industrial waste | Mun. waste renew. |
|------------------------------------|--------------------|----------|-----------------|-------------|-------------|---------------|------------------|-------------------|
| Production | c | c | - | 133 | - | 379 e | - | - |
| Imports | - | - | - | - | - | - | - | - |
| Exports | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| TPES | c | c | - | 133 | - | 379 | - | - |
| Statistical differences | - | - | - | - | - | - | - | - |
| Main activity electricity plants | - | - | - | - | - | - | - | - |
| Autoproducer electricity plants | c | - | - | -133 | - | - | - | - |
| Main activity CHP plants | - | - | - | - | - | - | - | - |
| Autoproducer CHP plants | - | - | - | - | - | - | - | - |
| Main heat plants | - | - | - | - | - | - | - | - |
| Autoproducer heat plants | - | - | - | - | - | - | - | - |
| Charcoal production plants | - | - | - | - | - | - | - | - |
| Other transformation | - | - | - | - | - | - | - | - |
| Energy Industry own use | - | - | - | - | - | - | - | - |
| Losses | - | - | - | - | - | - | - | - |
| TFC | - | - | - | - | - | 379 | - | - |
| Industry | - | - | - | - | - | - | - | - |
| Iron and steel | - | - | - | - | - | - | - | - |
| Chemical and petrochemical | - | - | - | - | - | - | - | - |
| Non-ferrous metals | - | - | - | - | - | - | - | - |
| Non-metallc minerals | - | - | - | - | - | - | - | - |
| Transport equipment | - | - | - | - | - | - | - | - |
| Machinery | - | - | - | - | - | - | - | - |
| Mining and quarrying | - | - | - | - | - | - | - | - |
| Food and tobacco | - | - | - | - | - | - | - | - |
| Paper, pulp and print | - | - | - | - | - | - | - | - |
| Wood and wood products | - | - | - | - | - | - | - | - |
| Construction | - | - | - | - | - | - | - | - |
| Textile and leather | - | - | - | - | - | - | - | - |
| Non-specified | - | - | - | - | - | - | - | - |
| Transport | - | - | - | - | - | - | - | - |
| Road | - | - | - | - | - | - | - | - |
| Other | - | - | - | - | - | - | - | - |
| Other | - | - | - | - | - | 379 | - | - |
| Residential | - | - | - | - | - | 379 e | - | - |
| Commercial and public services | - | - | - | - | - | - | - | - |
| Agriculture/forestry | - | - | - | - | - | - | - | - |
| Fishing | - | - | - | - | - | - | - | - |
| Non-specified | - | - | - | - | - | - | - | - |
| Electricity generated - GWh | c | c | - | 1544 | - | - | - | - |
| <i>Electricity plants</i> | <i>c</i> | <i>c</i> | <i>-</i> | <i>1544</i> | <i>-</i> | <i>-</i> | <i>-</i> | <i>-</i> |
| <i>CHP plants</i> | <i>-</i> | <i>-</i> | <i>-</i> | <i>-</i> | <i>-</i> | <i>-</i> | <i>-</i> | <i>-</i> |
| Heat generated - TJ | - | - | - | - | - | - | - | - |
| <i>CHP plants</i> | <i>-</i> | <i>-</i> | <i>-</i> | <i>-</i> | <i>-</i> | <i>-</i> | <i>-</i> | <i>-</i> |
| <i>Heat plants</i> | <i>-</i> | <i>-</i> | <i>-</i> | <i>-</i> | <i>-</i> | <i>-</i> | <i>-</i> | <i>-</i> |

1. Hydro does not include pumped hydro.

Source: IEA/OECD *World Energy Balances*.

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Table 6. Renewable and waste balance for 2016 (continued)

| Mun. waste non-ren. | Wood/ wood waste | Charcoal | Bio-gases | Bio-gasoline | Bio-diesel | Other liquid biofuels | Total renew. & waste sources ² | Share in total energy sources ³ |
|---------------------|------------------|----------|-----------|--------------|------------|-----------------------|---|--|
| - | 4 e | - | 19 | - | - | - | 535 | 6.5% |
| - | - | 21 e | - | - | - | - | 21 | 0.1% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | 4 | 21 | 19 | - | - | - | 556 | 2.4% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | -19 | - | - | - | -152 | x |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | 4 | 21 | - | - | - | - | 404 | 8.8% |
| - | 4 e | - | - | - | - | - | 383 | 18.3% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | 21 e | - | - | - | - | 21 | 3.3% |
| - | - | - | 114 | - | - | - | 1658 | 2.5% |
| - | - | - | 114 | - | - | - | 1658 | 2.5% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |

2. Total includes non-renewable waste.

3. Share of renewables on TFC excludes electricity and heat generated from renewable sources.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|--|-------|-------|-------|---------|---------|---------|---------|---|
| Geothermal (TJ) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Solar thermal (TJ) | | | | | | | | |
| Production | 14996 | 24949 | 46980 | 15765 e | 15887 e | 15887 e | 15887 e | -2.8 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 14996 | 24949 | 46980 | 15765 e | 15887 e | 15887 e | 15887 e | -2.8 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 14996 | 24949 | 46980 | 15765 e | 15887 e | 15887 e | .. | -2.8 |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 14996 | 24949 | 46980 | 15765 e | 15887 e | 15887 e | .. | -2.8 |
| Industrial waste (TJ) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Municipal waste - renewables (TJ) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics (continued)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|--|------|------|-------|-------|-------|-------|-------|---|
| Municipal waste - non-renewables (TJ) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Solid Biofuel excluding charcoal (TJ) | | | | | | | | |
| Production | 127 | 183 | 550 | 183 e | 183 e | 183 e | 183 e | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 127 | 183 | 550 | 183 e | 183 e | 183 e | 183 e | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | 367 | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 127 | 183 | 183 | 183 e | 183 e | 183 e | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 127 | 183 | 183 | 183 e | 183 e | 183 e | .. | - |
| Charcoal (kt) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | 4 e | 16 e | 23 e | 22 e | 29 e | 29 e | 13.2 |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | 4 e | 16 e | 23 e | 22 e | 29 e | 29 e | 13.2 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | 4 e | 16 e | 23 e | 22 e | 29 e | .. | 13.2 |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | 4 e | 16 e | 23 e | 22 e | 29 e | .. | 13.2 |
| Biogases (TJ) | | | | | | | | |
| Production | - | - | 347 e | 593 | 559 | 795 | 795 e | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | 347 | 593 | 559 | 795 | 795 e | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | 347 | 593 | 559 | 795 | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics (continued)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|-----------------------------------|------|------|------|------|------|------|-------|---|
| Biogasoline (kt) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Biodiesel (kt) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Other liquid biofuels (kt) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Figure 1. Contribution of renewables in 1990

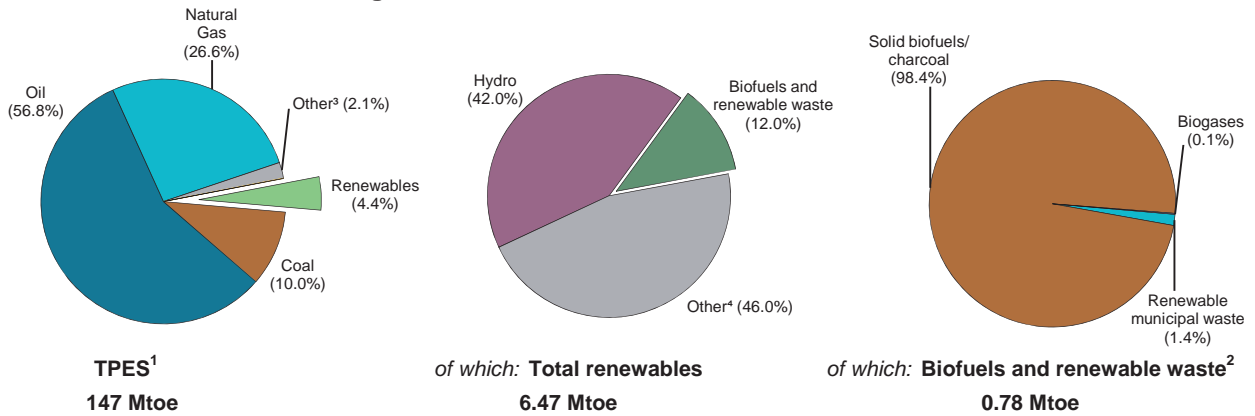


Figure 2. Contribution of renewables in 2017 provisional

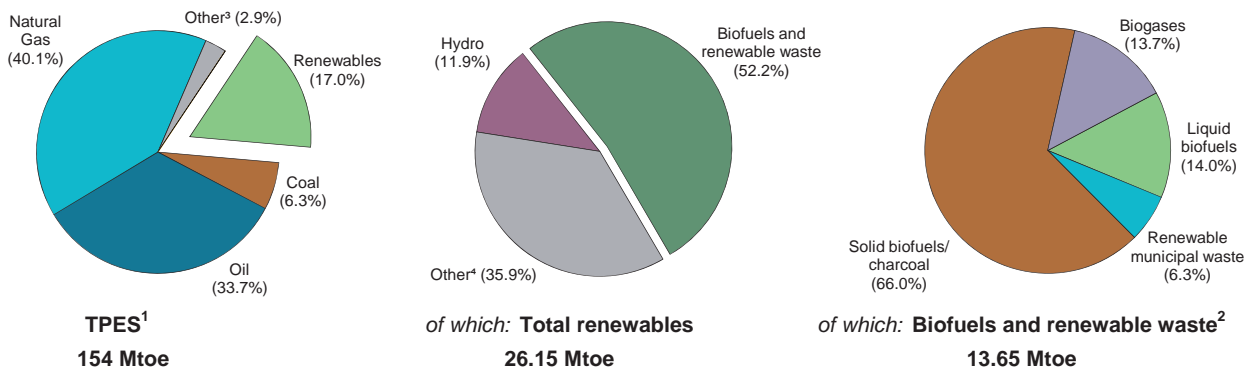
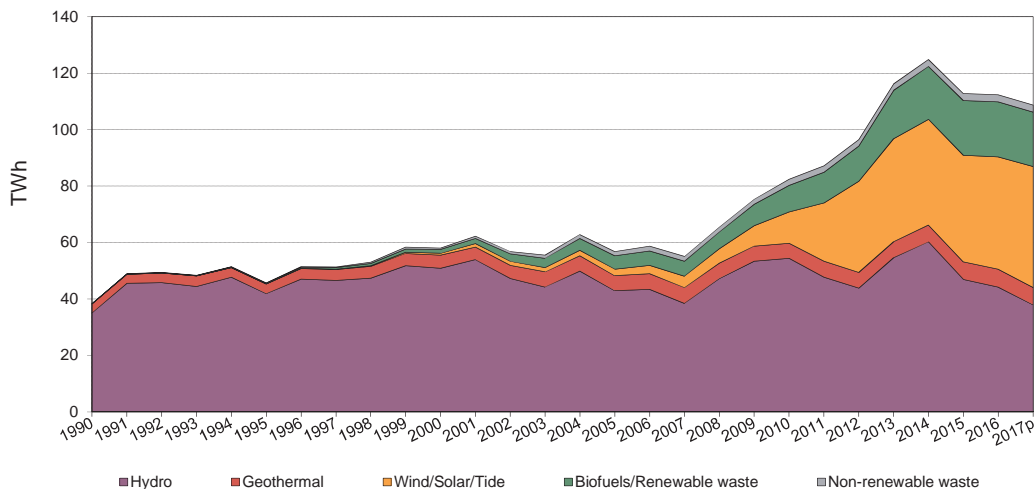


Figure 3. Electricity production by renewables and waste energy source



1. Total primary energy supply includes electricity trade.
2. Biofuels and renewable waste include solid biofuels, liquid biofuels, biogases, and renewable municipal waste.
3. Includes non-renewable municipal waste, industrial waste, peat, shale oil, electricity trade, and other sources of primary energy. (In the case of negative values, the net exports of electricity are greater than the other products in this category).
4. Includes geothermal, solar, wind and tide.

Note: Totals may not sum due to rounding.
Source: IEA/OECD *World Energy Balances*.

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Table 1. Energy supply, GDP and population

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|---|---------|---------|---------|---------|---------|---------|---------|-------------------------------------|
| TPES (Mtoe) | 146.57 | 171.54 | 173.74 | 146.77 | 152.56 | 150.98 | 153.50 | -0.7 |
| of which: Renewables (Mtoe) ¹ | 6.47 | 10.11 | 21.87 | 26.51 | 26.27 | 26.02 | 26.15 | 5.7 |
| Renewables/TPES(%) | 4.4 | 5.9 | 12.6 | 18.1 | 17.2 | 17.2 | 17.0 | 6.4 |
| GDP (billion 2010 US dollars) | 1749.18 | 2060.21 | 2125.06 | 2043.49 | 2062.94 | 2080.65 | 2111.90 | 0.1 |
| TPES/GDP ² | 0.08 | 0.08 | 0.08 | 0.07 | 0.07 | 0.07 | 0.07 | -0.8 |
| TPES/GDP (year 2010 = 100) | 102 | 102 | 100 | 88 | 90 | 89 | 89 | -0.8 |
| Population (millions) | 56.72 | 56.94 | 59.83 | 60.79 | 60.73 | 60.63 | 60.54 | 0.4 |
| TPES/population (toe per capita) | 2.58 | 3.01 | 2.90 | 2.41 | 2.51 | 2.49 | 2.54 | -1.0 |
| Electricity generation (TWh) ³ | 213.1 | 269.9 | 298.8 | 278.1 | 281.6 | 287.9 | 293.3 | 0.5 |
| of which: Renewables (TWh) ^{1,3} | 34.91 | 50.88 | 76.97 | 120.68 | 108.91 | 108.02 | 104.50 | 4.3 |
| Renew./Total Elec.(%) ^{1,4} | 16.4 | 18.8 | 25.8 | 43.4 | 38.7 | 37.5 | 35.6 | 3.8 |
| Road energy consumption (Mtoe) | 30.9 | 36.9 | 35.7 | 34.3 | 33.6 | 33.0 | .. | .. |
| of which: Liquid biofuels (Mtoe) | - | - | 1.42 | 1.07 | 1.17 | 1.04 | .. | .. |
| Liq. biofuels/road tr.(%) ⁵ | - | - | 4.0 | 3.1 | 3.5 | 3.2 | - | - |

1. Renewables do not include industrial waste, non-renewable municipal waste and pumped storage production.

2. In units of toe per thousand 2010 US dollars.

3. Electricity generation = gross production - amount of electricity produced in pumped storage plants.

4. Electricity share generated from renewables over the total electricity production.

5. Energy from liquid biofuels consumed in road transport over the total energy consumed in road transport.

Source: IEA/OECD *World Energy Balances* and OECD *Main Economic Indicators*.

Table 2. Net generating capacity of renewable and waste sources (MWe)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | Average annual percent change 00-16 |
|---|--------------|--------------|--------------|--------------|--------------|--------------|-------------------------------------|
| Total capacity | 19364 | 22003 | 33833 | 53932 | 54836 | 55608 | 6.0 |
| Hydro | 18770 | 20346 | 21520 | 22098 | 22220 | 22298 | 0.6 |
| Hydro <1MW | - | 373 | 509 | 654 | 697 | 742 | 4.4 |
| Hydro 1-10MW | - | 1824 | 2155 | 2432 | 2511 | 2557 | 2.1 |
| Hydro 10+MW | - | 11192 | 11312 | 11420 | 11420 | 11692 | 0.3 |
| Mixed plants | 2954 | 3001 | 3587 | 3610 | 3610 | 3325 | 0.6 |
| Pure pumped storage | 3234 | 3956 | 3957 | 3982 | 3982 | 3982 | 0.0 |
| Geothermal | 496 | 590 | 728 | 768 | 768 | 767 | 1.7 |
| Solar photovoltaic | 4 | 19 | 3592 | 18594 | 18901 | 19283 | 54.1 |
| Solar thermal | - | - | - | - | - | - | - |
| Tide, wave, ocean | - | - | - | - | - | - | - |
| Wind | 3 | 363 | 5794 | 8683 | 9137 | 9384 | 22.5 |
| Industrial waste | - | - | 16 | 17 | 28 | 28 | - |
| Municipal waste | 46 | 287 | 716 | 826 | 830 | 818 | 6.8 |
| Solid biofuels | 4 | 218 e | 406 | 620 | 616 | 685 | 7.4 |
| Biogases | 41 | 180 | 480 | 1336 | 1336 | 1352 | 13.4 |
| Liquid biofuels | - | - | 581 | 990 | 1000 | 993 | - |
| Solar collectors surface (1000 m ²) | 120 | 271 | 2415 | 3538 | 3724 | 3891 | 18.1 |
| Cap. of solar collectors (MW _{th}) ¹ | 84 | 190 | 1691 | 2477 | 2607 | 2724 | 18.1 |

1. Converted at 0.7 kW_{th}/m² of solar collector area, as estimated by the IEA Solar Heating & Cooling Programme.

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Table 3. Capacity factors (%)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 |
|--|--------------|--------------|--------------|--------------|--------------|--------------|
| Total plants¹ | 22.64 | 30.14 | 27.80 | 26.42 | 23.47 | 23.06 |
| Hydro | 21.33 | 28.56 | 28.86 | 31.13 | 24.13 | 22.66 |
| <i>of which: <1MW</i> | - | 47.52 | 50.36 | 54.95 | 41.87 | 40.60 |
| <i>of which: 1-10MW</i> | - | 41.16 | 46.15 | 51.60 | 37.77 | 36.50 |
| <i>of which: 10+MW</i> | - | 36.79 | 40.53 | 44.39 | 34.66 | 30.87 |
| <i>of which: pure pumped storage²</i> | x | x | x | x | x | x |
| Geothermal | 74.15 | 91.03 | 84.30 | 87.94 | 91.93 | 93.59 |
| Solar photovoltaic | 11.42 | 10.81 e | 6.06 | 13.69 | 13.86 | 13.09 |
| Solar thermal | - | - | - | - | - | - |
| Tide, wave and ocean | - | - | - | - | - | - |
| Wind | 7.61 | 17.71 | 17.98 | 19.95 | 18.55 | 21.52 |
| Industrial waste | - | - | 69.90 | 54.69 | 34.56 | 35.82 |
| Municipal waste | 18.12 e | 31.98 e | 65.26 | 65.52 | 64.45 | 67.42 |
| Solid biofuels | 34.25 | 22.24 e | 63.57 | 70.38 | 73.14 | 68.74 |
| Biogases | 0.56 | 35.96 | 48.85 | 70.05 | 70.17 | 69.73 |
| Biodiesels | - | - | - | 25.37 | 29.26 | 32.39 |
| Other liquid biofuels | - | - | 60.46 | 50.16 | 55.98 | 54.23 |

1. The capacity factor is defined as: the annual gross electricity generation divided by the reported net capacity times 365 (days/year) times 24 (hours/day).

2. In case a country has at least one mixed hydro plants, it is impossible to calculate capacity factor thus it is shown as 'not applicable'.

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Table 4. Gross electricity production from renewable and waste sources (GWh)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|--------------------------------------|--------------|--------------|--------------|---------------|---------------|---------------|---------------|---|
| Total electricity¹ | 38410 | 58094 | 82399 | 124842 | 112768 | 112350 | 108748 | 3.8 |
| Hydro | 35079 | 50900 | 54406 | 60256 | 46970 | 44257 | 37935 | -1.7 |
| <i>of which: pumped storage</i> | <i>3453</i> | <i>6700</i> | <i>3290</i> | <i>1711</i> | <i>1432</i> | <i>1825</i> | <i>1785</i> | <i>-7.5</i> |
| Geothermal | 3222 | 4705 | 5376 | 5916 | 6185 | 6289 | 6201 | 1.6 |
| Solar photovoltaic | 4 | 18 | 1906 | 22306 | 22942 | 22104 | 25207 | 53.1 |
| Solar thermal | - | - | - | - | - | - | - | - |
| Tide, wave, ocean | - | - | - | - | - | - | - | - |
| Wind | 2 | 563 | 9126 | 15178 | 14844 | 17689 | 17658 | 22.5 |
| Industrial waste | 16 | 112 | 98 | 81 | 85 | 87 | 81 | -1.9 |
| Municipal waste renew. | 37 | 402 | 2047 | 2371 | 2344 | 2415 | 2384 | 11.0 |
| Municipal waste non-renew. | 36 | 402 | 2047 | 2371 | 2344 | 2415 | 2384 | 11.0 |
| Solid biofuels | 12 | 425 | 2261 | 3823 | 3947 | 4125 | 4219 | 14.5 |
| Biogases | 2 | 567 | 2054 | 8198 | 8212 | 8259 | 8258 | 17.1 |
| Liquid biofuels | - | - | 3078 | 4342 | 4895 | 4710 | 4421 | - |
| of which: | | | | | | | | |
| Electricity only plants | 38378 | 57120 | 78161 | 114884 | 102036 | 101426 | .. | - |
| Hydro | 35079 | 50900 | 54406 | 60256 | 46970 | 44257 | .. | - |
| <i>of which: pumped storage</i> | <i>3453</i> | <i>6700</i> | <i>3290</i> | <i>1711</i> | <i>1432</i> | <i>1825</i> | .. | - |
| Geothermal | 3222 | 4705 | 5376 | 5916 | 6185 | 6289 | .. | - |
| Solar photovoltaic | 4 | 18 | 1906 | 22306 | 22942 | 22104 | .. | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Tide, wave, ocean | - | - | - | - | - | - | - | - |
| Wind | 2 | 563 | 9126 | 15178 | 14844 | 17689 | .. | - |
| Industrial waste | - | 56 | 98 | 61 | 57 | 54 | .. | - |
| Municipal waste renew. | 36 | 134 | 1061 | 1257 | 1208 | 1218 | .. | - |
| Municipal waste non-renew. | 35 | 133 | 1061 | 1257 | 1208 | 1218 | .. | - |
| Solid biofuels | - | 87 | 1544 | 2031 | 2089 | 2226 | .. | - |
| Biogases | - | 524 | 1451 | 3537 | 3139 | 3073 | .. | - |
| Liquid biofuels | - | - | 2132 | 3085 | 3394 | 3298 | .. | - |
| CHP plants | 32 | 974 | 4238 | 9958 | 10732 | 10924 | .. | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Industrial waste | 16 | 56 | - | 20 | 28 | 33 | .. | - |
| Municipal waste renew. | 1 | 268 | 986 | 1114 | 1136 | 1197 | .. | - |
| Municipal waste non-renew. | 1 | 269 | 986 | 1114 | 1136 | 1197 | .. | - |
| Solid biofuels | 12 | 338 | 717 | 1792 | 1858 | 1899 | .. | - |
| Biogases | 2 | 43 | 603 | 4661 | 5073 | 5186 | .. | - |
| Liquid biofuels | - | - | 946 | 1257 | 1501 | 1412 | .. | - |

1. **Total electricity** includes the electricity produced from industrial waste, non-renewable municipal waste and pumped storage. Electricity from renewable sources does *not* include the electricity produced from industrial waste, non-renewable municipal waste and pumped storage production.

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Table 5A. Heat production¹ from renewable and waste sources in the transformation sector (TJ)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|----------------------------|------|------|--------------|--------------|--------------|--------------|--------------|--|
| Total heat | - | - | 13976 | 44165 | 42635 | 44120 | 44581 | - |
| Geothermal | - | - | 589 | 764 | 780 | 810 | 841 | - |
| Solar thermal | - | - | - | 2 | 2 | 3 | 3 | - |
| Industrial waste | - | - | - | 56 | 219 | 298 | 274 | - |
| Municipal waste renew. | - | - | 2583 | 3568 | 4519 | 4901 | 4885 | - |
| Municipal waste non-renew. | - | - | 2583 | 3568 | 4519 | 4901 | 4885 | - |
| Solid biofuels | - | - | 6156 | 24820 | 22221 | 22674 | 23135 | - |
| Biogases | - | - | 1029 | 9997 | 8604 | 8708 | 8836 | - |
| Liquid biofuels | - | - | 1036 | 1390 | 1771 | 1825 | 1722 | - |
| <i>of which:</i> | | | | | | | | |
| CHP plants | - | - | 11140 | 40659 | 38893 | 40036 | .. | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | - | 56 | 219 | 298 | .. | - |
| Municipal waste renew. | - | - | 2583 | 3568 | 4519 | 4901 | .. | - |
| Municipal waste non-renew. | - | - | 2583 | 3568 | 4519 | 4901 | .. | - |
| Solid biofuels | - | - | 3919 | 22104 | 19281 | 19423 | .. | - |
| Biogases | - | - | 1019 | 9984 | 8593 | 8699 | .. | - |
| Liquid biofuels | - | - | 1036 | 1379 | 1762 | 1814 | .. | - |
| Heat only plants | - | - | 2836 | 3506 | 3742 | 4084 | .. | - |
| Geothermal | - | - | 589 | 764 | 780 | 810 | .. | - |
| Solar thermal | - | - | - | 2 | 2 | 3 | .. | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | - | - | - | - | - |
| Solid biofuels | - | - | 2237 | 2716 | 2940 | 3251 | .. | - |
| Biogases | - | - | 10 | 13 | 11 | 9 | .. | - |
| Liquid biofuels | - | - | - | 11 | 9 | 11 | .. | - |

1. Waste heat and heat production from heat pumps are not included and are reported separately in Table 5B.

Table 5B. Heat production from heat pumps and waste heat (TJ)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|----------------------------|------|------|------|------|------|------|-------|--|
| Total heat | - | - | - | - | - | - | - | - |
| Heat pumps ¹ | - | - | - | - | - | - | - | - |
| (-) Input to heat pumps | - | - | - | - | - | - | - | - |
| Other sources ² | - | - | - | - | - | - | - | - |

1. Installations producing heat for own use are not included.

2. Refers to production from hydrogen, purchased steam from industry, and waste heat.

Source: IEA/OECD *Electricity Statistics*.

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Table 6. Renewable and waste balance for 2016

| thousand tonnes of oil equivalent | Hydro ¹ | Wind | Tide wave ocean | Solar PV | Geo-thermal | Solar thermal | Industrial waste | Mun. waste renew. |
|------------------------------------|--------------------|--------------|-----------------|--------------|-------------|---------------|------------------|-------------------|
| Production | 3648 | 1521 | - | 1901 | 5571 | 200 | 312 | 871 |
| Imports | - | - | - | - | - | - | - | - |
| Exports | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| TPES | 3648 | 1521 | - | 1901 | 5571 | 200 | 312 | 871 |
| Statistical differences | - | - | - | - | - | - | - | - |
| Main activity electricity plants | -3600 | -1521 | - | -1901 | -5407 | - | -18 | -423 |
| Autoproducer electricity plants | -48 | - | - | - | - | - | - | -2 |
| Main activity CHP plants | - | - | - | - | - | - | -18 | -445 |
| Autoproducer CHP plants | - | - | - | - | - | - | - | - |
| Main heat plants | - | - | - | - | -39 | - | - | - |
| Autoproducer heat plants | - | - | - | - | - | - | - | - |
| Charcoal production plants | - | - | - | - | - | - | - | - |
| Other transformation | - | - | - | - | - | - | - | - |
| Energy Industry own use | - | - | - | - | - | - | - | - |
| Losses | - | - | - | - | - | - | - | - |
| TFC | - | - | - | - | 125 | 200 | 276 | - |
| Industry | - | - | - | - | 2 | 10 | 276 | - |
| Iron and steel | - | - | - | - | - | - | - | - |
| Chemical and petrochemical | - | - | - | - | - | - | 78 | - |
| Non-ferrous metals | - | - | - | - | - | - | - | - |
| Non-metallc minerals | - | - | - | - | - | - | 155 | - |
| Transport equipment | - | - | - | - | - | - | - | - |
| Machinery | - | - | - | - | - | - | 3 | - |
| Mining and quarrying | - | - | - | - | - | - | - | - |
| Food and tobacco | - | - | - | - | - | - | - | - |
| Paper, pulp and print | - | - | - | - | - | - | - | - |
| Wood and wood products | - | - | - | - | - | - | - | - |
| Construction | - | - | - | - | - | - | - | - |
| Textile and leather | - | - | - | - | - | - | - | - |
| Non-specified | - | - | - | - | 2 | 10 | 41 | - |
| Transport | - | - | - | - | - | - | - | - |
| Road | - | - | - | - | - | - | - | - |
| Other | - | - | - | - | - | - | - | - |
| Other | - | - | - | - | 122 | 190 | - | - |
| Residential | - | - | - | - | 1 | 148 | - | - |
| Commercial and public services | - | - | - | - | 76 | 40 | - | - |
| Agriculture/forestry | - | - | - | - | 14 | 2 | - | - |
| Fishing | - | - | - | - | 32 | - | - | - |
| Non-specified | - | - | - | - | - | - | - | - |
| Electricity generated - GWh | 42432 | 17689 | - | 22104 | 6289 | - | 87 | 2415 |
| <i>Electricity plants</i> | 42432 | 17689 | - | 22104 | 6289 | - | 54 | 1218 |
| <i>CHP plants</i> | - | - | - | - | - | - | 33 | 1197 |
| Heat generated - TJ | - | - | - | - | 810 | 3 | 298 | 4901 |
| <i>CHP plants</i> | - | - | - | - | - | - | 298 | 4901 |
| <i>Heat plants</i> | - | - | - | - | 810 | 3 | - | - |

1. Hydro does not include pumped hydro.

Source: IEA/OECD *World Energy Balances*.

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Table 6. Renewable and waste balance for 2016 (continued)

| Mun. waste non-ren. | Wood/wood waste | Charcoal | Bio-gases | Bio-gasoline | Bio-diesel | Other liquid biofuels | Total renew. & waste sources ² | Share in total energy sources ³ |
|---------------------|-----------------|-----------|-------------|--------------|-------------|-----------------------|---|--|
| 871 | 7232 | - | 1875 | 15 | 509 | 478 | 25004 | 74.0% |
| - | 1233 | 45 | - | 17 | 709 | 425 | 2429 | 1.6% |
| - | -24 | -1 | - | - | -203 | - | -228 | 0.7% |
| - | - | - | - | - | -3 | - | -3 | x |
| 871 | 8441 | 44 | 1875 | 33 | 1012 | 903 | 27203 | 18.0% |
| - | - | - | - | - | -1 | - | -1 | x |
| -423 | -691 | - | -711 | - | -1 | -596 | -15292 | x |
| -2 | -3 | - | -13 | - | - | -23 | -91 | x |
| -445 | -1041 | - | -1058 | - | -2 | -268 | -3277 | x |
| - | -12 | - | -48 | - | - | -17 | -77 | x |
| - | -98 | - | - | - | - | - | -137 | x |
| - | - | - | - | - | - | - | - | - |
| - | -15 | 7 | - | - | - | - | -8 | x |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | 6582 | 51 | 44 | 33 | 1008 | - | 8319 | 7.1% |
| - | 353 | 7 | 20 | - | - | - | 668 | 2.7% |
| - | - | - | - | - | - | - | - | - |
| - | 1 | - | 7 | - | - | - | 86 | 2.5% |
| - | - | - | - | - | - | - | - | - |
| - | 129 | - | - | - | - | - | 284 | 6.1% |
| - | - | - | - | - | - | - | - | - |
| - | 2 | - | - | - | - | - | 5 | 0.2% |
| - | - | - | - | - | - | - | - | - |
| - | 30 | 7 | 13 | - | - | - | 50 | 1.8% |
| - | - | - | - | - | - | - | - | - |
| - | 144 | - | - | - | - | - | 144 | 31.1% |
| - | 1 | - | - | - | - | - | 1 | 0.3% |
| - | - | - | - | - | - | - | - | - |
| - | 46 | - | - | - | - | - | 99 | 6.1% |
| - | - | - | - | 33 | 1008 | - | 1041 | 2.9% |
| - | - | - | - | 33 | 1008 | - | 1041 | 3.2% |
| - | - | - | - | - | - | - | - | - |
| - | 6228 | 44 | 24 | - | - | - | 6608 | 13.1% |
| - | 6129 | 44 | - | - | - | - | 6322 | 19.6% |
| - | 64 | - | 24 | - | - | - | 204 | 1.3% |
| - | 35 | - | - | - | - | - | 51 | 1.9% |
| - | - | - | - | - | - | - | 32 | 14.5% |
| - | - | - | - | - | - | - | - | - |
| 2415 | 4125 | - | 8259 | - | 11 | 4699 | 110525 | 38.4% |
| 1218 | 2226 | - | 3073 | - | 3 | 3295 | 99601 | 54.5% |
| 1197 | 1899 | - | 5186 | - | 8 | 1404 | 10924 | 10.4% |
| 4901 | 22674 | - | 8708 | - | 18 | 1807 | 44120 | 19.7% |
| 4901 | 19423 | - | 8699 | - | 18 | 1796 | 40036 | 18.2% |
| - | 3251 | - | 9 | - | - | 11 | 4084 | 100.0% |

2. Total includes non-renewable waste.

3. Share of renewables on TFC excludes electricity and heat generated from renewable sources.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|--|--------|----------|--------|--------|--------|--------|--------|---|
| Geothermal (TJ) | | | | | | | | |
| Production | 124392 | 178296 e | 199954 | 219177 | 228997 | 233230 | 230140 | 1.7 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 124392 | 178296 e | 199954 | 219177 | 228997 | 233230 | 230140 | 1.7 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | 115992 | 169380 e | 194711 | 214517 | 224219 | 228008 | .. | 1.9 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 8400 | 8916 | 5243 | 4660 | 4778 | 5222 | .. | -3.3 |
| <i>Industry</i> | - | - | 107 | 82 | 82 | 98 | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 8400 | 8916 | 5136 | 4578 | 4696 | 5124 | .. | -3.4 |
| Solar thermal (TJ) | | | | | | | | |
| Production | 202 | 456 | 5616 | 7519 | 7955 | 8382 | 8750 | 20.0 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 202 | 456 | 5616 | 7519 | 7955 | 8382 | 8750 | 20.0 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | 2 | 2 | 4 | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 202 | 456 | 5616 | 7517 | 7953 | 8378 | .. | 20.0 |
| <i>Industry</i> | - | - | 281 | 376 | 398 | 419 | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 202 | 456 | 5335 | 7141 | 7555 | 7959 | .. | 19.6 |
| Industrial waste (TJ) | | | | | | | | |
| Production | 6408 e | 3832 | 10998 | 12532 | 12696 | 13082 | 12956 | 8.0 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 6408 e | 3832 | 10998 | 12532 | 12696 | 13082 | 12956 | 8.0 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | 586 | 1232 | 1673 | 1147 | 1452 | 1507 | .. | 1.3 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 5822 e | 2600 e | 9325 | 11385 | 11244 | 11575 | .. | 9.8 |
| <i>Industry</i> | 5822 e | 2600 e | 9325 | 11385 | 11244 | 11575 | .. | 9.8 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Municipal waste - renewables (TJ) | | | | | | | | |
| Production | 470 e | 6992 e | 32589 | 35941 | 35420 | 36454 | 35965 | 10.9 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 470 e | 6992 e | 32589 | 35941 | 35420 | 36454 | 35965 | 10.9 |
| Statistical differences | - | -3400 | - | - | - | - | .. | - |
| Transformation processes | 470 e | 3592 e | 32589 | 35941 | 35420 | 36454 | .. | 15.6 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics (continued)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|--|-------|--------|--------|--------|--------|--------|--------|---|
| Municipal waste - non-renewables (TJ) | | | | | | | | |
| Production | 469 e | 6992 e | 32589 | 35941 | 35420 | 36454 | 35965 | 10.9 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 469 e | 6992 e | 32589 | 35941 | 35420 | 36454 | 35965 | 10.9 |
| Statistical differences | - | -3400 | - | - | - | - | .. | - |
| Transformation processes | 469 e | 3592 e | 32589 | 35941 | 35420 | 36454 | .. | 15.6 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Solid Biofuel excluding charcoal (TJ) | | | | | | | | |
| Production | 28163 | 49381 | 293574 | 273792 | 307323 | 302790 | 321428 | 12.0 |
| Net imports ¹ | 3843 | 20388 | 53230 | 63932 | 51822 | 50626 | 53813 | 5.8 |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 32006 | 69769 | 346804 | 337724 | 359145 | 353416 | 375241 | 10.7 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | 2943 | 9910 | 39677 | 86465 | 74434 | 77859 | .. | 13.8 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 29063 | 59859 | 307127 | 251259 | 284711 | 275557 | .. | 10.0 |
| <i>Industry</i> | 3390 | 8667 | 8398 | 12102 | 15235 | 14787 | .. | 3.4 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 25673 | 51192 | 298729 | 239157 | 269476 | 260770 | .. | 10.7 |
| Charcoal (kt) | | | | | | | | |
| Production | 41 e | 78 | 10 | 10 | 10 | 10 | 10 | -12.0 |
| Net imports ¹ | - | 39 | 68 | 60 | 57 | 60 | 60 | 2.7 |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 41 e | 117 | 78 | 70 | 67 | 70 | 70 | -3.2 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 41 e | 117 | 78 | 70 | 67 | 70 | .. | -3.2 |
| <i>Industry</i> | - | 28 | 10 | 10 | 10 | 10 | .. | -6.2 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 41 e | 89 | 68 | 60 | 57 | 60 | .. | -2.4 |
| Biogases (TJ) | | | | | | | | |
| Production | 42 | 5480 e | 21250 | 82105 | 78355 | 78505 | 78264 | 18.1 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 42 | 5480 e | 21250 | 82105 | 78355 | 78505 | 78264 | 18.1 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | 42 | 5480 e | 21199 | 80239 | 76489 | 76663 | .. | 17.9 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | 51 | 1866 | 1866 | 1842 | .. | - |
| <i>Industry</i> | - | - | - | 828 | 828 | 828 | .. | - |
| <i>Transport</i> | - | - | 1 | 1 | 1 | 1 | .. | - |
| <i>Other</i> | - | - | 50 | 1037 | 1037 | 1013 | .. | - |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics (continued)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|-----------------------------------|------|------|------|------|------|------|-------|---|
| Biogasoline (kt) | | | | | | | | |
| Production | - | - | 84 | 1 | 10 | 18 | 20 | - |
| Net imports ¹ | - | - | 59 | 11 | 20 | 20 | 19 | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | 143 | 12 | 30 | 38 | 39 | - |
| Statistical differences | - | - | -1 | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | 142 | 12 | 30 | 38 | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | 142 | 12 | 30 | 38 | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Biodiesel (kt) | | | | | | | | |
| Production | - | - | 799 | 580 | 577 | 576 | 426 | - |
| Net imports ¹ | - | - | 698 | 597 | 702 | 572 | 701 | - |
| Stock changes | - | - | -28 | 20 | 15 | -3 | 40 | - |
| Gross consumption | - | - | 1469 | 1197 | 1294 | 1145 | 1167 | - |
| Statistical differences | - | - | -1 | - | 1 | -1 | .. | - |
| Transformation processes | - | - | - | 3 | 3 | 3 | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | 1468 | 1194 | 1292 | 1141 | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | 1468 | 1194 | 1292 | 1141 | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Other liquid biofuels (kt) | | | | | | | | |
| Production | - | - | 75 | 115 | 187 | 546 | 513 | - |
| Net imports ¹ | - | - | 578 | 847 | 886 | 486 | 456 | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | 653 | 962 | 1073 | 1032 | 969 | - |
| Statistical differences | - | - | - | 1 | - | - | .. | - |
| Transformation processes | - | - | 653 | 963 | 1073 | 1032 | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Figure 1. Contribution of renewables in 1990

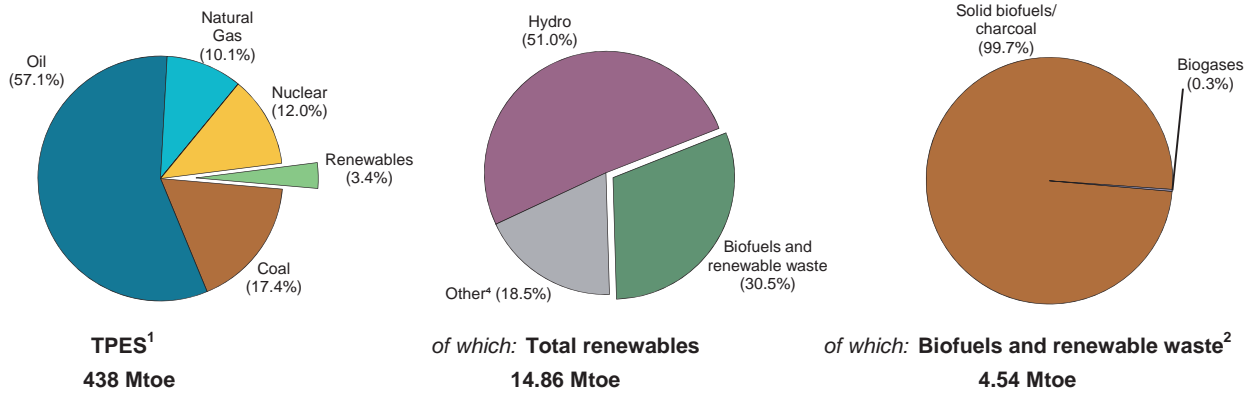


Figure 2. Contribution of renewables in 2017 provisional

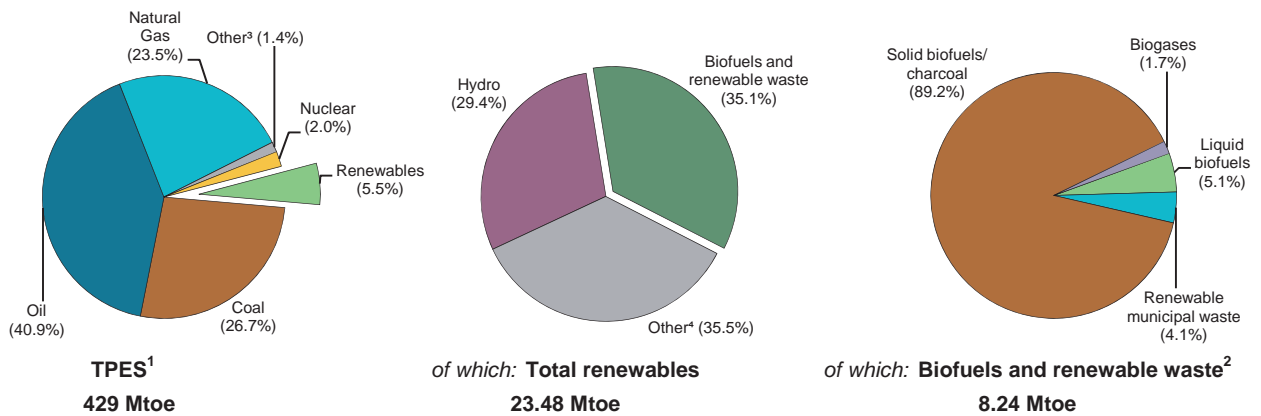
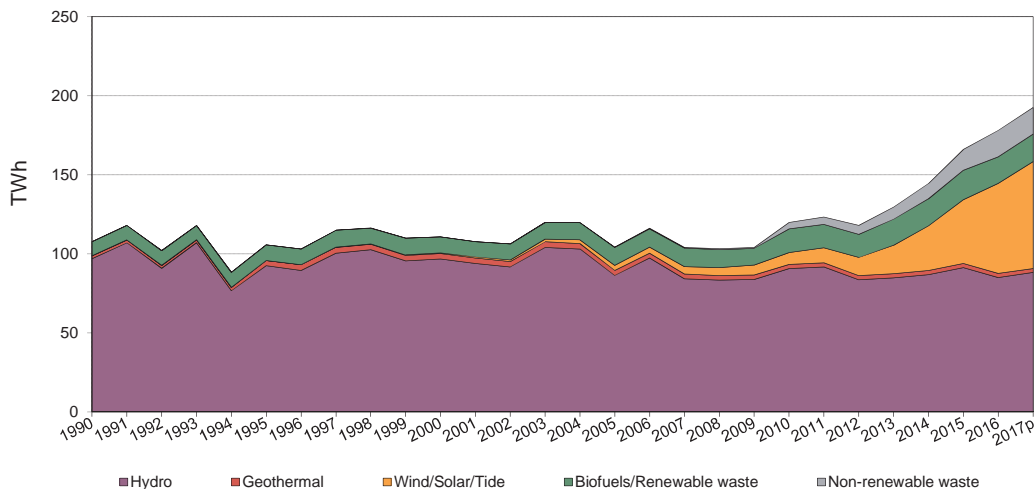


Figure 3. Electricity production by renewables and waste energy source



1. Total primary energy supply includes electricity trade.
 2. Biofuels and renewable waste include solid biofuels, liquid biofuels, biogases, and renewable municipal waste.
 3. Includes non-renewable municipal waste, industrial waste, peat, shale oil, electricity trade, and other sources of primary energy. (In the case of negative values, the net exports of electricity are greater than the other products in this category).
 4. Includes geothermal, solar, wind and tide.

Note: Totals may not sum due to rounding.
Source: IEA/OECD World Energy Balances.

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Table 1. Energy supply, GDP and population

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|---|---------|---------|---------|---------|---------|---------|---------|--|
| TPES (Mtoe) | 438.22 | 517.53 | 499.06 | 437.68 | 430.53 | 425.61 | 429.12 | -1.1 |
| of which: Renewables (Mtoe) ¹ | 14.86 | 15.89 | 18.38 | 19.99 | 21.82 | 22.28 | 23.48 | 2.3 |
| Renewables/TPES(%) | 3.4 | 3.1 | 3.7 | 4.6 | 5.1 | 5.2 | 5.5 | 3.5 |
| GDP (billion 2010 US dollars) | 4703.61 | 5348.94 | 5700.10 | 5916.32 | 5996.41 | 6052.67 | 6156.33 | 0.8 |
| TPES/GDP ² | 0.09 | 0.10 | 0.09 | 0.07 | 0.07 | 0.07 | 0.07 | -1.9 |
| TPES/GDP (year 2010 = 100) | 106 | 111 | 100 | 84 | 82 | 80 | 80 | -1.9 |
| Population (millions) | 123.61 | 126.83 | 128.04 | 127.26 | 127.11 | 126.96 | 126.73 | -0.0 |
| TPES/population (toe per capita) | 3.55 | 4.08 | 3.90 | 3.44 | 3.39 | 3.35 | 3.39 | -1.1 |
| Electricity generation (TWh) ³ | 860.6 | 1057.9 | 1120.6 | 1049.2 | 1042.8 | 1051.8 | 1077.2 | 0.1 |
| of which: Renewables (TWh) ^{1,3} | 98.80 | 98.35 | 108.88 | 131.40 | 148.73 | 155.16 | 167.70 | 3.2 |
| Renew./Total Elec.(%) ^{1,4} | 11.5 | 9.3 | 9.7 | 12.5 | 14.3 | 14.8 | 15.6 | 3.1 |
| Road energy consumption (Mtoe) | 60.0 | 75.7 | 67.8 | 64.0 | 63.7 | 63.3 | .. | .. |
| of which: Liquid biofuels (Mtoe) | - | - | 0.20 | 0.28 | 0.34 | 0.39 | .. | .. |
| Liq. biofuels/road tr.(%) ⁵ | - | - | 0.3 | 0.4 | 0.5 | 0.6 | - | - |

1. Renewables do not include industrial waste, non-renewable municipal waste and pumped storage production.

2. In units of toe per thousand 2010 US dollars.

3. Electricity generation = gross production - amount of electricity produced in pumped storage plants.

4. Electricity share generated from renewables over the total electricity production.

5. Energy from liquid biofuels consumed in road transport over the total energy consumed in road transport.

Source: IEA/OECD *World Energy Balances* and OECD *Main Economic Indicators*.

Table 2. Net generating capacity of renewable and waste sources (MWe)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | Average annual percent change 00-16 |
|---|--------------|--------------|--------------|--------------|--------------|--------------|--|
| Total capacity | 38101 | 48463 | 57017 | 78884 | 90442 | 98863 | 4.6 |
| Hydro | 37830 | 46324 | 47736 | 49597 | 50034 | 50117 | 0.5 |
| Hydro <1MW | - | - | - | - | - | - | - |
| Hydro 1-10MW | 1378 | 1472 | 4369 | 4194 | 4248 | 596 | -5.5 |
| Hydro 10+MW | 19447 | 20547 | 17993 | 18054 | 18237 | 21972 | 0.4 |
| Mixed plants | - | - | 5625 | 5625 | 5625 | 5625 | - |
| Pure pumped storage | 17005 | 24305 | 19749 | 21724 | 21924 | 21924 | -0.6 |
| Geothermal | 270 | 533 | 537 | 508 | 516 | 526 | -0.1 |
| Solar photovoltaic | 1 e | 330 e | 3618 e | 23339 e | 34150 e | 42040 e | 35.4 |
| Solar thermal | - | - | - | - | - | - | - |
| Tide, wave, ocean | - | - | - | - | - | - | - |
| Wind | - | 84 | 2294 | 2753 | 2808 | 3246 | 25.7 |
| Industrial waste | - | .. | 26 | 26 | 26 | 26 e | - |
| Municipal waste | - | 1192 | 1700 | 1907 | 1907 | 1907 | 3.0 |
| Solid biofuels | - | - | 1100 | 739 | 978 | 978 e | - |
| Biogases | - | - | 6 | 15 | 23 | 23 e | - |
| Liquid biofuels | - | - | - | - | - | - | - |
| Solar collectors surface (1000 m ²) | - | - | 6319 e | 6578 e | 6578 e | 6578 e | - |
| Cap. of solar collectors (MW _{th}) ¹ | - | - | 4423 e | 4605 e | 4605 e | 4605 e | - |

1. Converted at 0.7 kW_{th}/m² of solar collector area, as estimated by the IEA Solar Heating & Cooling Programme.

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Table 3. Capacity factors (%)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 |
|--|--------------|--------------|--------------|--------------|--------------|--------------|
| Total plants¹ | 32.28 | 26.10 | 24.00 | 20.91 | 20.95 | 20.56 |
| Hydro | 29.28 | 23.86 | 21.69 | 20.01 | 20.82 | 19.38 |
| <i>of which: <1MW</i> | - | - | - | - | - | - |
| <i>of which: 1-10MW</i> | 58.71 | 58.08 | 43.13 | 45.42 | 44.26 | 62.70 |
| <i>of which: 10+MW</i> | 47.55 | 42.77 | 42.69 | 42.27 | 44.22 | 39.29 |
| <i>of which: pure pumped storage²</i> | 6.00 | 5.80 | x | x | x | x |
| Geothermal | 73.61 | 71.70 | 56.26 | 58.88 | 57.41 | 54.45 |
| Solar photovoltaic | x | 12.34 e | 11.18 e | 11.23 e | 11.63 e | 13.84 e |
| Solar thermal | - | - | - | - | - | - |
| Tide, wave and ocean | - | - | - | - | - | - |
| Wind | - | 14.63 | 19.71 | 21.63 | 22.69 | 20.93 |
| Industrial waste | - | x | x | x | x | x |
| Municipal waste | - | - | 37.77 e | 37.06 e | 37.39 e | 21.89 e |
| Solid biofuels | - | - | x | x | x | x |
| Biogases | - | - | 20.93 | 12.94 | 7.44 | 85.86 e |
| Biodiesels | - | - | - | - | - | - |
| Other liquid biofuels | - | - | - | - | - | - |

1. The capacity factor is defined as: the annual gross electricity generation divided by the reported net capacity times 365 (days/year) times 24 (hours/day).

2. In case a country has at least one mixed hydro plants, it is impossible to calculate capacity factor thus it is shown as 'not applicable'.

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Table 4. Gross electricity production from renewable and waste sources (GWh)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|--------------------------------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---|
| Total electricity¹ | 107744 | 110796 | 119881 | 144469 | 165988 | 178060 | 192575 | 3.3 |
| Hydro | 97033 | 96817 | 90682 | 86942 | 91270 | 85083 | 88311 | -0.5 |
| <i>of which: pumped storage</i> | <i>8940</i> | <i>12349</i> | <i>6881</i> | <i>3410</i> | <i>4152</i> | <i>6181</i> | <i>7980</i> | <i>-2.5</i> |
| Geothermal | 1741 | 3348 | 2647 | 2620 | 2595 | 2509 | 2451 | -1.8 |
| Solar photovoltaic | 67 | 357 | 3543 | 22952 | 34802 | 50952 | 61261 | 35.3 |
| Solar thermal | - | - | - | - | - | - | - | - |
| Tide, wave, ocean | - | - | - | - | - | - | - | - |
| Wind | - | 108 | 3962 | 5217 | 5581 | 5951 | 6320 | 27.0 |
| Industrial waste | - | 94 | 1304 | 6563 | 9987 | 14890 | 15204 | 34.9 |
| Municipal waste renew. | - | - | 2812 | 3096 | 3123 | 1828 | 1693 | - |
| Municipal waste non-renew. | - | - | 2812 | 3096 | 3123 | 1828 | 1693 | - |
| Solid biofuels | 8903 | 10072 | 12108 | 13966 | 15492 | 14846 | 15467 | 2.6 |
| Biogases | - | - | 11 | 17 | 15 | 173 | 175 | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| of which: | | | | | | | | |
| Electricity only plants | 107744 | 110796 | 119881 | 144469 | 165988 | 178060 | .. | - |
| Hydro | 97033 | 96817 | 90682 | 86942 | 91270 | 85083 | .. | - |
| <i>of which: pumped storage</i> | <i>8940</i> | <i>12349</i> | <i>6881</i> | <i>3410</i> | <i>4152</i> | <i>6181</i> | <i>..</i> | <i>-</i> |
| Geothermal | 1741 | 3348 | 2647 | 2620 | 2595 | 2509 | .. | - |
| Solar photovoltaic | 67 | 357 | 3543 | 22952 | 34802 | 50952 | .. | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Tide, wave, ocean | - | - | - | - | - | - | - | - |
| Wind | - | 108 | 3962 | 5217 | 5581 | 5951 | .. | - |
| Industrial waste | - | 94 | 1304 | 6563 | 9987 | 14890 | .. | - |
| Municipal waste renew. | - | - | 2812 | 3096 | 3123 | 1828 | .. | - |
| Municipal waste non-renew. | - | - | 2812 | 3096 | 3123 | 1828 | .. | - |
| Solid biofuels | 8903 | 10072 | 12108 | 13966 | 15492 | 14846 | .. | - |
| Biogases | - | - | 11 | 17 | 15 | 173 | .. | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| CHP plants | - | - | - | - | - | - | - | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | - | - | - | - | - |
| Solid biofuels | - | - | - | - | - | - | - | - |
| Biogases | - | - | - | - | - | - | - | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |

1. **Total electricity** includes the electricity produced from industrial waste, non-renewable municipal waste and pumped storage. Electricity from renewable sources does *not* include the electricity produced from industrial waste, non-renewable municipal waste and pumped storage production.

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Table 5A. Heat production¹ from renewable and waste sources in the transformation sector (TJ)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|----------------------------|-----------|------------|-----------|------|------|------|-------|-------------------------------------|
| Total heat | 52 | 135 | 22 | - | - | - | - | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | 52 | 135 | 22 | - | - | - | - | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | - | - | - | - | - |
| Solid biofuels | - | - | - | - | - | - | - | - |
| Biogases | - | - | - | - | - | - | - | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| <i>of which:</i> | | | | | | | | |
| CHP plants | - | - | - | - | - | - | - | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | - | - | - | - | - |
| Solid biofuels | - | - | - | - | - | - | - | - |
| Biogases | - | - | - | - | - | - | - | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| Heat only plants | 52 | 135 | 22 | - | - | - | - | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | 52 | 135 | 22 | - | - | - | - | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | - | - | - | - | - |
| Solid biofuels | - | - | - | - | - | - | - | - |
| Biogases | - | - | - | - | - | - | - | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |

1. Waste heat and heat production from heat pumps are not included and are reported separately in Table 5B.

Table 5B. Heat production from heat pumps and waste heat (TJ)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|----------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------------------------------|
| Total heat | 1474 | 6753 | 6453 | 5252 | 5003 | 5014 | 5014 | -1.7 |
| Heat pumps ¹ | - | - | - | - | - | - | - | - |
| (-) Input to heat pumps | - | - | - | - | - | - | - | - |
| Other sources ² | 1474 | 6753 | 6453 | 5252 | 5003 | 5014 | 5014 | -1.7 |

1. Installations producing heat for own use are not included.

2. Refers to production from hydrogen, purchased steam from industry, and waste heat.

Source: IEA/OECD *Electricity Statistics*.

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Table 6. Renewable and waste balance for 2016

| thousand tonnes of oil equivalent | Hydro ¹ | Wind | Tide wave ocean | Solar PV | Geo-thermal | Solar thermal | Industrial waste | Mun. waste renew. |
|------------------------------------|--------------------|-------------|-----------------|--------------|-------------|---------------|------------------|-------------------|
| Production | 6784 | 512 | - | 4381 | 2337 | 248 | 5438 | 365 e |
| Imports | - | - | - | - | - | - | - | - |
| Exports | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| TPES | 6784 | 512 | - | 4381 | 2337 | 248 | 5438 | 365 |
| Statistical differences | - | - | - | - | - | - | -72 | - |
| Main activity electricity plants | -6503 | -115 | - | -561 | -2070 | - | -2656 | - |
| Autoproducer electricity plants | -281 | -397 | - | -3820 | -87 | - | -446 | -365 e |
| Main activity CHP plants | - | - | - | - | - | - | - | - |
| Autoproducer CHP plants | - | - | - | - | - | - | - | - |
| Main heat plants | - | - | - | - | - | - | - | - |
| Autoproducer heat plants | - | - | - | - | - | - | - | - |
| Charcoal production plants | - | - | - | - | - | - | - | - |
| Other transformation | - | - | - | - | - | - | -116 | - |
| Energy Industry own use | - | - | - | - | - | - | - | - |
| Losses | - | - | - | - | - | - | - | - |
| TFC | - | - | - | - | 180 | 248 | 2148 | - |
| Industry | - | - | - | - | - | - | 1001 | - |
| Iron and steel | - | - | - | - | - | - | 34 | - |
| Chemical and petrochemical | - | - | - | - | - | - | 126 | - |
| Non-ferrous metals | - | - | - | - | - | - | 34 | - |
| Non-metallc minerals | - | - | - | - | - | - | 508 | - |
| Transport equipment | - | - | - | - | - | - | - | - |
| Machinery | - | - | - | - | - | - | - | - |
| Mining and quarrying | - | - | - | - | - | - | - | - |
| Food and tobacco | - | - | - | - | - | - | - | - |
| Paper, pulp and print | - | - | - | - | - | - | 300 | - |
| Wood and wood products | - | - | - | - | - | - | - | - |
| Construction | - | - | - | - | - | - | - | - |
| Textile and leather | - | - | - | - | - | - | - | - |
| Non-specified | - | - | - | - | - | - | - | - |
| Transport | - | - | - | - | - | - | - | - |
| Road | - | - | - | - | - | - | - | - |
| Other | - | - | - | - | - | - | - | - |
| Other | - | - | - | - | 180 | 248 | 1147 | - |
| Residential | - | - | - | - | - | 228 | - | - |
| Commercial and public services | - | - | - | - | 103 | 20 | 306 | - |
| Agriculture/forestry | - | - | - | - | 77 | - | - | - |
| Fishing | - | - | - | - | - | - | - | - |
| Non-specified | - | - | - | - | - | - | 841 | - |
| Electricity generated - GWh | 78902 | 5951 | - | 50952 | 2509 | - | 14890 | 1828 e |
| Electricity plants | 78902 | 5951 | - | 50952 | 2509 | - | 14890 | 1828 e |
| CHP plants | - | - | - | - | - | - | - | - |
| Heat generated - TJ | - | - | - | - | - | - | - | - |
| CHP plants | - | - | - | - | - | - | - | - |
| Heat plants | - | - | - | - | - | - | - | - |

1. Hydro does not include pumped hydro.

Source: IEA/OECD World Energy Balances.

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Table 6. Renewable and waste balance for 2016 (continued)

| Mun. waste non-ren. | Wood/wood waste | Charcoal | Bio-gases | Bio-gasoline | Bio-diesel | Other liquid biofuels | Total renew. & waste sources ² | Share in total energy sources ³ |
|---------------------|-----------------|----------|------------|--------------|------------|-----------------------|---|--|
| 365 e | 6576 | - | 137 | 1 | 11 | - | 27155 | 76.7% |
| - | 549 | - | - | 374 | 1 | - | 924 | 0.2% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| 365 | 7126 | - | 137 | 376 | 12 | - | 28081 | 6.6% |
| - | 247 | - | - | - | - | - | 175 | x |
| - | -1078 | - | -15 | - | - | - | -12998 | x |
| -365 e | -2544 | - | -23 | - | - | - | -8328 | x |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | -21 e | 8 | - | - | - | - | -13 | x |
| - | -3 | - | -3 | - | - | - | -122 | x |
| - | - | - | -97 | - | - | - | -97 | x |
| - | - | - | - | - | - | - | - | - |
| - | 3727 | 8 | - | 376 | 12 | - | 6699 | 2.3% |
| - | 2943 | - | - | - | - | - | 3944 | 4.8% |
| - | - | - | - | - | - | - | 34 | 0.2% |
| - | - | - | - | - | - | - | 126 | 0.7% |
| - | - | - | - | - | - | - | 34 | 1.6% |
| - | 137 | - | - | - | - | - | 645 | 7.7% |
| - | - | - | - | - | - | - | - | - |
| - | 5 | - | - | - | - | - | 5 | 0.1% |
| - | - | - | - | - | - | - | - | - |
| - | 79 | - | - | - | - | - | 79 | 1.4% |
| - | 2495 | - | - | - | - | - | 2795 | 33.0% |
| - | 227 | - | - | - | - | - | 227 | 29.6% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | 376 | 12 | - | 388 | 0.5% |
| - | - | - | - | 376 | 12 | - | 388 | 0.6% |
| - | - | - | - | - | - | - | - | - |
| - | 784 | 8 | - | - | - | - | 2367 | 2.3% |
| - | - | 8 | - | - | - | - | 236 | 0.5% |
| - | 567 | - | - | - | - | - | 996 | 1.9% |
| - | - | - | - | - | - | - | 77 | 2.3% |
| - | - | - | - | - | - | - | - | - |
| - | 217 | - | - | - | - | - | 1058 | 100.0% |
| 1828 e | 14846 | - | 173 | - | - | - | 171879 | 16.3% |
| 1828 e | 14846 | - | 173 | - | - | - | 171879 | 16.3% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |

2. Total includes non-renewable waste.

3. Share of renewables on TFC excludes electricity and heat generated from renewable sources.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|--|-------|--------|---------|---------|---------|---------|--------|---|
| Geothermal (TJ) | | | | | | | | |
| Production | 65986 | 129777 | 102688 | 101567 | 100571 | 97850 | 95481 | -1.7 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 65986 | 129777 | 102688 | 101567 | 100571 | 97850 | 95481 | -1.7 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | 62679 | 120526 | 95279 | 94325 | 93413 | 90315 | .. | -1.8 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 3307 | 9251 | 7409 | 7242 | 7158 | 7535 | .. | -1.3 |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 3307 | 9251 | 7409 | 7242 | 7158 | 7535 | .. | -1.3 |
| Solar thermal (TJ) | | | | | | | | |
| Production | 48893 | 33823 | 17175 | 12158 | 11175 | 10387 | 10387 | -7.1 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 48893 | 33823 | 17175 | 12158 | 11175 | 10387 | 10387 | -7.1 |
| Statistical differences | - | - | -1 | 1 | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 48893 | 33823 | 17174 | 12159 | 11175 | 10387 | .. | -7.1 |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 48893 | 33823 | 17174 | 12159 | 11175 | 10387 | .. | -7.1 |
| Industrial waste (TJ) | | | | | | | | |
| Production | 1099 | 8817 | 72327 | 144928 | 174434 | 227671 | 229932 | 22.5 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 1099 | 8817 | 72327 | 144928 | 174434 | 227671 | 229932 | 22.5 |
| Statistical differences | 7 | 9 | -690 | -149 | 149 | -3007 | .. | - |
| Transformation processes | 80 | 1018 | 11098 | 59193 | 87064 | 134712 | .. | 35.7 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 1026 | 7808 | 60539 | 85586 | 87519 | 89952 | .. | 16.5 |
| <i>Industry</i> | - | 6371 | 14066 | 36875 | 39323 | 41927 | .. | 12.5 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 1026 | 1437 | 46473 | 48711 | 48196 | 48025 | .. | 24.5 |
| Municipal waste - renewables (TJ) | | | | | | | | |
| Production | - | - | 24025 e | 26018 e | 26034 e | 15292 e | 14005 | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | 24025 e | 26018 e | 26034 e | 15292 e | 14005 | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | 24025 e | 26018 e | 26034 e | 15292 e | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics (continued)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|--|--------|--------|---------|---------|---------|---------|--------|---|
| Municipal waste - non-renewables (TJ) | | | | | | | | |
| Production | - | - | 24025 e | 26018 e | 26034 e | 15292 e | 14005 | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | 24025 e | 26018 e | 26034 e | 15292 e | 14005 | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | 24025 e | 26018 e | 26034 e | 15292 e | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Solid Biofuel excluding charcoal (TJ) | | | | | | | | |
| Production | 188589 | 191416 | 282033 | 271226 | 285586 | 275338 | 277509 | 2.3 |
| Net imports ¹ | 1021 | 4508 | 6399 | 11805 | 16681 | 23003 | 29903 | 10.7 |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 189610 | 195924 | 288432 | 283031 | 302267 | 298341 | 307412 | 2.7 |
| Statistical differences | 5951 | 4203 | 1208 | 9911 | 9561 | 10335 | .. | - |
| Transformation processes | 86485 | 93031 | 122696 | 142232 | 156885 | 152631 | .. | 3.1 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 109076 | 107096 | 166944 | 150710 | 154943 | 156045 | .. | 2.4 |
| <i>Industry</i> | 103840 | 103385 | 132376 | 123287 | 124323 | 123219 | .. | 1.1 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 5236 | 3711 | 34568 | 27423 | 30620 | 32826 | .. | 14.6 |
| Charcoal (kt) | | | | | | | | |
| Production | 35 | 25 | 14 | 12 | 12 | 12 | 12 | -4.5 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 35 | 25 | 14 | 12 | 12 | 12 | 12 | -4.5 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 35 | 25 | 14 | 12 | 12 | 12 | .. | -4.5 |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 35 | 25 | 14 | 12 | 12 | 12 | .. | -4.5 |
| Biogases (TJ) | | | | | | | | |
| Production | 490 | 28 | 100 | 264 | 242 | 5756 | 5756 | 39.5 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 490 | 28 | 100 | 264 | 242 | 5756 | 5756 | 39.5 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | 490 | 28 | 100 | 264 | 242 | 1701 | .. | 29.3 |
| Energy industry own use | - | - | - | - | - | 4055 | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics (continued)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|-----------------------------------|------|------|------|------|------|------|-------|---|
| Biogasoline (kt) | | | | | | | | |
| Production | - | - | 18 | 14 | 2 | 2 | - | - |
| Net imports ¹ | - | - | 282 | 403 | 515 | 585 | 638 | - |
| Stock changes | - | - | 1 | - | - | - | - | - |
| Gross consumption | - | - | 301 | 417 | 517 | 587 | 638 | - |
| Statistical differences | - | - | -1 | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | 300 | 417 | 517 | 587 | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | 300 | 417 | 517 | 587 | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Biodiesel (kt) | | | | | | | | |
| Production | - | - | 8 | 13 | 13 | 13 | 13 | - |
| Net imports ¹ | - | - | - | 1 | 1 | 1 | 1 | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | 8 | 14 | 14 | 14 | 14 | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | 8 | 14 | 14 | 14 | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | 8 | 14 | 14 | 14 | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Other liquid biofuels (kt) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Figure 1. Contribution of renewables in 1990

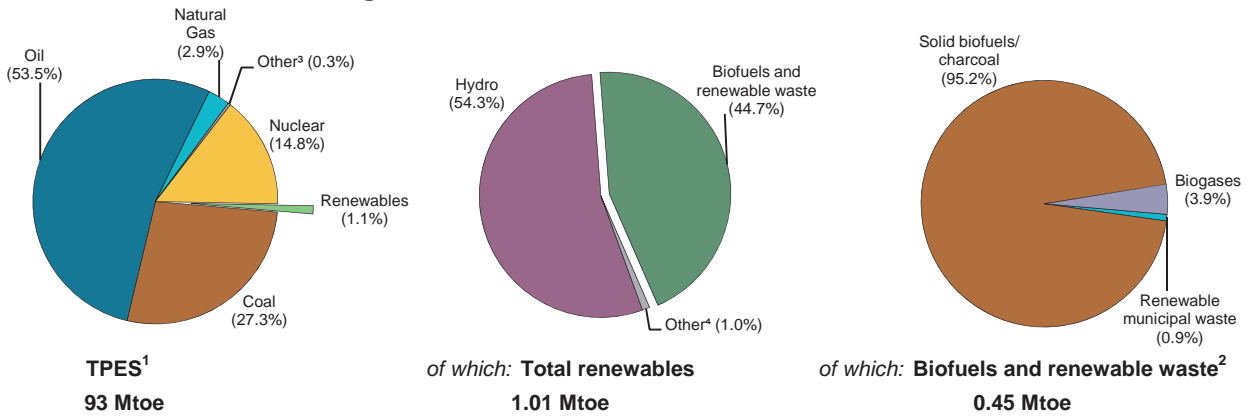


Figure 2. Contribution of renewables in 2017 provisional

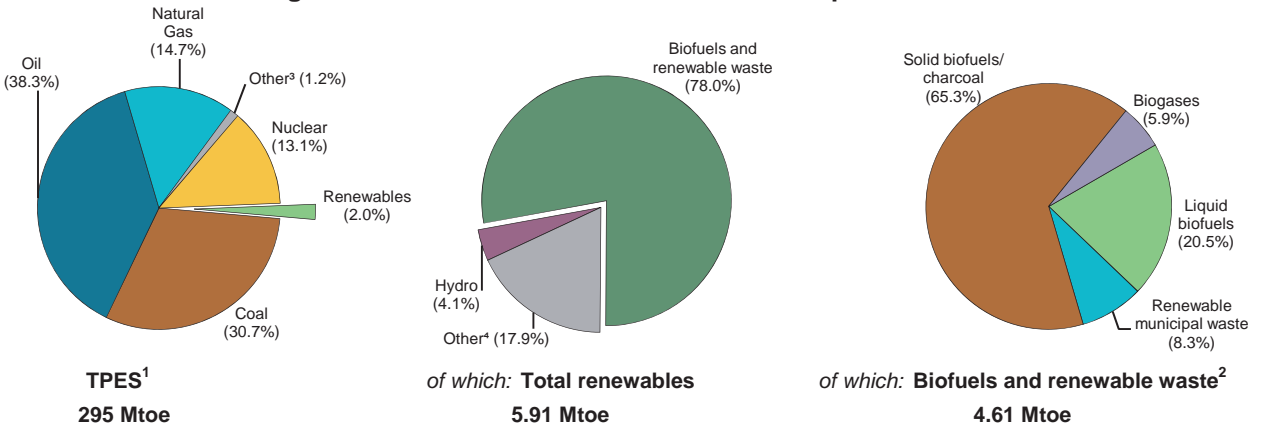
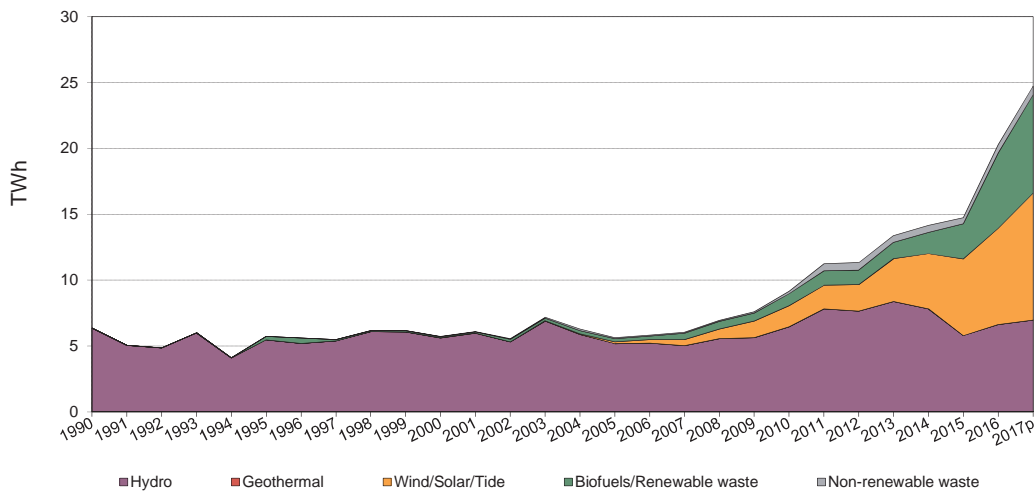


Figure 3. Electricity production by renewables and waste energy source



1. Total primary energy supply includes electricity trade.
2. Biofuels and renewable waste include solid biofuels, liquid biofuels, biogases, and renewable municipal waste.
3. Includes non-renewable municipal waste, industrial waste, peat, shale oil, electricity trade, and other sources of primary energy. (In the case of negative values, the net exports of electricity are greater than the other products in this category).
4. Includes geothermal, solar, wind and tide.

Note: Totals may not sum due to rounding.
Source: IEA/OECD World Energy Balances.

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Table 1. Energy supply, GDP and population

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|---|--------|--------|---------|---------|---------|---------|---------|--|
| TPES (Mtoe) | 92.91 | 188.16 | 250.03 | 268.43 | 272.68 | 282.41 | 294.79 | 2.7 |
| of which: Renewables (Mtoe) ¹ | 1.01 | 0.76 | 1.81 | 3.93 | 4.02 | 4.30 | 5.91 | 12.8 |
| Renewables/TPES(%) | 1.1 | 0.4 | 0.7 | 1.5 | 1.5 | 1.5 | 2.0 | 9.9 |
| GDP (billion 2010 US dollars) | 362.89 | 710.04 | 1094.50 | 1234.34 | 1268.78 | 1305.95 | 1345.95 | 3.8 |
| TPES/GDP ² | 0.26 | 0.26 | 0.23 | 0.22 | 0.21 | 0.22 | 0.22 | -1.1 |
| TPES/GDP (year 2010 = 100) | 112 | 116 | 100 | 95 | 94 | 95 | 96 | -1.1 |
| Population (millions) | 42.87 | 47.01 | 49.55 | 50.75 | 51.02 | 51.25 | 51.45 | 0.5 |
| TPES/population (toe per capita) | 2.17 | 4.00 | 5.05 | 5.29 | 5.35 | 5.51 | 5.73 | 2.1 |
| Electricity generation (TWh) ³ | 105.4 | 288.5 | 496.7 | 545.9 | 549.0 | 558.8 | 561.3 | 4.0 |
| of which: Renewables (TWh) ^{1,3} | 6.36 | 4.11 | 6.19 | 8.55 | 10.64 | 15.88 | 19.89 | 9.7 |
| Renew./Total Elec.(%) ^{1,4} | 6.0 | 1.4 | 1.2 | 1.6 | 1.9 | 2.8 | 3.5 | 5.5 |
| Road energy consumption (Mtoe) | 10.6 | 22.2 | 28.5 | 30.4 | 32.1 | 32.9 | .. | .. |
| of which: Liquid biofuels (Mtoe) | - | - | 0.33 | 0.37 | 0.42 | 0.50 | .. | .. |
| Liq. biofuels/road tr.(%) ⁵ | - | - | 1.2 | 1.2 | 1.3 | 1.5 | - | - |

1. Renewables do not include industrial waste, non-renewable municipal waste and pumped storage production.

2. In units of toe per thousand 2010 US dollars.

3. Electricity generation = gross production - amount of electricity produced in pumped storage plants.

4. Electricity share generated from renewables over the total electricity production.

5. Energy from liquid biofuels consumed in road transport over the total energy consumed in road transport.

Source: IEA/OECD *World Energy Balances* and OECD *Main Economic Indicators*.

Table 2. Net generating capacity of renewable and waste sources (MWe)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | Average annual percent change 00-16 |
|---|-------------|---------------|-------------|--------------|--------------|--------------|--|
| Total capacity | 2341 | 3219 e | 6759 | 10539 | 12113 | 13625 | 9.4 |
| Hydro | 2340 | 3149 | 5525 | 6467 | 6471 | 6485 | 4.6 |
| Hydro <1MW | - | 4 | 19 | 14 | 11 | 29 | 13.2 |
| Hydro 1-10MW | - | 38 | 82 | 92 | 96 | 147 | 8.8 |
| Hydro 10+MW | - | 1507 | 1524 | 1661 | 1664 | 1609 | 0.4 |
| Mixed plants | - | - | - | - | - | - | - |
| Pure pumped storage | 1000 | 1600 | 3900 | 4700 | 4700 | 4700 | 7.0 |
| Geothermal | - | - | - | - | - | - | - |
| Solar photovoltaic | 1 | 4 | 650 | 2481 | 3613 | 4502 | 55.1 |
| Solar thermal | - | - | - | - | - | - | - |
| Tide, wave, ocean | - | - | 1 | 255 | 255 | 255 | - |
| Wind | - | 7 | 382 | 612 | 847 | 1067 | 36.9 |
| Industrial waste | - | - | 21 | 74 | 104 | 173 | - |
| Municipal waste | - | 11 e | 39 | 99 | 189 | 153 | 17.9 |
| Solid biofuels | - | 48 e | 46 | 74 | 160 | 501 | 15.8 |
| Biogases | - | - | 95 | 121 | 113 | 129 | - |
| Liquid biofuels | - | - | - | 356 | 361 | 360 | - |
| Solar collectors surface (1000 m ²) | - | 1257 e | 1381 | 1580 | 1609 | 1638 | 1.7 |
| Cap. of solar collectors (MW _{th}) ¹ | - | 880 e | 967 | 1106 | 1126 | 1147 | 1.7 |

1. Converted at 0.7 kW_{th}/m² of solar collector area, as estimated by the IEA Solar Heating & Cooling Programme.

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Table 3. Capacity factors (%)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 |
|--|--------------|----------------|--------------|--------------|--------------|--------------|
| Total plants¹ | 31.02 | 20.30 e | 15.48 | 15.35 | 13.91 | 17.01 |
| Hydro | 31.03 | 20.34 | 13.37 | 13.80 | 10.22 | 11.68 |
| <i>of which: <1MW</i> | - | 48.52 | 45.14 | 42.59 | 55.72 | 32.55 |
| <i>of which: 1-10MW</i> | - | 25.23 | 37.73 | 53.75 | 47.28 | 39.27 |
| <i>of which: 10+MW</i> | - | 29.61 | 24.99 | 15.57 | 11.62 | 16.02 |
| <i>of which: pure pumped storage²</i> | 19.15 | 11.42 | 8.17 | 12.31 | 8.87 | 9.20 |
| Geothermal | - | - | - | - | - | - |
| Solar photovoltaic | 10.59 | 15.08 | 13.57 | 11.76 | 12.56 | 12.99 |
| Solar thermal | - | - | - | - | - | - |
| Tide, wave and ocean | - | - | - | 22.03 | 22.22 | 22.18 |
| Wind | - | 27.21 | 24.41 | 21.37 | 18.09 | 18.01 |
| Industrial waste | - | - | 56.73 | 51.68 | 18.87 | 23.79 |
| Municipal waste | - | 37.64 e | 60.86 | 41.69 | 29.69 | 34.26 |
| Solid biofuels | - | 10.94 e | 65.12 | 41.06 | 47.56 | 83.70 |
| Biogases | - | - | 63.85 | 62.15 | 59.43 | 45.94 |
| Biodiesels | - | - | - | - | - | - |
| Other liquid biofuels | - | - | - | 17.21 | 39.00 | 43.06 |

1. The capacity factor is defined as: the annual gross electricity generation divided by the reported net capacity times 365 (days/year) times 24 (hours/day).

2. In case a country has at least one mixed hydro plants, it is impossible to calculate capacity factor thus it is shown as 'not applicable'.

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Table 4. Gross electricity production from renewable and waste sources (GWh)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|--------------------------------------|-------------|-------------|-------------|--------------|--------------|--------------|--------------|---|
| Total electricity¹ | 6362 | 5725 | 9168 | 14173 | 14759 | 20306 | 24721 | 9.0 |
| Hydro | 6361 | 5610 | 6472 | 7820 | 5796 | 6634 | 6980 | 1.3 |
| <i>of which: pumped storage</i> | <i>1677</i> | <i>1600</i> | <i>2790</i> | <i>5068</i> | <i>3650</i> | <i>3787</i> | <i>4186</i> | <i>5.8</i> |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar photovoltaic | 1 | 5 | 772 | 2557 | 3975 | 5123 | 6975 | 53.1 |
| Solar thermal | - | - | - | - | - | - | - | - |
| Tide, wave, ocean | - | - | - | 492 | 496 | 496 | 489 | - |
| Wind | - | 17 | 817 | 1146 | 1342 | 1683 | 2160 | 33.0 |
| Industrial waste | - | - | 104 | 335 | 172 | 360 | 367 | - |
| Municipal waste renew. | - | 22 | 121 | 144 | 196 | 184 | 188 | 13.5 |
| Municipal waste non-renew. | - | 14 | 88 | 217 | 295 | 276 | 282 | 19.3 |
| Solid biofuels | - | 46 | 262 | 266 | 666 | 3673 | 5981 | 33.2 |
| Biogases | - | 11 | 532 | 659 | 588 | 519 | 845 | 29.1 |
| Liquid biofuels | - | - | - | 537 | 1233 | 1358 | 454 | - |
| of which: | | | | | | | | |
| Electricity only plants | 6362 | 5689 | 8837 | 13603 | 14326 | 19740 | .. | - |
| Hydro | 6361 | 5610 | 6472 | 7820 | 5796 | 6634 | .. | - |
| <i>of which: pumped storage</i> | <i>1677</i> | <i>1600</i> | <i>2790</i> | <i>5068</i> | <i>3650</i> | <i>3787</i> | .. | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar photovoltaic | 1 | 5 | 772 | 2557 | 3975 | 5123 | .. | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Tide, wave, ocean | - | - | - | 492 | 496 | 496 | .. | - |
| Wind | - | 17 | 817 | 1146 | 1342 | 1683 | .. | - |
| Industrial waste | - | - | 103 | 227 | 114 | 147 | .. | - |
| Municipal waste renew. | - | - | 1 | 50 | 133 | 131 | .. | - |
| Municipal waste non-renew. | - | - | 1 | 76 | 200 | 197 | .. | - |
| Solid biofuels | - | 46 | 241 | 158 | 553 | 3516 | .. | - |
| Biogases | - | 11 | 430 | 540 | 484 | 455 | .. | - |
| Liquid biofuels | - | - | - | 537 | 1233 | 1358 | .. | - |
| CHP plants | - | 36 | 331 | 570 | 433 | 566 | .. | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | 1 | 108 | 58 | 213 | .. | - |
| Municipal waste renew. | - | 22 | 120 | 94 | 63 | 53 | .. | - |
| Municipal waste non-renew. | - | 14 | 87 | 141 | 95 | 79 | .. | - |
| Solid biofuels | - | - | 21 | 108 | 113 | 157 | .. | - |
| Biogases | - | - | 102 | 119 | 104 | 64 | .. | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |

1. **Total electricity** includes the electricity produced from industrial waste, non-renewable municipal waste and pumped storage. Electricity from renewable sources does *not* include the electricity produced from industrial waste, non-renewable municipal waste and pumped storage production.

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Table 5A. Heat production¹ from renewable and waste sources in the transformation sector (TJ)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|----------------------------|------|--------|-------|-------|-------|-------|-------|--|
| Total heat | - | 3353 e | 20102 | 34920 | 22199 | 24278 | 24219 | 12.3 |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | 2066 | 10756 | 5123 | 10072 | 10083 | - |
| Municipal waste renew. | - | 2012 e | 9553 | 6713 | 5139 | 3993 | 4180 | 4.4 |
| Municipal waste non-renew. | - | 1341 e | 6891 | 10069 | 7708 | 5990 | 6271 | 9.5 |
| Solid biofuels | - | - | 1077 | 6805 | 3861 | 3770 | 3315 | - |
| Biogases | - | - | 515 | 577 | 368 | 453 | 370 | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| <i>of which:</i> | | | | | | | | |
| CHP plants | - | - | 3896 | 5660 | 5463 | 5608 | .. | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | 9 | 941 | 439 | 831 | .. | - |
| Municipal waste renew. | - | - | 1331 | 743 | 568 | 539 | .. | - |
| Municipal waste non-renew. | - | - | 964 | 1115 | 851 | 809 | .. | - |
| Solid biofuels | - | - | 1077 | 2313 | 3237 | 2976 | .. | - |
| Biogases | - | - | 515 | 548 | 368 | 453 | .. | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| Heat only plants | - | 3353 e | 16206 | 29260 | 16736 | 18670 | .. | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | 2057 | 9815 | 4684 | 9241 | .. | - |
| Municipal waste renew. | - | 2012 e | 8222 | 5970 | 4571 | 3454 | .. | - |
| Municipal waste non-renew. | - | 1341 e | 5927 | 8954 | 6857 | 5181 | .. | - |
| Solid biofuels | - | - | - | 4492 | 624 | 794 | .. | - |
| Biogases | - | - | - | 29 | - | - | - | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |

1. Waste heat and heat production from heat pumps are not included and are reported separately in Table 5B.

Table 5B. Heat production from heat pumps and waste heat (TJ)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|----------------------------|------|------|------|------|------|------|-------|--|
| Total heat | - | - | - | - | - | - | - | - |
| Heat pumps ¹ | - | - | - | - | - | - | - | - |
| (-) Input to heat pumps | - | - | - | - | - | - | - | - |
| Other sources ² | - | - | - | - | - | - | - | - |

1. Installations producing heat for own use are not included.

2. Refers to production from hydrogen, purchased steam from industry, and waste heat.

Source: IEA/OECD *Electricity Statistics*.

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Table 6. Renewable and waste balance for 2016

| thousand tonnes of oil equivalent | Hydro ¹ | Wind | Tide wave ocean | Solar PV | Geo-thermal | Solar thermal | Industrial waste | Mun. waste renew. |
|------------------------------------|--------------------|-------------|-----------------|-------------|-------------|---------------|------------------|-------------------|
| Production | 245 | 145 | 43 | 440 | 162 | 28 | 2611 | 377 |
| Imports | - | - | - | - | - | - | - | - |
| Exports | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| TPES | 245 | 145 | 43 | 440 | 162 | 28 | 2611 | 377 |
| Statistical differences | - | - | - | - | - | - | - | - |
| Main activity electricity plants | -245 | -144 | -43 | -387 | - | - | - | - |
| Autoproducer electricity plants | - | -1 | - | -53 | - | - | -34 | -33 |
| Main activity CHP plants | - | - | - | - | - | - | - | - |
| Autoproducer CHP plants | - | - | - | - | - | - | -45 | -31 |
| Main heat plants | - | - | - | - | - | - | - | - |
| Autoproducer heat plants | - | - | - | - | - | - | -280 | -90 |
| Charcoal production plants | - | - | - | - | - | - | - | - |
| Other transformation | - | - | - | - | - | - | - | - |
| Energy Industry own use | - | - | - | - | - | - | - | - |
| Losses | - | - | - | - | - | - | - | - |
| TFC | - | - | - | - | 162 | 28 | 2251 | 223 |
| Industry | - | - | - | - | 4 | 1 | 2150 | 35 |
| Iron and steel | - | - | - | - | - | - | 8 | - |
| Chemical and petrochemical | - | - | - | - | - | - | 330 | - |
| Non-ferrous metals | - | - | - | - | - | - | - | - |
| Non-metallc minerals | - | - | - | - | - | - | 673 | - |
| Transport equipment | - | - | - | - | - | - | - | - |
| Machinery | - | - | - | - | - | - | - | - |
| Mining and quarrying | - | - | - | - | - | - | - | - |
| Food and tobacco | - | - | - | - | - | - | 31 | - |
| Paper, pulp and print | - | - | - | - | - | - | 366 | 6 |
| Wood and wood products | - | - | - | - | - | - | 7 | - |
| Construction | - | - | - | - | - | - | 7 | 7 |
| Textile and leather | - | - | - | - | - | - | 66 | - |
| Non-specified | - | - | - | - | 4 | 1 | 663 | 21 |
| Transport | - | - | - | - | - | - | - | - |
| Road | - | - | - | - | - | - | - | - |
| Other | - | - | - | - | - | - | - | - |
| Other | - | - | - | - | 158 | 27 | 101 | 189 |
| Residential | - | - | - | - | 26 | 13 | - | - |
| Commercial and public services | - | - | - | - | 107 | 15 | 101 | 188 |
| Agriculture/forestry | - | - | - | - | 24 | - | - | - |
| Fishing | - | - | - | - | - | - | - | - |
| Non-specified | - | - | - | - | - | - | - | - |
| Electricity generated - GWh | 2847 | 1683 | 496 | 5123 | - | - | 360 | 184 |
| <i>Electricity plants</i> | 2847 | 1683 | 496 | 5123 | - | - | 147 | 131 |
| <i>CHP plants</i> | - | - | - | - | - | - | 213 | 53 |
| Heat generated - TJ | - | - | - | - | - | - | 10072 | 3993 |
| <i>CHP plants</i> | - | - | - | - | - | - | 831 | 539 |
| <i>Heat plants</i> | - | - | - | - | - | - | 9241 | 3454 |

1. Hydro does not include pumped hydro.

Source: IEA/OECD *World Energy Balances*.

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Table 6. Renewable and waste balance for 2016 (continued)

| Mun. waste non-ren. | Wood/wood waste | Charcoal | Bio-gases | Bio-gasoline | Bio-diesel | Other liquid biofuels | Total renew. & waste sources ² | Share in total energy sources ³ |
|---------------------|-----------------|----------|------------|--------------|------------|-----------------------|---|--|
| 566 | 1850 | - | 166 | - | 495 | 347 | 7475 | 14.5% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| 566 | 1850 | - | 166 | - | 495 | 347 | 7475 | 2.7% |
| - | - | - | - | - | - | - | - | - |
| - | -746 | - | -31 | - | - | -347 | -1943 | x |
| -50 | -51 | - | -69 | - | - | - | -291 | x |
| - | -21 | - | -21 | - | - | - | -42 | x |
| -46 | -109 | - | - | - | - | - | -231 | x |
| - | - | - | - | - | - | - | - | - |
| -135 | -35 | - | - | - | - | - | -540 | x |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| 335 | 888 | - | 45 | - | 495 | - | 4427 | 2.5% |
| 52 | 551 | - | 20 | - | - | - | 2813 | 5.9% |
| - | - | - | - | - | - | - | 8 | 0.1% |
| - | 5 | - | 5 | - | - | - | 340 | 4.3% |
| - | - | - | - | - | - | - | - | - |
| - | 2 | - | - | - | - | - | 675 | 12.2% |
| - | 3 | - | - | - | - | - | 3 | 0.1% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | 29 | - | 9 | - | - | - | 69 | 3.6% |
| 9 | 298 | - | 2 | - | - | - | 681 | 32.1% |
| - | 147 | - | - | - | - | - | 154 | 42.2% |
| 11 | - | - | - | - | - | - | 25 | 2.8% |
| 1 | 24 | - | 1 | - | - | - | 92 | 4.8% |
| 31 | 42 | - | 4 | - | - | - | 766 | 16.5% |
| - | - | - | - | - | 495 | - | 495 | 1.4% |
| - | - | - | - | - | 495 | - | 495 | 1.5% |
| - | - | - | - | - | - | - | - | - |
| 283 | 337 | - | 25 | - | - | - | 1120 | 2.4% |
| - | 140 | - | - | - | - | - | 179 | 0.9% |
| 283 | 134 | - | 25 | - | - | - | 853 | 4.0% |
| - | 63 | - | - | - | - | - | 87 | 5.4% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| 276 | 3674 | - | 519 | - | - | 1358 | 16520 | 3.0% |
| 197 | 3517 | - | 455 | - | - | 1358 | 15954 | 3.2% |
| 79 | 157 | - | 64 | - | - | - | 566 | 1.0% |
| 5990 | 3770 | - | 453 | - | - | - | 24278 | 11.0% |
| 809 | 2976 | - | 453 | - | - | - | 5608 | 2.8% |
| 5181 | 794 | - | - | - | - | - | 18670 | 83.7% |

2. Total includes non-renewable waste.

3. Share of renewables on TFC excludes electricity and heat generated from renewable sources.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|--|-------|--------|-------|-------|-------|--------|--------|---|
| Geothermal (TJ) | | | | | | | | |
| Production | - | - | 1400 | 4542 | 5654 | 6784 | 8142 | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | 1400 | 4542 | 5654 | 6784 | 8142 | - |
| Statistical differences | - | - | 1 | - | 1 | 1 | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | 1401 | 4542 | 5655 | 6785 | .. | - |
| <i>Industry</i> | - | - | 40 | - | 155 | 161 | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | 1361 | 4542 | 5500 | 6624 | .. | - |
| Solar thermal (TJ) | | | | | | | | |
| Production | 416 | 1745 | 1225 | 1193 | 1192 | 1193 | 1624 | -2.3 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 416 | 1745 | 1225 | 1193 | 1192 | 1193 | 1624 | -2.3 |
| Statistical differences | 1 | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 417 | 1745 | 1225 | 1193 | 1192 | 1193 | .. | -2.3 |
| <i>Industry</i> | - | - | 18 | - | 47 | 44 | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 417 | 1745 | 1207 | 1193 | 1145 | 1149 | .. | -2.6 |
| Industrial waste (TJ) | | | | | | | | |
| Production | 11663 | 39228 | 74973 | 78446 | 88702 | 109305 | 111532 | 6.6 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 11663 | 39228 | 74973 | 78446 | 88702 | 109305 | 111532 | 6.6 |
| Statistical differences | -72 | -184 | 17 | - | 1 | - | .. | - |
| Transformation processes | - | - | 3528 | 14329 | 7901 | 15053 | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 11591 | 39044 | 71462 | 64117 | 80802 | 94252 | .. | 5.7 |
| <i>Industry</i> | 11426 | 38823 | 65273 | 62242 | 77496 | 90024 | .. | 5.4 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 165 | 221 | 6189 | 1875 | 3306 | 4228 | .. | 20.3 |
| Municipal waste - renewables (TJ) | | | | | | | | |
| Production | 160 e | 4579 e | 17460 | 14781 | 16283 | 15787 | 16109 | 8.0 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 160 e | 4579 e | 17460 | 14781 | 16283 | 15787 | 16109 | 8.0 |
| Statistical differences | - | 504 | 2054 | -1 | - | - | .. | - |
| Transformation processes | - | 2721 | 14433 | 10502 | 8136 | 6442 | .. | 5.5 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 160 e | 2362 e | 5081 | 4278 | 8147 | 9345 | .. | 9.0 |
| <i>Industry</i> | - | - | - | 50 | 661 | 1446 | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 160 e | 2362 e | 5081 | 4228 | 7486 | 7899 | .. | 7.8 |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics (continued)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|--|-------|--------|-------|-------|-------|-------|--------|---|
| Municipal waste - non-renewables (TJ) | | | | | | | | |
| Production | 107 e | 3053 e | 16540 | 22172 | 24425 | 23680 | 24162 | 13.7 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 107 e | 3053 e | 16540 | 22172 | 24425 | 23680 | 24162 | 13.7 |
| Statistical differences | - | 335 | 1482 | -1 | - | - | .. | - |
| Transformation processes | - | 1814 | 10406 | 15753 | 12203 | 9663 | .. | 11.0 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 107 e | 1574 e | 7616 | 6418 | 12222 | 14017 | .. | 14.6 |
| <i>Industry</i> | - | - | - | 76 | 991 | 2168 | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 107 e | 1574 e | 7616 | 6342 | 11231 | 11849 | .. | 13.4 |
| Solid Biofuel excluding charcoal (TJ) | | | | | | | | |
| Production | 16950 | 8253 | 13792 | 87847 | 78694 | 77468 | 126110 | 15.0 |
| Net imports ¹ | 972 | 1153 | 743 | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 17922 | 9406 | 14535 | 87847 | 78694 | 77468 | 126110 | 14.1 |
| Statistical differences | - | - | 3 | 1 | 1 | -1 | .. | - |
| Transformation processes | - | 433 | 4583 | 10119 | 11243 | 40273 | .. | 32.7 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 17922 | 8973 | 9955 | 77729 | 67452 | 37194 | .. | 9.3 |
| <i>Industry</i> | - | 4518 | 7550 | 42274 | 24414 | 23072 | .. | 10.7 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 17922 | 4455 | 2405 | 35455 | 43038 | 14122 | .. | 7.5 |
| Charcoal (kt) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Biogases (TJ) | | | | | | | | |
| Production | 739 | 1492 | 8316 | 9330 | 7726 | 6955 | 11322 | 10.1 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 739 | 1492 | 8316 | 9330 | 7726 | 6955 | 11322 | 10.1 |
| Statistical differences | - | - | 108 | - | - | - | .. | - |
| Transformation processes | - | 112 | 5020 | 5573 | 5965 | 5062 | .. | 26.9 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 739 | 1380 | 3404 | 3757 | 1761 | 1893 | .. | 2.0 |
| <i>Industry</i> | 501 | 821 | 241 | 1404 | 1617 | 840 | .. | 0.1 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 238 | 559 | 3163 | 2353 | 144 | 1053 | .. | 4.0 |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics (continued)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|-----------------------------------|------|------|------|------|------|------|-------|---|
| Biogasoline (kt) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Biodiesel (kt) | | | | | | | | |
| Production | - | - | 329 | 369 | 413 | 489 | 528 | - |
| Net imports ¹ | - | - | - | - | 10 | - | - | - |
| Stock changes | - | - | - | -16 | 16 | - | - | - |
| Gross consumption | - | - | 329 | 353 | 439 | 489 | 528 | - |
| Statistical differences | - | - | - | 16 | -26 | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | 329 | 369 | 413 | 489 | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | 329 | 369 | 413 | 489 | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Other liquid biofuels (kt) | | | | | | | | |
| Production | - | - | - | 192 | 317 | 395 | 465 | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | 192 | 317 | 395 | 465 | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | 192 | 317 | 395 | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

LATVIA

Figure 1. Contribution of renewables in 1990

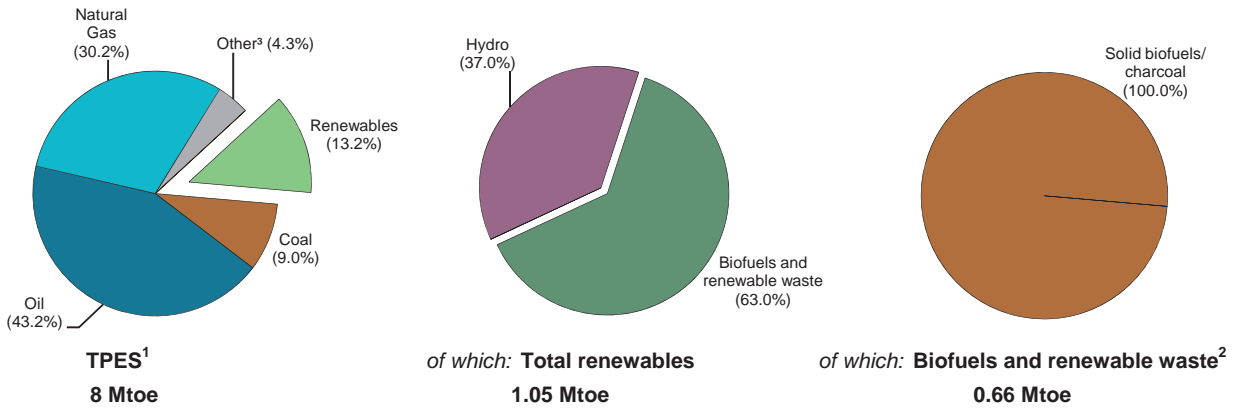


Figure 2. Contribution of renewables in 2017 provisional

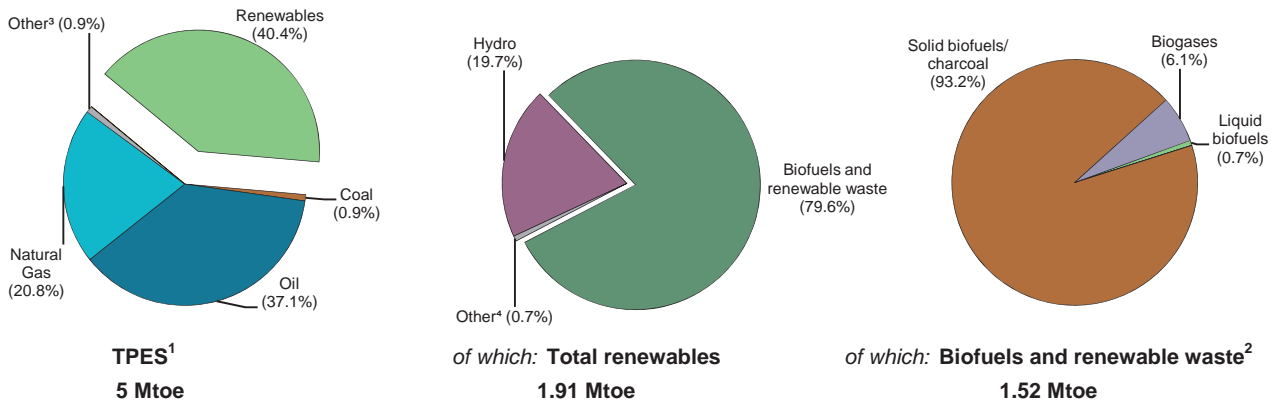
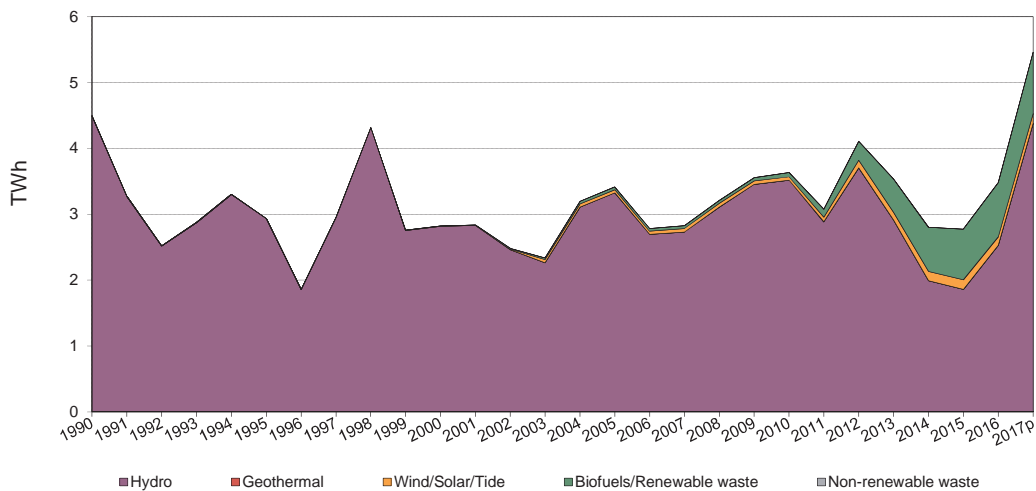


Figure 3. Electricity production by renewables and waste energy source



1. Total primary energy supply includes electricity trade.
2. Biofuels and renewable waste include solid biofuels, liquid biofuels, biogases, and renewable municipal waste.
3. Includes non-renewable municipal waste, industrial waste, peat, shale oil, electricity trade, and other sources of primary energy. (In the case of negative values, the net exports of electricity are greater than the other products in this category).
4. Includes geothermal, solar, wind and tide.

Note: Totals may not sum due to rounding.
Source: IEA/OECD *World Energy Balances*.

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Table 1. Energy supply, GDP and population

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|---|------|-------|-------|-------|-------|-------|-------|-------------------------------------|
| TPES (Mtoe) | 7.89 | 3.83 | 4.51 | 4.34 | 4.26 | 4.25 | 4.73 | 1.3 |
| of which: Renewables (Mtoe) ¹ | 1.05 | 1.19 | 1.43 | 1.61 | 1.54 | 1.62 | 1.91 | 2.8 |
| Renewables/TPES(%) | 13.2 | 31.1 | 31.8 | 37.2 | 36.1 | 38.2 | 40.4 | 1.6 |
| GDP (billion 2010 US dollars) | - | 16.42 | 23.77 | 27.44 | 28.26 | 28.88 | 30.20 | 3.6 |
| TPES/GDP ² | - | 0.23 | 0.19 | 0.16 | 0.15 | 0.15 | 0.16 | -2.3 |
| TPES/GDP (year 2010 = 100) | - | 123 | 100 | 83 | 80 | 78 | 83 | -2.3 |
| Population (millions) | 2.66 | 2.37 | 2.10 | 1.99 | 1.98 | 1.96 | 1.94 | -1.2 |
| TPES/population (toe per capita) | 2.96 | 1.62 | 2.15 | 2.18 | 2.16 | 2.17 | 2.44 | 2.5 |
| Electricity generation (TWh) ³ | 6.6 | 4.1 | 6.6 | 5.1 | 5.5 | 6.4 | 7.5 | 3.6 |
| of which: Renewables (TWh) ^{1,3} | 4.50 | 2.82 | 3.64 | 2.80 | 2.78 | 3.48 | 5.46 | 4.0 |
| Renew./Total Elec.(%) ^{1,4} | 67.6 | 68.3 | 54.9 | 54.5 | 50.2 | 54.2 | 72.5 | 0.4 |
| Road energy consumption (Mtoe) | 0.8 | 0.7 | 1.0 | 0.9 | 1.0 | 1.0 | .. | .. |
| of which: Liquid biofuels (Mtoe) | - | - | 0.03 | 0.02 | 0.02 | 0.01 | .. | .. |
| Liq. biofuels/road tr.(%) ⁵ | - | - | 2.7 | 2.3 | 2.2 | 0.9 | - | - |

1. Renewables do not include industrial waste, non-renewable municipal waste and pumped storage production.

2. In units of toe per thousand 2010 US dollars.

3. Electricity generation = gross production - amount of electricity produced in pumped storage plants.

4. Electricity share generated from renewables over the total electricity production.

5. Energy from liquid biofuels consumed in road transport over the total energy consumed in road transport.

Source: IEA/OECD *World Energy Balances* and OECD *Main Economic Indicators*.

Table 2. Net generating capacity of renewable and waste sources (MWe)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | Average annual percent change 00-16 |
|---|-------------|-------------|-------------|-------------|-------------|-------------|-------------------------------------|
| Total capacity | 1487 | 1515 | 1622 | 1780 | 1784 | 1779 | 1.0 |
| Hydro | 1487 | 1513 | 1576 | 1590 | 1589 | 1565 | 0.2 |
| Hydro <1MW | - | 8 | 25 | 29 | 28 | 28 | 8.1 |
| Hydro 1-10MW | - | - | 1 | 1 | 1 | 1 | - |
| Hydro 10+MW | 1487 | 1505 | 1550 | 1560 | 1560 | 1536 | 0.1 |
| Mixed plants | - | - | - | - | - | - | - |
| Pure pumped storage | - | - | - | - | - | - | - |
| Geothermal | - | - | - | - | - | - | - |
| Solar photovoltaic | - | - | - | - | - | 1 | - |
| Solar thermal | - | - | - | - | - | - | - |
| Tide, wave, ocean | - | - | - | - | - | - | - |
| Wind | - | 2 | 30 | 69 | 69 | 70 | 24.9 |
| Industrial waste | - | - | - | - | - | - | - |
| Municipal waste | - | - | - | - | - | - | - |
| Solid biofuels | - | - | 5 | 63 | 66 | 81 | - |
| Biogases | - | - | 11 | 58 | 60 | 62 | - |
| Liquid biofuels | - | - | - | - | - | - | - |
| Solar collectors surface (1000 m ²) | - | - | - | - | - | - | - |
| Cap. of solar collectors (MW _{th}) ¹ | - | - | - | - | - | - | - |

1. Converted at 0.7 kW_{th}/m² of solar collector area, as estimated by the IEA Solar Heating & Cooling Programme.

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Table 3. Capacity factors (%)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 |
|--|--------------|--------------|--------------|--------------|--------------|--------------|
| Total plants¹ | 34.51 | 21.28 | 25.58 | 17.98 | 17.77 | 22.34 |
| Hydro | 34.51 | 21.27 | 25.50 | 14.31 | 13.36 | 18.45 |
| <i>of which: <1MW</i> | - | 35.96 | 31.52 | 25.17 | 28.73 | 23.14 |
| <i>of which: 1-10MW</i> | - | - | 67.11 | 50.13 | 42.61 | 63.76 |
| <i>of which: 10+MW</i> | 34.51 | 21.19 | 25.38 | 14.09 | 13.07 | 18.34 |
| <i>of which: pure pumped storage²</i> | - | - | - | - | - | - |
| Geothermal | - | - | - | - | - | - |
| Solar photovoltaic | - | - | - | - | - | 4.36 |
| Solar thermal | - | - | - | - | - | - |
| Tide, wave and ocean | - | - | - | - | - | - |
| Wind | - | 25.21 | 18.67 | 23.33 | 24.34 | 20.86 |
| Industrial waste | - | - | - | - | - | - |
| Municipal waste | - | - | - | - | - | - |
| Solid biofuels | - | - | 19.20 | 57.79 | 65.34 | 60.16 |
| Biogases | - | - | 58.83 | 68.89 | 74.53 | 73.08 |
| Biodiesels | - | - | - | - | - | - |
| Other liquid biofuels | - | - | - | - | - | - |

1. The capacity factor is defined as: the annual gross electricity generation divided by the reported net capacity times 365 (days/year) times 24 (hours/day).

2. In case a country has at least one mixed hydro plants, it is impossible to calculate capacity factor thus it is shown as 'not applicable'.

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Table 4. Gross electricity production from renewable and waste sources (GWh)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|--------------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|---|
| Total electricity¹ | 4496 | 2823 | 3635 | 2804 | 2776 | 3482 | 5461 | 4.0 |
| Hydro | 4496 | 2819 | 3520 | 1994 | 1860 | 2530 | 4381 | 2.6 |
| <i>of which: pumped storage</i> | - | - | - | - | - | - | - | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar photovoltaic | - | - | - | - | - | - | .. | .. |
| Solar thermal | - | - | - | - | - | - | - | - |
| Tide, wave, ocean | - | - | - | - | - | - | - | - |
| Wind | - | 4 | 49 | 141 | 147 | 128 | 150 | 23.8 |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | - | - | - | - | - |
| Solid biofuels | - | - | 9 | 319 | 378 | 427 | 525 | - |
| Biogases | - | - | 57 | 350 | 391 | 397 | 405 | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| <i>of which:</i> | | | | | | | | |
| Electricity only plants | 4496 | 2823 | 3577 | 2137 | 2007 | 2658 | .. | - |
| Hydro | 4496 | 2819 | 3520 | 1994 | 1860 | 2530 | .. | - |
| <i>of which: pumped storage</i> | - | - | - | - | - | - | - | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar photovoltaic | - | - | - | - | - | - | - | .. |
| Solar thermal | - | - | - | - | - | - | - | - |
| Tide, wave, ocean | - | - | - | - | - | - | - | - |
| Wind | - | 4 | 49 | 141 | 147 | 128 | .. | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | - | - | - | - | - |
| Solid biofuels | - | - | 2 | 2 | - | - | - | - |
| Biogases | - | - | 6 | - | - | - | - | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| CHP plants | - | - | 58 | 667 | 769 | 824 | .. | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | - | - | - | - | - |
| Solid biofuels | - | - | 7 | 317 | 378 | 427 | .. | - |
| Biogases | - | - | 51 | 350 | 391 | 397 | .. | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |

1. **Total electricity** includes the electricity produced from industrial waste, non-renewable municipal waste and pumped storage. Electricity from renewable sources does *not* include the electricity produced from industrial waste, non-renewable municipal waste and pumped storage production.

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Table 5A. Heat production¹ from renewable and waste sources in the transformation sector (TJ)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|----------------------------|------------|-------------|-------------|-------------|-------------|--------------|--------------|-------------------------------------|
| Total heat | 732 | 3691 | 4290 | 8515 | 9296 | 11476 | 13230 | 7.8 |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | - | - | - | - | - |
| Solid biofuels | 732 | 3691 | 4237 | 7754 | 8404 | 10524 | 12229 | 7.3 |
| Biogases | - | - | 50 | 761 | 892 | 952 | 1001 | - |
| Liquid biofuels | - | - | 3 | - | - | - | - | - |
| <i>of which:</i> | | | | | | | | |
| CHP plants | - | - | 456 | 4530 | 5338 | 6686 | .. | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | - | - | - | - | - |
| Solid biofuels | - | - | 403 | 3769 | 4446 | 5734 | .. | - |
| Biogases | - | - | 50 | 761 | 892 | 952 | .. | - |
| Liquid biofuels | - | - | 3 | - | - | - | - | - |
| Heat only plants | 732 | 3691 | 3834 | 3985 | 3958 | 4790 | .. | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | - | - | - | - | - |
| Solid biofuels | 732 | 3691 | 3834 | 3985 | 3958 | 4790 | .. | - |
| Biogases | - | - | - | - | - | - | - | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |

1. Waste heat and heat production from heat pumps are not included and are reported separately in Table 5B.

Table 5B. Heat production from heat pumps and waste heat (TJ)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|----------------------------|-------------|------|----------|------|------|------|-------|-------------------------------------|
| Total heat | 1458 | - | 7 | - | - | - | - | - |
| Heat pumps ¹ | - | - | - | - | - | - | - | - |
| (-) Input to heat pumps | - | - | - | - | - | - | - | - |
| Other sources ² | 1458 | - | 7 | - | - | - | - | - |

1. Installations producing heat for own use are not included.

2. Refers to production from hydrogen, purchased steam from industry, and waste heat.

Source: IEA/OECD *Electricity Statistics*.

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Table 6. Renewable and waste balance for 2016

| thousand tonnes of oil equivalent | Hydro ¹ | Wind | Tide wave ocean | Solar PV | Geo-thermal | Solar thermal | Industrial waste | Mun. waste renew. |
|------------------------------------|--------------------|------------|-----------------|----------|-------------|---------------|------------------|-------------------|
| Production | 218 | 11 | - | - | - | - | 3 | - |
| Imports | - | - | - | - | - | - | 2 | - |
| Exports | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| TPES | 218 | 11 | - | - | - | - | 5 | - |
| Statistical differences | - | - | - | - | - | - | - | - |
| Main activity electricity plants | -217 | -11 | - | - | - | - | - | - |
| Autoproducer electricity plants | - | - | - | - | - | - | - | - |
| Main activity CHP plants | - | - | - | - | - | - | - | - |
| Autoproducer CHP plants | - | - | - | - | - | - | - | - |
| Main heat plants | - | - | - | - | - | - | - | - |
| Autoproducer heat plants | - | - | - | - | - | - | - | - |
| Charcoal production plants | - | - | - | - | - | - | - | - |
| Other transformation | - | - | - | - | - | - | - | - |
| Energy Industry own use | - | - | - | - | - | - | - | - |
| Losses | - | - | - | - | - | - | - | - |
| TFC | - | - | - | - | - | - | 5 | - |
| Industry | - | - | - | - | - | - | 5 | - |
| Iron and steel | - | - | - | - | - | - | - | - |
| Chemical and petrochemical | - | - | - | - | - | - | - | - |
| Non-ferrous metals | - | - | - | - | - | - | - | - |
| Non-metallc minerals | - | - | - | - | - | - | 5 | - |
| Transport equipment | - | - | - | - | - | - | - | - |
| Machinery | - | - | - | - | - | - | - | - |
| Mining and quarrying | - | - | - | - | - | - | - | - |
| Food and tobacco | - | - | - | - | - | - | - | - |
| Paper, pulp and print | - | - | - | - | - | - | - | - |
| Wood and wood products | - | - | - | - | - | - | - | - |
| Construction | - | - | - | - | - | - | - | - |
| Textile and leather | - | - | - | - | - | - | - | - |
| Non-specified | - | - | - | - | - | - | - | - |
| Transport | - | - | - | - | - | - | - | - |
| Road | - | - | - | - | - | - | - | - |
| Other | - | - | - | - | - | - | - | - |
| Other | - | - | - | - | - | - | - | - |
| Residential | - | - | - | - | - | - | - | - |
| Commercial and public services | - | - | - | - | - | - | - | - |
| Agriculture/forestry | - | - | - | - | - | - | - | - |
| Fishing | - | - | - | - | - | - | - | - |
| Non-specified | - | - | - | - | - | - | - | - |
| Electricity generated - GWh | 2530 | 128 | - | - | - | - | - | - |
| <i>Electricity plants</i> | 2530 | 128 | - | - | - | - | - | - |
| <i>CHP plants</i> | - | - | - | - | - | - | - | - |
| Heat generated - TJ | - | - | - | - | - | - | - | - |
| <i>CHP plants</i> | - | - | - | - | - | - | - | - |
| <i>Heat plants</i> | - | - | - | - | - | - | - | - |

1. Hydro does not include pumped hydro.

Source: IEA/OECD *World Energy Balances*.

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Table 6. Renewable and waste balance for 2016 (continued)

| Mun. waste non-ren. | Wood/wood waste | Charcoal | Bio-gases | Bio-gasoline | Bio-diesel | Other liquid biofuels | Total renew. & waste sources ² | Share in total energy sources ³ |
|---------------------|-----------------|-----------|------------|--------------|------------|-----------------------|---|--|
| 6 | 2076 | - | 90 | 3 | 40 | - | 2447 | 100.0% |
| 23 | 126 | 5 | - | 7 | 5 | - | 168 | 3.9% |
| - | -906 | -12 | - | -2 | -43 | - | -963 | 45.3% |
| 3 | 4 | - | - | - | 2 | - | 9 | x |
| 32 | 1300 | -7 | 90 | 8 | 4 | - | 1661 | 39.1% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | -228 | x |
| - | - | - | - | - | - | - | - | - |
| - | -239 | - | -60 | - | - | - | -299 | x |
| - | -8 | - | -22 | - | - | - | -30 | x |
| - | -135 | - | - | - | - | - | -135 | x |
| - | -31 | - | - | - | - | - | -31 | x |
| - | -17 | 9 | - | - | - | - | -8 | x |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| 32 | 870 | 1 | 8 | 8 | 4 | - | 928 | 24.5% |
| 32 | 330 | - | 1 | - | - | - | 368 | 49.1% |
| - | - | - | - | - | - | - | - | - |
| - | 4 | - | 1 | - | - | - | 5 | 21.3% |
| - | - | - | - | - | - | - | - | - |
| 32 | 1 | - | - | - | - | - | 38 | 34.6% |
| - | - | - | - | - | - | - | - | - |
| - | 3 | - | - | - | - | - | 3 | 18.0% |
| - | - | - | - | - | - | - | - | - |
| - | 9 | - | - | - | - | - | 9 | 11.4% |
| - | - | - | - | - | - | - | - | - |
| - | 308 | - | - | - | - | - | 308 | 69.3% |
| - | 2 | - | - | - | - | - | 2 | 5.7% |
| - | - | - | - | - | - | - | - | - |
| - | 4 | - | - | - | - | - | 4 | 32.0% |
| - | - | - | - | 8 | 4 | - | 12 | 1.2% |
| - | - | - | - | 8 | 1 | - | 9 | 0.9% |
| - | - | - | - | - | 4 | - | 4 | 5.9% |
| - | 540 | 1 | 8 | - | - | - | 549 | 28.7% |
| - | 449 | 1 | - | - | - | - | 450 | 39.3% |
| - | 77 | - | 3 | - | - | - | 80 | 13.5% |
| - | 13 | - | 5 | - | - | - | 18 | 10.9% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | 427 | - | 396 | - | - | - | 3481 | 54.2% |
| - | - | - | - | - | - | - | 2658 | 100.0% |
| - | 427 | - | 396 | - | - | - | 823 | 21.9% |
| - | 10524 | - | 952 | - | - | - | 11476 | 39.6% |
| - | 5734 | - | 952 | - | - | - | 6686 | 30.8% |
| - | 4790 | - | - | - | - | - | 4790 | 65.8% |

2. Total includes non-renewable waste.

3. Share of renewables on TFC excludes electricity and heat generated from renewable sources.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|--|------|------|------|------|------|------|-------|---|
| Geothermal (TJ) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Solar thermal (TJ) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Industrial waste (TJ) | | | | | | | | |
| Production | - | - | 105 | 168 | 84 | 113 | 97 | - |
| Net imports ¹ | - | - | - | 196 | 224 | 85 | 95 | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | 105 | 364 | 308 | 198 | 192 | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | 105 | 364 | 308 | 198 | .. | - |
| <i>Industry</i> | - | - | 105 | 364 | 308 | 198 | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Municipal waste - renewables (TJ) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics (continued)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|--|-------|-------|--------|--------|--------|--------|--------|---|
| Municipal waste - non-renewables (TJ) | | | | | | | | |
| Production | - | - | 334 | 171 | 256 | 256 | 362 | - |
| Net imports ¹ | - | - | 761 | 2046 | 1722 | 947 | 1454 | - |
| Stock changes | - | - | -19 | 153 | 17 | 135 | -19 | - |
| Gross consumption | - | - | 1076 | 2370 | 1995 | 1338 | 1797 | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | 1076 | 2370 | 1995 | 1338 | .. | - |
| <i>Industry</i> | - | - | 1076 | 2370 | 1995 | 1338 | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Solid Biofuel excluding charcoal (TJ) | | | | | | | | |
| Production | 28271 | 48151 | 66823 | 85666 | 84121 | 86912 | 85358 | 3.8 |
| Net imports ¹ | - | -8451 | -22135 | -27864 | -29602 | -32668 | -30548 | 8.8 |
| Stock changes | -690 | -4 | 1018 | -1782 | -1823 | 175 | 4908 | - |
| Gross consumption | 27581 | 39696 | 45706 | 56020 | 52696 | 54419 | 59718 | 2.0 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | 1729 | 5196 | 7458 | 13717 | 14757 | 17999 | .. | 8.1 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | 80 | - | - | - | - | - | .. | - |
| Final energy consumption | 25772 | 34500 | 38248 | 42303 | 37939 | 36420 | .. | 0.3 |
| <i>Industry</i> | 268 | 2467 | 9459 | 14792 | 14992 | 13829 | .. | 11.4 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 25504 | 32033 | 28789 | 27511 | 22947 | 22591 | .. | -2.2 |
| Charcoal (kt) | | | | | | | | |
| Production | - | - | 9 | 13 | 11 | 12 | 13 | - |
| Net imports ¹ | - | - | -8 | -10 | -7 | -10 | -12 | - |
| Stock changes | - | - | 1 | - | -2 | - | 1 | - |
| Gross consumption | - | - | 2 | 3 | 2 | 2 | 2 | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | 2 | 3 | 2 | 2 | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | 2 | 3 | 2 | 2 | .. | - |
| Biogases (TJ) | | | | | | | | |
| Production | - | - | 558 | 3136 | 3674 | 3762 | 3901 | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | 558 | 3136 | 3674 | 3762 | 3901 | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | 439 | 2780 | 3310 | 3424 | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | 119 | 356 | 364 | 338 | .. | - |
| <i>Industry</i> | - | - | - | 32 | 31 | 24 | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | 119 | 324 | 333 | 314 | .. | - |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics (continued)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|-----------------------------------|------|------|------|------|------|------|-------|---|
| Biogasoline (kt) | | | | | | | | |
| Production | - | - | 15 | - | 3 | 5 | 9 | - |
| Net imports ¹ | - | - | -5 | 10 | 9 | 8 | 3 | - |
| Stock changes | - | - | 4 | - | - | - | - | - |
| Gross consumption | - | - | 14 | 10 | 12 | 13 | 12 | - |
| Statistical differences | - | - | -1 | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | 13 | 10 | 12 | 13 | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | 13 | 10 | 12 | 13 | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Biodiesel (kt) | | | | | | | | |
| Production | - | - | 43 | 75 | 66 | 45 | 53 | - |
| Net imports ¹ | - | - | -25 | -56 | -43 | -42 | -54 | - |
| Stock changes | - | - | 2 | 1 | -4 | 2 | 4 | - |
| Gross consumption | - | - | 20 | 20 | 19 | 5 | 3 | - |
| Statistical differences | - | - | 1 | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | 21 | 20 | 19 | 5 | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | 21 | 20 | 19 | 5 | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Other liquid biofuels (kt) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Figure 1. Contribution of renewables in 1990

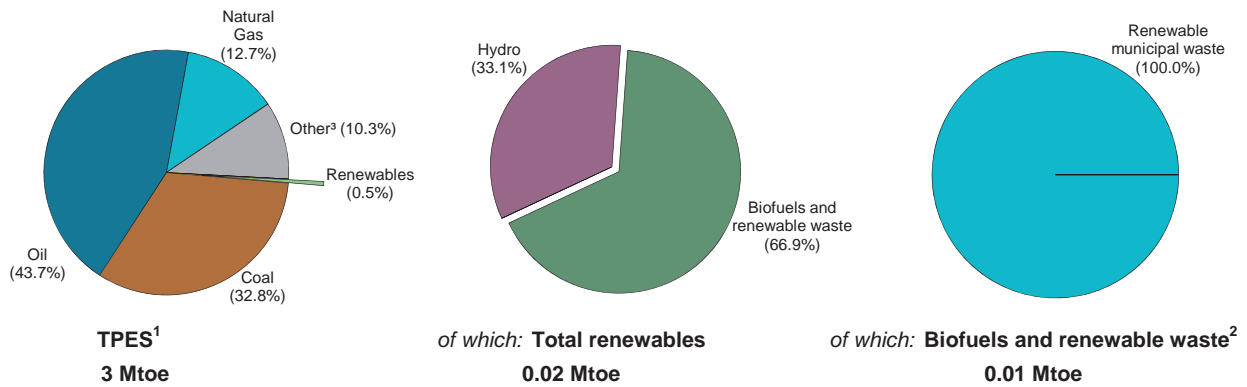


Figure 2. Contribution of renewables in 2017 provisional

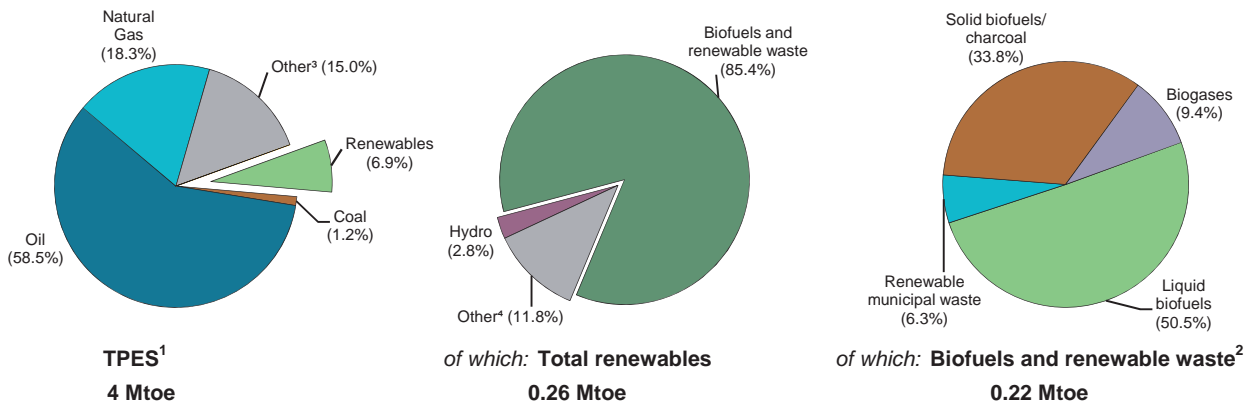
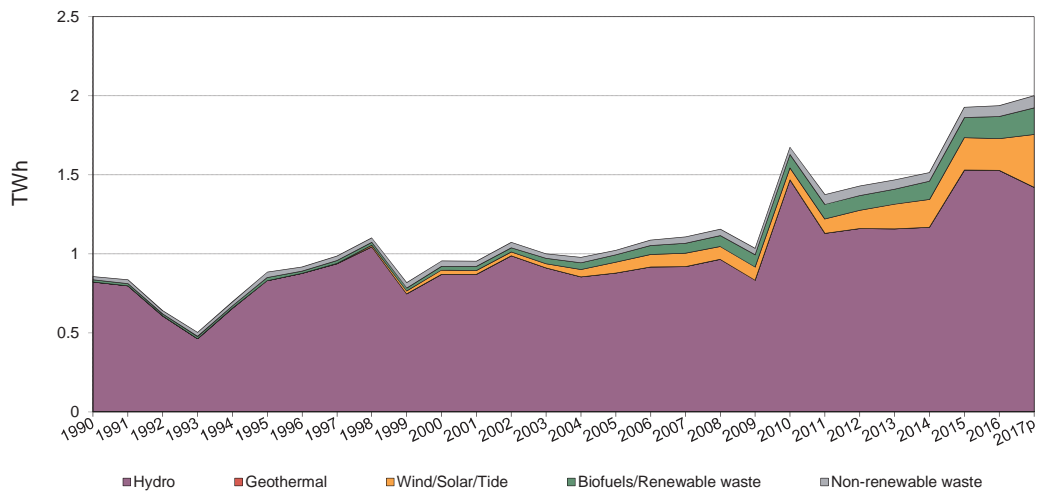


Figure 3. Electricity production by renewables and waste energy source



1. Total primary energy supply includes electricity trade.
2. Biofuels and renewable waste include solid biofuels, liquid biofuels, biogases, and renewable municipal waste.
3. Includes non-renewable municipal waste, industrial waste, peat, shale oil, electricity trade, and other sources of primary energy. (In the case of negative values, the net exports of electricity are greater than the other products in this category).
4. Includes geothermal, solar, wind and tide.

Note: Totals may not sum due to rounding.
Source: IEA/OECD *World Energy Balances*.

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Table 1. Energy supply, GDP and population

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|---|-------|-------|-------|-------|-------|-------|-------|-------------------------------------|
| TPES (Mtoe) | 3.39 | 3.35 | 4.22 | 3.82 | 3.73 | 3.69 | 3.78 | 0.7 |
| of which: Renewables (Mtoe) ¹ | 0.02 | 0.04 | 0.13 | 0.19 | 0.21 | 0.22 | 0.26 | 11.9 |
| Renewables/TPES(%) | 0.5 | 1.2 | 3.0 | 5.0 | 5.5 | 6.0 | 6.9 | 11.1 |
| GDP (billion 2010 US dollars) | 24.12 | 40.78 | 53.21 | 59.61 | 61.32 | 63.21 | 64.66 | 2.7 |
| TPES/GDP ² | 0.14 | 0.08 | 0.08 | 0.06 | 0.06 | 0.06 | 0.06 | -2.0 |
| TPES/GDP (year 2010 = 100) | 177 | 104 | 100 | 81 | 77 | 74 | 74 | -2.0 |
| Population (millions) | 0.38 | 0.44 | 0.51 | 0.56 | 0.57 | 0.58 | 0.60 | 1.9 |
| TPES/population (toe per capita) | 8.87 | 7.66 | 8.31 | 6.85 | 6.55 | 6.32 | 6.33 | -1.1 |
| Electricity generation (TWh) ³ | 0.6 | 0.4 | 3.2 | 1.9 | 1.3 | 0.8 | 0.9 | 4.5 |
| of which: Renewables (TWh) ^{1,3} | 0.08 | 0.17 | 0.27 | 0.40 | 0.43 | 0.46 | 0.59 | 7.5 |
| Renew./Total Elec.(%) ^{1,4} | 13.3 | 41.0 | 8.3 | 20.9 | 32.3 | 58.2 | 66.1 | 2.9 |
| Road energy consumption (Mtoe) | 0.9 | 1.6 | 2.2 | 2.1 | 2.0 | 1.9 | .. | .. |
| of which: Liquid biofuels (Mtoe) | - | - | 0.04 | 0.07 | 0.08 | 0.09 | .. | .. |
| Liq. biofuels/road tr.(%) ⁵ | - | - | 1.9 | 3.4 | 4.2 | 4.7 | - | - |

1. Renewables do not include industrial waste, non-renewable municipal waste and pumped storage production.

2. In units of toe per thousand 2010 US dollars.

3. Electricity generation = gross production - amount of electricity produced in pumped storage plants.

4. Electricity share generated from renewables over the total electricity production.

5. Energy from liquid biofuels consumed in road transport over the total energy consumed in road transport.

Source: IEA/OECD *World Energy Balances* and OECD *Main Economic Indicators*.

Table 2. Net generating capacity of renewable and waste sources (MWe)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | Average annual percent change 00-16 |
|---|-------------|-------------|-------------|-------------|-------------|-------------|-------------------------------------|
| Total capacity | 1139 | 1155 | 1235 | 1529 | 1543 | 1605 | 2.1 |
| Hydro | 1133 | 1133 | 1134 | 1330 | 1330 | 1330 | 1.0 |
| Hydro <1MW | 1 | 1 | 2 | 2 | 2 | 2 | 4.4 |
| Hydro 1-10MW | 32 | 32 | 32 | 32 | 32 | 32 | - |
| Hydro 10+MW | - | - | - | - | - | - | - |
| Mixed plants | - | - | - | - | - | - | - |
| Pure pumped storage | 1100 | 1100 | 1100 | 1296 | 1296 | 1296 | 1.0 |
| Geothermal | - | - | - | - | - | - | - |
| Solar photovoltaic | - | - | 29 | 110 | 116 | 122 | - |
| Solar thermal | - | - | - | - | - | - | - |
| Tide, wave, ocean | - | - | - | - | - | - | - |
| Wind | - | 14 | 44 | 58 | 64 | 120 | 14.4 |
| Industrial waste | - | - | - | - | - | - | - |
| Municipal waste | 6 | 8 | 19 | 17 | 17 | 17 | 4.8 |
| Solid biofuels | - | - | - | 4 | 4 | 4 | - |
| Biogases | - | - | 9 | 10 | 12 | 12 | - |
| Liquid biofuels | - | - | - | - | - | - | - |
| Solar collectors surface (1000 m ²) | - | - | 29 | 52 | 56 | 59 | - |
| Cap. of solar collectors (MW _{th}) ¹ | - | - | 20 | 36 | 39 | 41 | - |

1. Converted at 0.7 kW_{th}/m² of solar collector area, as estimated by the IEA Solar Heating & Cooling Programme.

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Table 3. Capacity factors (%)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 |
|--|-------------|-------------|--------------|--------------|--------------|--------------|
| Total plants¹ | 8.59 | 9.43 | 15.48 | 11.30 | 14.27 | 13.79 |
| Hydro | 8.29 | 8.77 | 14.78 | 10.03 | 13.14 | 13.12 |
| <i>of which: <1MW</i> | 34.25 | 68.49 | 43.68 | 31.68 | 37.00 | 44.55 |
| <i>of which: 1-10MW</i> | 23.90 | 41.96 | 35.68 | 36.47 | 33.09 | 38.39 |
| <i>of which: 10+MW</i> | - | - | - | - | - | - |
| <i>of which: pure pumped storage²</i> | 7.81 | 7.75 | 14.12 | 9.34 | 12.61 | 12.44 |
| Geothermal | - | - | - | - | - | - |
| Solar photovoltaic | - | - | 8.32 | 9.83 | 10.21 | 9.38 |
| Solar thermal | - | - | - | - | - | - |
| Tide, wave and ocean | - | - | - | - | - | - |
| Wind | - | 22.02 | 14.29 | 15.72 | 18.17 | 9.65 |
| Industrial waste | - | - | - | - | - | - |
| Municipal waste | 64.69 e | 73.48 | 44.80 | 59.88 | 71.40 | 74.99 |
| Solid biofuels | - | - | - | 59.95 | 68.98 | 71.66 |
| Biogases | - | - | 70.98 | 69.08 | 58.52 | 69.16 |
| Biodiesels | - | - | - | - | - | - |
| Other liquid biofuels | - | - | - | - | - | - |

1. The capacity factor is defined as: the annual gross electricity generation divided by the reported net capacity times 365 (days/year) times 24 (hours/day).

2. In case a country has at least one mixed hydro plants, it is impossible to calculate capacity factor thus it is shown as 'not applicable'.

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Table 4. Gross electricity production from renewable and waste sources (GWh)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|--------------------------------------|------------|------------|-------------|-------------|-------------|-------------|-------------|---|
| Total electricity¹ | 857 | 955 | 1674 | 1515 | 1928 | 1938 | 2000 | 4.4 |
| Hydro | 823 | 871 | 1468 | 1169 | 1530 | 1528 | 1422 | 2.9 |
| <i>of which: pumped storage</i> | 753 | 747 | 1360 | 1061 | 1431 | 1413 | 1336 | 3.5 |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar photovoltaic | - | - | 21 | 95 | 104 | 100 | 102 | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Tide, wave, ocean | - | - | - | - | - | - | - | - |
| Wind | - | 27 | 55 | 80 | 102 | 101 | 231 | 13.5 |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | 13 | 18 | 28 | 34 | 40 | 42 | 47 | 5.8 |
| Municipal waste non-renew. | 21 | 34 | 46 | 55 | 66 | 69 | 77 | 4.9 |
| Solid biofuels | - | - | - | 21 | 24 | 25 | 46 | - |
| Biogases | - | 5 | 56 | 61 | 62 | 73 | 75 | 17.3 |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| of which: | | | | | | | | |
| Electricity only plants | 857 | 950 | 1618 | 1433 | 1842 | 1840 | .. | - |
| Hydro | 823 | 871 | 1468 | 1169 | 1530 | 1528 | .. | - |
| <i>of which: pumped storage</i> | 753 | 747 | 1360 | 1061 | 1431 | 1413 | .. | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar photovoltaic | - | - | 21 | 95 | 104 | 100 | .. | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Tide, wave, ocean | - | - | - | - | - | - | - | - |
| Wind | - | 27 | 55 | 80 | 102 | 101 | .. | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | 13 | 18 | 28 | 34 | 40 | 42 | .. | - |
| Municipal waste non-renew. | 21 | 34 | 46 | 55 | 66 | 69 | .. | - |
| Solid biofuels | - | - | - | - | - | - | - | - |
| Biogases | - | - | - | - | - | - | - | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| CHP plants | - | 5 | 56 | 82 | 86 | 98 | .. | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | - | - | - | - | - |
| Solid biofuels | - | - | - | 21 | 24 | 25 | .. | - |
| Biogases | - | 5 | 56 | 61 | 62 | 73 | .. | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |

1. **Total electricity** includes the electricity produced from industrial waste, non-renewable municipal waste and pumped storage. Electricity from renewable sources does *not* include the electricity produced from industrial waste, non-renewable municipal waste and pumped storage production.

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Table 5A. Heat production¹ from renewable and waste sources in the transformation sector (TJ)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|----------------------------|------|------|------|------|------|------|-------|--|
| Total heat | - | 4 | 114 | 538 | 626 | 645 | 989 | 38.3 |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | - | - | - | - | - |
| Solid biofuels | - | 4 | 81 | 461 | 546 | 559 | 900 | 37.5 |
| Biogases | - | - | 33 | 77 | 80 | 86 | 89 | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| <i>of which:</i> | | | | | | | | |
| CHP plants | - | - | 33 | 413 | 461 | 474 | .. | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | - | - | - | - | - |
| Solid biofuels | - | - | - | 336 | 381 | 388 | .. | - |
| Biogases | - | - | 33 | 77 | 80 | 86 | .. | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| Heat only plants | - | 4 | 81 | 125 | 165 | 171 | .. | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | - | - | - | - | - |
| Solid biofuels | - | 4 | 81 | 125 | 165 | 171 | .. | - |
| Biogases | - | - | - | - | - | - | - | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |

1. Waste heat and heat production from heat pumps are not included and are reported separately in Table 5B.

Table 5B. Heat production from heat pumps and waste heat (TJ)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|----------------------------|------|------|------|------|------|------|-------|--|
| Total heat | - | - | - | - | - | - | - | - |
| Heat pumps ¹ | - | - | - | - | - | - | - | - |
| (-) Input to heat pumps | - | - | - | - | - | - | - | - |
| Other sources ² | - | - | - | - | - | - | - | - |

1. Installations producing heat for own use are not included.

2. Refers to production from hydrogen, purchased steam from industry, and waste heat.

Source: IEA/OECD *Electricity Statistics*.

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Table 6. Renewable and waste balance for 2016

| thousand tonnes of oil equivalent | Hydro ¹ | Wind | Tide wave ocean | Solar PV | Geo-thermal | Solar thermal | Industrial waste | Mun. waste renew. |
|------------------------------------|--------------------|------------|-----------------|------------|-------------|---------------|------------------|-------------------|
| Production | 10 | 9 | - | 9 | - | 2 | 13 | 13 |
| Imports | - | - | - | - | - | - | - | - |
| Exports | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| TPES | 10 | 9 | - | 9 | - | 2 | 13 | 13 |
| Statistical differences | - | - | - | - | - | - | - | - |
| Main activity electricity plants | -9 | -9 | - | - | - | - | - | -13 |
| Autoproducer electricity plants | -1 | - | - | -9 | - | - | - | - |
| Main activity CHP plants | - | - | - | - | - | - | - | - |
| Autoproducer CHP plants | - | - | - | - | - | - | - | - |
| Main heat plants | - | - | - | - | - | - | - | - |
| Autoproducer heat plants | - | - | - | - | - | - | - | - |
| Charcoal production plants | - | - | - | - | - | - | - | - |
| Other transformation | - | - | - | - | - | - | - | - |
| Energy Industry own use | - | - | - | - | - | - | - | - |
| Losses | - | - | - | - | - | - | - | - |
| TFC | - | - | - | - | - | 2 | 13 | - |
| Industry | - | - | - | - | - | - | 13 | - |
| Iron and steel | - | - | - | - | - | - | - | - |
| Chemical and petrochemical | - | - | - | - | - | - | - | - |
| Non-ferrous metals | - | - | - | - | - | - | - | - |
| Non-metallc minerals | - | - | - | - | - | - | 13 | - |
| Transport equipment | - | - | - | - | - | - | - | - |
| Machinery | - | - | - | - | - | - | - | - |
| Mining and quarrying | - | - | - | - | - | - | - | - |
| Food and tobacco | - | - | - | - | - | - | - | - |
| Paper, pulp and print | - | - | - | - | - | - | - | - |
| Wood and wood products | - | - | - | - | - | - | - | - |
| Construction | - | - | - | - | - | - | - | - |
| Textile and leather | - | - | - | - | - | - | - | - |
| Non-specified | - | - | - | - | - | - | - | - |
| Transport | - | - | - | - | - | - | - | - |
| Road | - | - | - | - | - | - | - | - |
| Other | - | - | - | - | - | - | - | - |
| Other | - | - | - | - | - | 2 | - | - |
| Residential | - | - | - | - | - | 2 | - | - |
| Commercial and public services | - | - | - | - | - | - | - | - |
| Agriculture/forestry | - | - | - | - | - | - | - | - |
| Fishing | - | - | - | - | - | - | - | - |
| Non-specified | - | - | - | - | - | - | - | - |
| Electricity generated - GWh | 115 | 101 | - | 100 | - | - | - | 42 |
| <i>Electricity plants</i> | 115 | 101 | - | 100 | - | - | - | 42 |
| <i>CHP plants</i> | - | - | - | - | - | - | - | - |
| Heat generated - TJ | - | - | - | - | - | - | - | - |
| <i>CHP plants</i> | - | - | - | - | - | - | - | - |
| <i>Heat plants</i> | - | - | - | - | - | - | - | - |

1. Hydro does not include pumped hydro.

Source: IEA/OECD *World Energy Balances*.

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Table 6. Renewable and waste balance for 2016 (continued)

| Mun. waste non-ren. | Wood/wood waste | Charcoal | Bio-gases | Bio-gasoline | Bio-diesel | Other liquid biofuels | Total renew. & waste sources ² | Share in total energy sources ³ |
|---------------------|-----------------|----------|-----------|--------------|------------|-----------------------|---|--|
| 21 | 63 | - | 20 | - | - | - | 160 | 100.0% |
| - | 32 | - | - | 9 | 81 | - | 122 | 2.9% |
| - | -26 | - | - | - | - | - | -26 | 16.8% |
| - | - | - | - | - | - | - | - | - |
| 21 | 69 | - | 20 | 9 | 81 | - | 256 | 6.9% |
| - | - | - | - | - | - | - | - | - |
| -21 | - | - | - | - | - | - | -52 | x |
| - | - | - | - | - | - | - | -10 | x |
| - | -15 | - | - | - | - | - | -15 | x |
| - | - | - | -11 | - | - | - | -11 | x |
| - | -5 | - | - | - | - | - | -5 | x |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | -5 | - | - | - | -5 | x |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | 50 | - | 5 | 9 | 81 | - | 160 | 4.5% |
| - | 24 | - | - | - | - | - | 37 | 5.5% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | 4 | - | - | - | - | - | 17 | 11.3% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | 19 | - | - | - | - | - | 19 | 82.7% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | 9 | 81 | - | 90 | 4.7% |
| - | - | - | - | 9 | 81 | - | 90 | 4.7% |
| - | - | - | - | - | - | - | - | - |
| - | 26 | - | 5 | - | - | - | 33 | 3.5% |
| - | 25 | - | - | - | - | - | 27 | 5.5% |
| - | 1 | - | 1 | - | - | - | 2 | 0.5% |
| - | - | - | 3 | - | - | - | 3 | 12.3% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| 69 | 25 | - | 73 | - | - | - | 525 | 67.1% |
| 69 | - | - | - | - | - | - | 427 | 99.8% |
| - | 25 | - | 73 | - | - | - | 98 | 27.6% |
| - | 559 | - | 86 | - | - | - | 645 | 26.5% |
| - | 388 | - | 86 | - | - | - | 474 | 22.0% |
| - | 171 | - | - | - | - | - | 171 | 62.4% |

2. Total includes non-renewable waste.

3. Share of renewables on TFC excludes electricity and heat generated from renewable sources.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|--|------|------|------|------|------|------|-------|---|
| Geothermal (TJ) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Solar thermal (TJ) | | | | | | | | |
| Production | - | - | 38 | 73 | 79 | 85 | 91 | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | 38 | 73 | 79 | 85 | 91 | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | 38 | 73 | 79 | 85 | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | 38 | 73 | 79 | 85 | .. | - |
| Industrial waste (TJ) | | | | | | | | |
| Production | - | 268 | 597 | 640 | 569 | 546 | 546 | 4.5 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | 268 | 597 | 640 | 569 | 546 | 546 | 4.5 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | 268 | 597 | 640 | 569 | 546 | .. | 4.5 |
| <i>Industry</i> | - | 268 | 597 | 640 | 569 | 546 | .. | 4.5 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Municipal waste - renewables (TJ) | | | | | | | | |
| Production | 510 | 407 | 421 | 443 | 516 | 529 | 589 | 1.7 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 510 | 407 | 421 | 443 | 516 | 529 | 589 | 1.7 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | 510 | 407 | 421 | 443 | 516 | 529 | .. | 1.7 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics (continued)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|--|------|------|------|------|------|------|-------|---|
| Municipal waste - non-renewables (TJ) | | | | | | | | |
| Production | 444 | 769 | 692 | 728 | 849 | 871 | 968 | 0.8 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 444 | 769 | 692 | 728 | 849 | 871 | 968 | 0.8 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | 444 | 769 | 692 | 728 | 849 | 871 | .. | 0.8 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Solid Biofuel excluding charcoal (TJ) | | | | | | | | |
| Production | - | 637 | 2052 | 2766 | 2392 | 2646 | 2887 | 9.3 |
| Net imports ¹ | - | 1 | -40 | -69 | 374 | 245 | 279 | 41.0 |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | 638 | 2012 | 2697 | 2766 | 2891 | 3166 | 9.9 |
| Statistical differences | - | - | - | - | - | 1 | .. | - |
| Transformation processes | - | 5 | 95 | 672 | 792 | 814 | .. | 37.5 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | 633 | 1917 | 2025 | 1974 | 2078 | .. | 7.7 |
| <i>Industry</i> | - | - | 1169 | 1116 | 1025 | 999 | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | 633 | 748 | 909 | 949 | 1079 | .. | 3.4 |
| Charcoal (kt) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Biogases (TJ) | | | | | | | | |
| Production | - | 40 | 490 | 701 | 739 | 833 | 881 | 20.9 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | 40 | 490 | 701 | 739 | 833 | 881 | 20.9 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | 17 | 275 | 555 | 595 | 644 | .. | 25.5 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | 23 | 215 | 146 | 144 | 189 | .. | 14.1 |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | 23 | 215 | 146 | 144 | 189 | .. | 14.1 |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics (continued)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|-----------------------------------|------|------|------|------|------|------|-------|---|
| Biogasoline (kt) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | 1 | 5 | 11 | 14 | 10 | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | 1 | 5 | 11 | 14 | 10 | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | 1 | 5 | 11 | 14 | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | 1 | 5 | 11 | 14 | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Biodiesel (kt) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | 45 | 75 | 83 | 89 | 117 | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | 45 | 75 | 83 | 89 | 117 | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | 45 | 75 | 83 | 89 | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | 45 | 75 | 83 | 89 | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Other liquid biofuels (kt) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Figure 1. Contribution of renewables in 1990

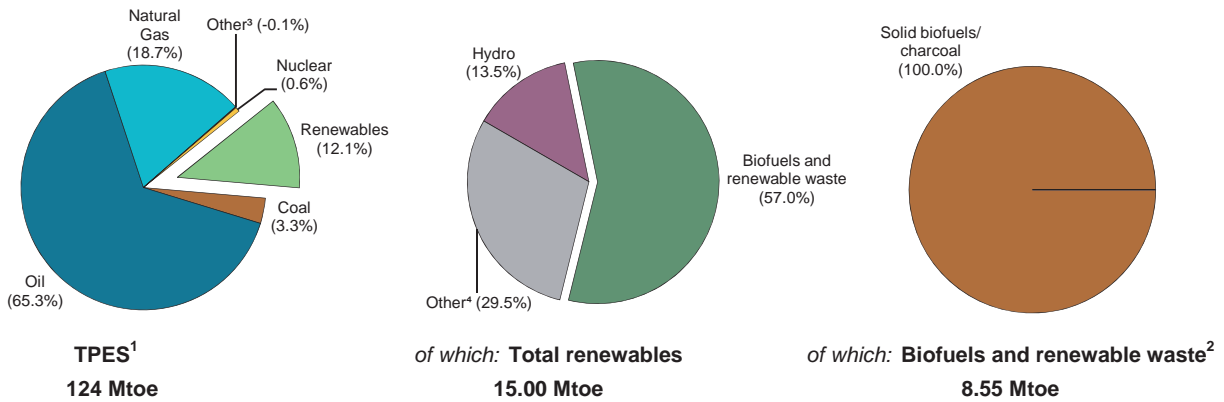


Figure 2. Contribution of renewables in 2017 provisional

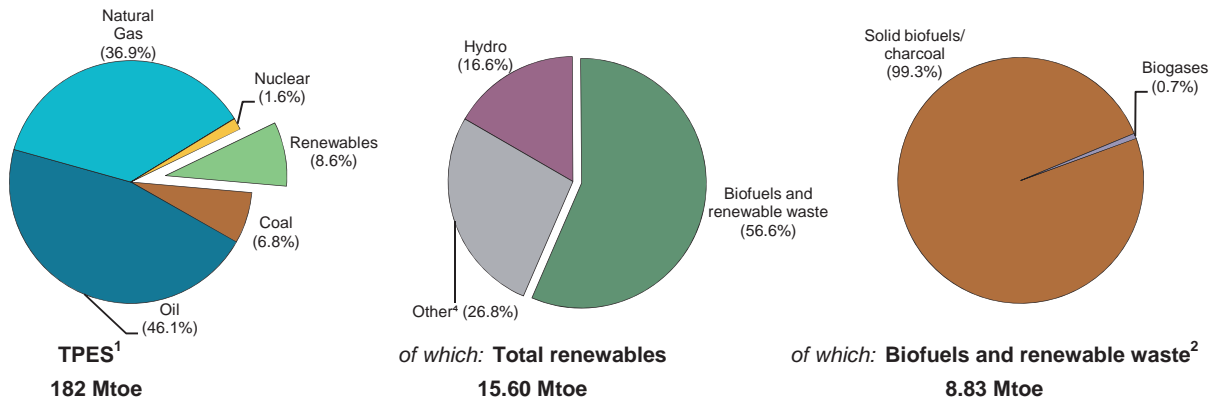
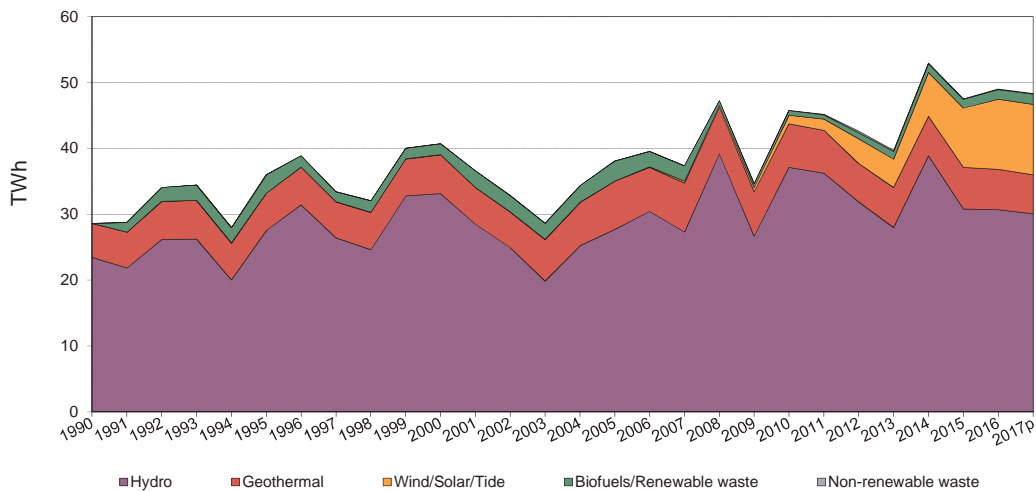


Figure 3. Electricity production by renewables and waste energy source



1. Total primary energy supply includes electricity trade.
2. Biofuels and renewable waste include solid biofuels, liquid biofuels, biogases, and renewable municipal waste.
3. Includes non-renewable municipal waste, industrial waste, peat, shale oil, electricity trade, and other sources of primary energy. (In the case of negative values, the net exports of electricity are greater than the other products in this category).
4. Includes geothermal, solar, wind and tide.

Note: Totals may not sum due to rounding.
Source: IEA/OECD World Energy Balances.

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Table 1. Energy supply, GDP and population

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|---|--------|--------|---------|---------|---------|---------|---------|--|
| TPES (Mtoe) | 123.69 | 150.82 | 178.54 | 188.18 | 184.89 | 185.16 | 182.14 | 1.1 |
| of which: Renewables (Mtoe) ¹ | 15.00 | 16.91 | 15.15 | 15.93 | 15.47 | 15.62 | 15.60 | -0.5 |
| Renewables/TPES(%) | 12.1 | 11.2 | 8.5 | 8.5 | 8.4 | 8.4 | 8.6 | -1.6 |
| GDP (billion 2010 US dollars) | 643.21 | 915.22 | 1057.80 | 1184.65 | 1223.40 | 1259.04 | 1284.68 | 2.0 |
| TPES/GDP ² | 0.19 | 0.16 | 0.17 | 0.16 | 0.15 | 0.15 | 0.14 | -0.9 |
| TPES/GDP (year 2010 = 100) | 114 | 98 | 100 | 94 | 90 | 87 | 84 | -0.9 |
| Population (millions) | 87.07 | 100.90 | 114.26 | 119.71 | 121.01 | 122.27 | 123.52 | 1.2 |
| TPES/population (toe per capita) | 1.42 | 1.49 | 1.56 | 1.57 | 1.53 | 1.51 | 1.47 | -0.1 |
| Electricity generation (TWh) ³ | 115.8 | 205.7 | 275.5 | 301.5 | 310.7 | 320.4 | 319.5 | 2.6 |
| of which: Renewables (TWh) ^{1,3} | 28.60 | 40.73 | 45.75 | 52.89 | 47.48 | 48.94 | 48.24 | 1.0 |
| Renew./Total Elec.(%) ^{1,4} | 24.7 | 19.8 | 16.6 | 17.5 | 15.3 | 15.3 | 15.1 | -1.6 |
| Road energy consumption (Mtoe) | 27.2 | 33.9 | 49.7 | 49.8 | 49.5 | 51.3 | .. | .. |
| of which: Liquid biofuels (Mtoe) | - | - | - | - | - | - | .. | .. |
| Liq. biofuels/road tr.(%) ⁵ | - | - | - | - | - | - | - | - |

1. Renewables do not include industrial waste, non-renewable municipal waste and pumped storage production.

2. In units of toe per thousand 2010 US dollars.

3. Electricity generation = gross production - amount of electricity produced in pumped storage plants.

4. Electricity share generated from renewables over the total electricity production.

5. Energy from liquid biofuels consumed in road transport over the total energy consumed in road transport.

Source: IEA/OECD *World Energy Balances* and OECD *Main Economic Indicators*.

Table 2. Net generating capacity of renewable and waste sources (MWe)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | Average annual percent change 00-16 |
|---|-------------|--------------|--------------|--------------|--------------|--------------|--|
| Total capacity | 8546 | 10868 | 13531 | 16610 | 17325 | 18759 | 3.5 |
| Hydro | 7838 | 9653 | 11597 | 12464 | 12223 | 12580 | 1.7 |
| Hydro <1MW | - | 6 | 3 | 3 | 3 | 3 | -4.2 |
| Hydro 1-10MW | 33 | 136 | 98 | 117 | 115 | 169 | 1.4 |
| Hydro 10+MW | 7805 | 9511 | 11496 | 12344 | 12105 | 12408 | 1.7 |
| Mixed plants | - | - | - | - | - | - | - |
| Pure pumped storage | - | - | - | - | - | - | - |
| Geothermal | 700 | 855 | 965 | 813 | 906 | 926 | 0.5 |
| Solar photovoltaic | 5 | 14 | 29 | 116 | 173 | 199 e | 18.0 |
| Solar thermal | - | - | - | - | - | - | - |
| Tide, wave, ocean | - | - | - | - | - | - | - |
| Wind | 3 | 17 | 519 | 2569 | 3271 | 4051 | 40.8 |
| Industrial waste | - | - | 16 | 42 | 29 | 162 | - |
| Municipal waste | - | - | - | - | - | - | - |
| Solid biofuels | - | 321 | 384 | 569 | 685 | 796 | 5.8 |
| Biogases | - | 8 | 21 | 37 | 38 | 45 | 11.4 |
| Liquid biofuels | - | - | - | - | - | - | - |
| Solar collectors surface (1000 m ²) | - | 373 | 1666 | 2810 | 3166 | 3547 | 15.1 |
| Cap. of solar collectors (MW _{th}) ¹ | - | 261 | 1166 | 1967 | 2216 | 2483 | 15.1 |

1. Converted at 0.7 kW_{th}/m² of solar collector area, as estimated by the IEA Solar Heating & Cooling Programme.

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Table 3. Capacity factors (%)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 |
|--|--------------|--------------|--------------|--------------|--------------|--------------|
| Total plants¹ | 38.21 | 42.78 | 38.64 | 36.40 | 31.30 | 29.82 |
| Hydro | 34.19 | 39.18 | 36.55 | 35.62 | 28.78 | 27.86 |
| <i>of which: <1MW</i> | - | 28.54 | 39.36 | 37.66 | 43.29 | 40.54 |
| <i>of which: 1-10MW</i> | 48.43 | 37.60 | 45.57 | 40.75 | 45.00 | 35.21 |
| <i>of which: 10+MW</i> | 34.13 | 39.21 | 36.47 | 35.57 | 28.62 | 27.75 |
| <i>of which: pure pumped storage²</i> | - | - | - | - | - | - |
| Geothermal | 83.56 | 78.79 | 78.29 | 84.24 | 79.77 | 75.79 |
| Solar photovoltaic | 2.28 | 5.71 | 12.20 | 21.72 | 16.21 | 14.47 e |
| Solar thermal | - | - | - | - | - | - |
| Tide, wave and ocean | - | - | - | - | - | - |
| Wind | 3.81 | 12.76 | 27.25 | 28.56 | 30.52 | 29.24 |
| Industrial waste | - | - | 34.10 | 20.85 | 11.07 | 5.12 |
| Municipal waste | - | - | - | - | - | - |
| Solid biofuels | - | 58.86 | 18.14 | 23.85 | 19.68 | 18.68 |
| Biogases | - | 24.26 | 64.24 | 50.82 | 48.18 | 40.18 |
| Biodiesels | - | - | - | - | - | - |
| Other liquid biofuels | - | - | - | - | - | - |

1. The capacity factor is defined as: the annual gross electricity generation divided by the reported net capacity times 365 (days/year) times 24 (hours/day).

2. In case a country has at least one mixed hydro plants, it is impossible to calculate capacity factor thus it is shown as 'not applicable'.

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Table 4. Gross electricity production from renewable and waste sources (GWh)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|--------------------------------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|-------------------------------------|
| Total electricity¹ | 28604 | 40732 | 45795 | 52970 | 47506 | 49010 | 48324 | 1.0 |
| Hydro | 23478 | 33133 | 37131 | 38893 | 30815 | 30698 | 30078 | -0.6 |
| <i>of which: pumped storage</i> | - | - | - | - | - | - | - | - |
| Geothermal | 5124 | 5901 | 6618 | 6000 | 6331 | 6148 | 5925 | 0.0 |
| Solar photovoltaic | 1 | 7 | 31 | 221 | 246 | 252 | 360 | 26.1 |
| Solar thermal | - | - | - | - | - | - | - | - |
| Tide, wave, ocean | - | - | - | - | - | - | - | - |
| Wind | 1 | 19 | 1239 | 6426 | 8745 | 10378 | 10353 | 44.9 |
| Industrial waste | - | - | 48 | 77 | 28 | 73 | 81 | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | - | - | - | - | - |
| Solid biofuels | - | 1655 | 610 | 1189 | 1180 | 1303 | 1327 | -1.3 |
| Biogases | - | 17 | 118 | 164 | 161 | 158 | 200 | 15.6 |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| of which: | | | | | | | | |
| Electricity only plants | 28604 | 40732 | 45689 | 52512 | 47136 | 48564 | .. | - |
| Hydro | 23478 | 33133 | 37131 | 38893 | 30815 | 30698 | .. | - |
| <i>of which: pumped storage</i> | - | - | - | - | - | - | - | - |
| Geothermal | 5124 | 5901 | 6618 | 6000 | 6331 | 6148 | .. | - |
| Solar photovoltaic | 1 | 7 | 31 | 221 | 246 | 252 | .. | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Tide, wave, ocean | - | - | - | - | - | - | - | - |
| Wind | 1 | 19 | 1239 | 6426 | 8745 | 10378 | .. | - |
| Industrial waste | - | - | 48 | 17 | 28 | 73 | .. | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | - | - | - | - | - |
| Solid biofuels | - | 1655 | 610 | 900 | 923 | 956 | .. | - |
| Biogases | - | 17 | 12 | 55 | 48 | 59 | .. | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| CHP plants | - | - | 106 | 458 | 370 | 446 | .. | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | - | 60 | - | - | - | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | - | - | - | - | - |
| Solid biofuels | - | - | - | 289 | 257 | 347 | .. | - |
| Biogases | - | - | 106 | 109 | 113 | 99 | .. | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |

1. **Total electricity** includes the electricity produced from industrial waste, non-renewable municipal waste and pumped storage. Electricity from renewable sources does *not* include the electricity produced from industrial waste, non-renewable municipal waste and pumped storage production.

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Table 5A. Heat production¹ from renewable and waste sources in the transformation sector (TJ)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|----------------------------|------|------|------|------|------|------|-------|--|
| Total heat | - | - | - | - | - | - | - | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | - | - | - | - | - |
| Solid biofuels | - | - | - | - | - | - | - | - |
| Biogases | - | - | - | - | - | - | - | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| <i>of which:</i> | | | | | | | | |
| CHP plants | - | - | - | - | - | - | - | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | - | - | - | - | - |
| Solid biofuels | - | - | - | - | - | - | - | - |
| Biogases | - | - | - | - | - | - | - | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| Heat only plants | - | - | - | - | - | - | - | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | - | - | - | - | - |
| Solid biofuels | - | - | - | - | - | - | - | - |
| Biogases | - | - | - | - | - | - | - | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |

1. Waste heat and heat production from heat pumps are not included and are reported separately in Table 5B.

Table 5B. Heat production from heat pumps and waste heat (TJ)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|----------------------------|------|------|------|------|------|------|-------|--|
| Total heat | - | - | - | - | - | - | - | - |
| Heat pumps ¹ | - | - | - | - | - | - | - | - |
| (-) Input to heat pumps | - | - | - | - | - | - | - | - |
| Other sources ² | - | - | - | - | - | - | - | - |

1. Installations producing heat for own use are not included.

2. Refers to production from hydrogen, purchased steam from industry, and waste heat.

Source: IEA/OECD *Electricity Statistics*.

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Table 6. Renewable and waste balance for 2016

| thousand tonnes of oil equivalent | Hydro ¹ | Wind | Tide wave ocean | Solar PV | Geo-thermal | Solar thermal | Industrial waste | Mun. waste renew. |
|------------------------------------|--------------------|--------------|-----------------|------------|-------------|---------------|------------------|-------------------|
| Production | 2640 | 892 | - | 22 | 3168 | 243 | 13 | - |
| Imports | - | - | - | - | - | - | - | - |
| Exports | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| TPES | 2640 | 892 | - | 22 | 3168 | 243 | 13 | - |
| Statistical differences | - | - | - | - | - | - | - | - |
| Main activity electricity plants | -2563 | -212 | - | -1 | -3108 | - | - | - |
| Autoproducer electricity plants | -77 | -681 | - | -21 | -59 | - | -13 | - |
| Main activity CHP plants | - | - | - | - | - | - | - | - |
| Autoproducer CHP plants | - | - | - | - | - | - | - | - |
| Main heat plants | - | - | - | - | - | - | - | - |
| Autoproducer heat plants | - | - | - | - | - | - | - | - |
| Charcoal production plants | - | - | - | - | - | - | - | - |
| Other transformation | - | - | - | - | - | - | - | - |
| Energy Industry own use | - | - | - | - | - | - | - | - |
| Losses | - | - | - | - | - | - | - | - |
| TFC | - | - | - | - | - | 243 | - | - |
| Industry | - | - | - | - | - | 12 | - | - |
| Iron and steel | - | - | - | - | - | - | - | - |
| Chemical and petrochemical | - | - | - | - | - | - | - | - |
| Non-ferrous metals | - | - | - | - | - | - | - | - |
| Non-metallc minerals | - | - | - | - | - | - | - | - |
| Transport equipment | - | - | - | - | - | - | - | - |
| Machinery | - | - | - | - | - | - | - | - |
| Mining and quarrying | - | - | - | - | - | - | - | - |
| Food and tobacco | - | - | - | - | - | - | - | - |
| Paper, pulp and print | - | - | - | - | - | - | - | - |
| Wood and wood products | - | - | - | - | - | - | - | - |
| Construction | - | - | - | - | - | - | - | - |
| Textile and leather | - | - | - | - | - | - | - | - |
| Non-specified | - | - | - | - | - | 12 | - | - |
| Transport | - | - | - | - | - | - | - | - |
| Road | - | - | - | - | - | - | - | - |
| Other | - | - | - | - | - | - | - | - |
| Other | - | - | - | - | - | 231 | - | - |
| Residential | - | - | - | - | - | 140 | - | - |
| Commercial and public services | - | - | - | - | - | 91 | - | - |
| Agriculture/forestry | - | - | - | - | - | - | - | - |
| Fishing | - | - | - | - | - | - | - | - |
| Non-specified | - | - | - | - | - | - | - | - |
| Electricity generated - GWh | 30698 | 10378 | - | 252 | 6148 | - | 73 | - |
| <i>Electricity plants</i> | 30698 | 10378 | - | 252 | 6148 | - | 73 | - |
| <i>CHP plants</i> | - | - | - | - | - | - | - | - |
| Heat generated - TJ | - | - | - | - | - | - | - | - |
| <i>CHP plants</i> | - | - | - | - | - | - | - | - |
| <i>Heat plants</i> | - | - | - | - | - | - | - | - |

1. Hydro does not include pumped hydro.

Source: IEA/OECD *World Energy Balances*.

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Table 6. Renewable and waste balance for 2016 (continued)

| Mun. waste non-ren. | Wood/wood waste | Charcoal | Bio-gases | Bio-gasoline | Bio-diesel | Other liquid biofuels | Total renew. & waste sources ² | Share in total energy sources ³ |
|---------------------|-----------------|----------|------------|--------------|------------|-----------------------|---|--|
| - | 8609 | - | 46 | - | - | - | 15633 | 8.7% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | 8609 | - | 46 | - | - | - | 15633 | 8.4% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | -5884 | x |
| - | -1371 | - | -19 | - | - | - | -2241 | x |
| - | - | - | - | - | - | - | - | - |
| - | -315 | - | -27 | - | - | - | -342 | x |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | 6923 | - | - | - | - | - | 7166 | 5.9% |
| - | 914 | - | - | - | - | - | 926 | 2.6% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | 792 | - | - | - | - | - | 792 | 50.3% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | 122 | - | - | - | - | - | 134 | 0.8% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | 6008 | - | - | - | - | - | 6239 | 22.0% |
| - | 6008 | - | - | - | - | - | 6148 | 34.6% |
| - | - | - | - | - | - | - | 91 | 2.3% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | 1303 | - | 158 | - | - | - | 49010 | 15.3% |
| - | 956 | - | 59 | - | - | - | 48564 | 16.0% |
| - | 347 | - | 99 | - | - | - | 446 | 2.6% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |

2. Total includes non-renewable waste.

3. Share of renewables on TFC excludes electricity and heat generated from renewable sources.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|--|--------|--------|--------|--------|--------|--------|--------|---|
| Geothermal (TJ) | | | | | | | | |
| Production | 184464 | 212436 | 151847 | 129902 | 134554 | 132619 | 125471 | -2.9 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 184464 | 212436 | 151847 | 129902 | 134554 | 132619 | 125471 | -2.9 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | 184464 | 212436 | 151847 | 129902 | 134554 | 132619 | .. | -2.9 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Solar thermal (TJ) | | | | | | | | |
| Production | 727 | 1822 | 4858 | 8064 | 9087 | 10181 | 11320 | 11.4 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 727 | 1822 | 4858 | 8064 | 9087 | 10181 | 11320 | 11.4 |
| Statistical differences | - | - | -1 | - | - | -1 | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 727 | 1822 | 4857 | 8064 | 9087 | 10180 | .. | 11.4 |
| <i>Industry</i> | 34 | 85 | 218 | 415 | 462 | 519 | .. | 12.0 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 693 | 1737 | 4639 | 7649 | 8625 | 9661 | .. | 11.3 |
| Industrial waste (TJ) | | | | | | | | |
| Production | - | - | 533 | 861 | 473 | 552 | 615 | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | 533 | 861 | 473 | 552 | 615 | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | 533 | 861 | 473 | 552 | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Municipal waste - renewables (TJ) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics (continued)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|--|--------|--------|--------|--------|--------|--------|--------|---|
| Municipal waste - non-renewables (TJ) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Solid Biofuel excluding charcoal (TJ) | | | | | | | | |
| Production | 358132 | 373986 | 338040 | 363107 | 358731 | 360430 | 367177 | -0.2 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 358132 | 373986 | 338040 | 363107 | 358731 | 360430 | 367177 | -0.2 |
| Statistical differences | -1 | 1 | - | 1 | -1 | 1 | .. | - |
| Transformation processes | - | 31321 | 41080 | 71283 | 68740 | 70597 | .. | 5.2 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 358131 | 342666 | 296960 | 291825 | 289990 | 289834 | .. | -1.0 |
| <i>Industry</i> | 81669 | 57690 | 37649 | 37708 | 37150 | 38276 | .. | -2.5 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 276462 | 284976 | 259311 | 254117 | 252840 | 251558 | .. | -0.8 |
| Charcoal (kt) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Biogases (TJ) | | | | | | | | |
| Production | - | 357 | 1298 | 1939 | 1961 | 1912 | 2520 | 11.1 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | 357 | 1298 | 1939 | 1961 | 1912 | 2520 | 11.1 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | 357 | 1298 | 1939 | 1961 | 1912 | .. | 11.1 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics (continued)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|-----------------------------------|------|------|------|------|------|------|-------|---|
| Biogasoline (kt) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Biodiesel (kt) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Other liquid biofuels (kt) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Figure 1. Contribution of renewables in 1990

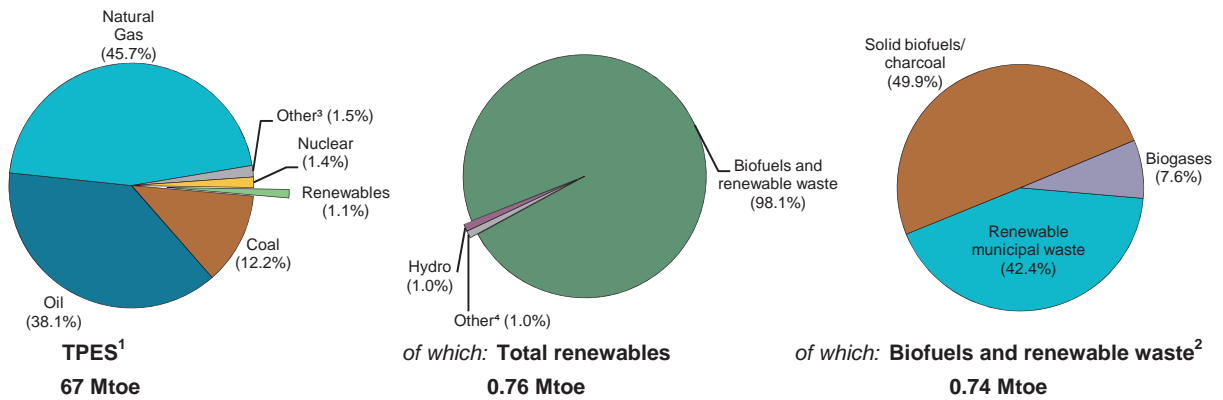


Figure 2. Contribution of renewables in 2017 provisional

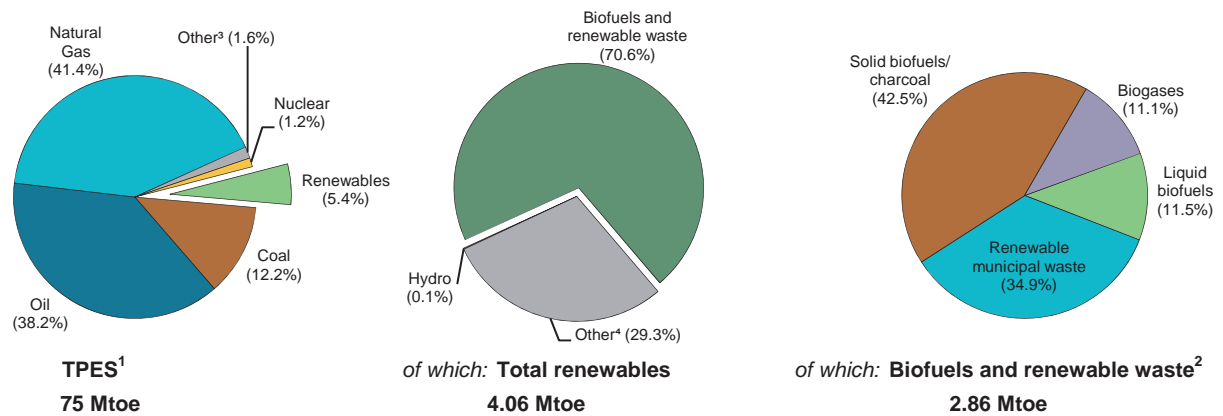
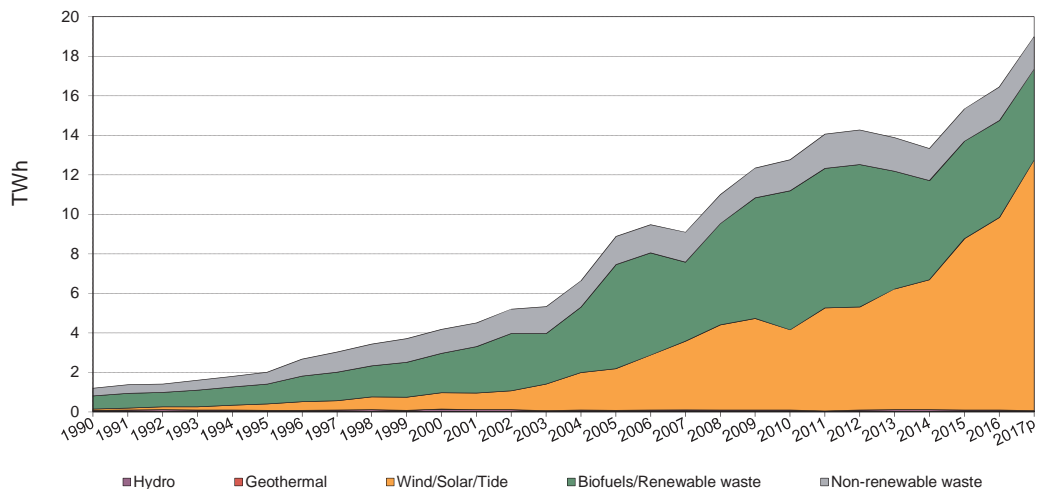


Figure 3. Electricity production by renewables and waste energy source



1. Total primary energy supply includes electricity trade.
2. Biofuels and renewable waste include solid biofuels, liquid biofuels, biogases, and renewable municipal waste.
3. Includes non-renewable municipal waste, industrial waste, peat, shale oil, electricity trade, and other sources of primary energy. (In the case of negative values, the net exports of electricity are greater than the other products in this category).
4. Includes geothermal, solar, wind and tide.

Note: Totals may not sum due to rounding.
Source: IEA/OECD *World Energy Balances*.

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Table 1. Energy supply, GDP and population

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|---|--------|--------|--------|--------|--------|--------|--------|--|
| TPES (Mtoe) | 67.21 | 75.45 | 84.32 | 73.40 | 73.60 | 74.54 | 74.98 | -0.0 |
| of which: Renewables (Mtoe) ¹ | 0.76 | 1.35 | 3.23 | 3.44 | 3.70 | 3.77 | 4.06 | 6.7 |
| Renewables/TPES(%) | 1.1 | 1.8 | 3.8 | 4.7 | 5.0 | 5.1 | 5.4 | 6.7 |
| GDP (billion 2010 US dollars) | 530.53 | 734.69 | 836.39 | 851.64 | 870.89 | 890.14 | 918.28 | 1.3 |
| TPES/GDP ² | 0.13 | 0.10 | 0.10 | 0.09 | 0.08 | 0.08 | 0.08 | -1.3 |
| TPES/GDP (year 2010 = 100) | 126 | 102 | 100 | 85 | 84 | 83 | 81 | -1.3 |
| Population (millions) | 14.95 | 15.92 | 16.61 | 16.86 | 16.93 | 17.03 | 17.13 | 0.4 |
| TPES/population (toe per capita) | 4.50 | 4.74 | 5.08 | 4.35 | 4.35 | 4.38 | 4.38 | -0.5 |
| Electricity generation (TWh) ³ | 72.0 | 89.6 | 119.3 | 103.4 | 110.1 | 115.2 | 116.6 | 1.6 |
| of which: Renewables (TWh) ^{1,3} | 0.81 | 2.97 | 11.20 | 11.71 | 13.70 | 14.73 | 17.33 | 10.9 |
| Renew./Total Elec.(%) ^{1,4} | 1.1 | 3.3 | 9.4 | 11.3 | 12.4 | 12.8 | 14.9 | 9.2 |
| Road energy consumption (Mtoe) | 8.8 | 10.4 | 11.1 | 9.8 | 9.9 | 9.9 | .. | .. |
| of which: Liquid biofuels (Mtoe) | - | - | 0.23 | 0.35 | 0.30 | 0.24 | .. | .. |
| Liq. biofuels/road tr.(%) ⁵ | - | - | 2.1 | 3.6 | 3.0 | 2.4 | - | - |

1. Renewables do not include industrial waste, non-renewable municipal waste and pumped storage production.

2. In units of toe per thousand 2010 US dollars.

3. Electricity generation = gross production - amount of electricity produced in pumped storage plants.

4. Electricity share generated from renewables over the total electricity production.

5. Energy from liquid biofuels consumed in road transport over the total energy consumed in road transport.

Source: IEA/OECD *World Energy Balances* and OECD *Main Economic Indicators*.

Table 2. Net generating capacity of renewable and waste sources (MWe)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | Average annual percent change 00-16 |
|---|------------|-------------|-------------|-------------|-------------|-------------|--|
| Total capacity | 308 | 1022 | 3855 | 5161 | 6130 | 7507 | 13.3 |
| Hydro | 37 | 37 | 37 | 37 | 37 | 37 | - |
| Hydro <1MW | - | - | - | - | - | - | - |
| Hydro 1-10MW | - | - | - | - | - | - | - |
| Hydro 10+MW | 37 | 37 | 37 | 37 | 37 | 37 | - |
| Mixed plants | - | - | - | - | - | - | - |
| Pure pumped storage | - | - | - | - | - | - | - |
| Geothermal | - | - | - | - | - | - | - |
| Solar photovoltaic | 1 | 13 | 90 | 1048 | 1515 | 2049 | 37.2 |
| Solar thermal | - | - | - | - | - | - | - |
| Tide, wave, ocean | - | - | - | - | - | - | - |
| Wind | 50 | 447 | 2237 | 2865 | 3391 | 4257 | 15.1 |
| Industrial waste | - | - | - | - | - | - | - |
| Municipal waste | 196 | 394 | 586 | 649 | 649 | 649 | 3.2 |
| Solid biofuels | 5 | 72 | 688 | 325 | 299 | 294 | 9.2 |
| Biogases | 19 | 59 | 200 | 237 | 239 | 221 | 8.6 |
| Liquid biofuels | - | - | 17 | - | - | - | - |
| Solar collectors surface (1000 m ²) | 73 | 276 | 576 | 644 | 647 | 652 | 5.5 |
| Cap. of solar collectors (MW _{th}) ¹ | 51 | 193 | 403 | 451 | 453 | 456 | 5.5 |

1. Converted at 0.7 kW_{th}/m² of solar collector area, as estimated by the IEA Solar Heating & Cooling Programme.

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Table 3. Capacity factors (%)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 |
|--|--------------|--------------|--------------|--------------|--------------|--------------|
| Total plants¹ | 44.48 | 46.69 | 37.79 | 29.49 | 28.54 | 25.00 |
| Hydro | 26.22 | 43.94 | 32.40 | 34.62 | 28.60 | 30.88 |
| <i>of which: <1MW</i> | - | - | - | - | - | - |
| <i>of which: 1-10MW</i> | - | - | - | - | - | - |
| <i>of which: 10+MW</i> | 26.22 | 43.94 | 32.40 | 34.62 | 28.60 | 30.88 |
| <i>of which: pure pumped storage²</i> | - | - | - | - | - | - |
| Geothermal | - | - | - | - | - | - |
| Solar photovoltaic | 4.79 | 6.75 | 7.09 | 8.55 | 8.45 | 8.69 |
| Solar thermal | - | - | - | - | - | - |
| Tide, wave and ocean | - | - | - | - | - | - |
| Wind | 12.79 | 21.17 | 20.38 | 23.10 | 25.42 | 21.91 |
| Industrial waste | - | - | - | - | - | - |
| Municipal waste | 54.34 | 71.87 | 64.81 | 62.17 | 63.86 | 65.31 |
| Solid biofuels | 78.69 | 68.92 | 69.65 | 73.72 | 72.43 | 74.03 |
| Biogases | 54.80 | 55.24 | 58.67 | 48.43 | 49.48 | 51.28 |
| Biodiesels | - | - | - | - | - | - |
| Other liquid biofuels | - | - | 36.37 | - | - | - |

1. The capacity factor is defined as: the annual gross electricity generation divided by the reported net capacity times 365 (days/year) times 24 (hours/day).

2. In case a country has at least one mixed hydro plants, it is impossible to calculate capacity factor thus it is shown as 'not applicable'.

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Table 4. Gross electricity production from renewable and waste sources (GWh)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|--------------------------------------|-------------|-------------|--------------|--------------|--------------|--------------|--------------|---|
| Total electricity¹ | 1200 | 4181 | 12761 | 13334 | 15329 | 16442 | 18989 | 9.3 |
| Hydro | 85 | 142 | 105 | 112 | 93 | 100 | 61 | -4.8 |
| <i>of which: pumped storage</i> | - | - | - | - | - | - | - | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar photovoltaic | - | 8 | 56 | 785 | 1122 | 1560 | 2099 | 38.8 |
| Solar thermal | - | - | - | - | - | - | - | - |
| Tide, wave, ocean | - | - | - | - | - | - | - | - |
| Wind | 56 | 829 | 3994 | 5797 | 7550 | 8170 | 10574 | 16.2 |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | 539 | 1272 | 1763 | 1909 | 1997 | 2005 | 1942 | 2.5 |
| Municipal waste non-renew. | 394 | 1209 | 1564 | 1626 | 1634 | 1708 | 1655 | 1.9 |
| Solid biofuels | 34 | 435 | 4197 | 2100 | 1897 | 1906 | 1717 | 8.4 |
| Biogases | 92 | 286 | 1028 | 1005 | 1036 | 993 | 941 | 7.3 |
| Liquid biofuels | - | - | 54 | - | - | - | - | - |
| of which: | | | | | | | | |
| Electricity only plants | 141 | 3011 | 7463 | 8177 | 10533 | 10979 | .. | - |
| Hydro | 85 | 142 | 105 | 112 | 93 | 100 | .. | - |
| <i>of which: pumped storage</i> | - | - | - | - | - | - | - | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar photovoltaic | - | 8 | 56 | 785 | 1122 | 1560 | .. | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Tide, wave, ocean | - | - | - | - | - | - | - | - |
| Wind | 56 | 829 | 3994 | 5797 | 7550 | 8170 | .. | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | - | 834 | 384 | - | - | - | - | - |
| Municipal waste non-renew. | - | 793 | 341 | - | - | - | - | - |
| Solid biofuels | - | 291 | 2447 | 1437 | 1725 | 1115 | .. | - |
| Biogases | - | 114 | 82 | 46 | 43 | 34 | .. | - |
| Liquid biofuels | - | - | 54 | - | - | - | - | - |
| CHP plants | 1059 | 1170 | 5298 | 5157 | 4796 | 5463 | .. | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | 539 | 438 | 1379 | 1909 | 1997 | 2005 | .. | - |
| Municipal waste non-renew. | 394 | 416 | 1223 | 1626 | 1634 | 1708 | .. | - |
| Solid biofuels | 34 | 144 | 1750 | 663 | 172 | 791 | .. | - |
| Biogases | 92 | 172 | 946 | 959 | 993 | 959 | .. | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |

1. **Total electricity** includes the electricity produced from industrial waste, non-renewable municipal waste and pumped storage. Electricity from renewable sources does *not* include the electricity produced from industrial waste, non-renewable municipal waste and pumped storage production.

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Table 5A. Heat production¹ from renewable and waste sources in the transformation sector (TJ)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|----------------------------|-------------|-------------|--------------|--------------|--------------|--------------|--------------|--|
| Total heat | 3377 | 6344 | 11752 | 19146 | 22644 | 22923 | 25691 | 8.6 |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | 1806 | 3126 | 4992 | 9747 | 11689 | 11105 | 11828 | 8.1 |
| Municipal waste non-renew. | 1318 | 2971 | 4427 | 8303 | 9563 | 9473 | 10076 | 7.4 |
| Solid biofuels | 233 | 203 | 2051 | 1050 | 1344 | 2072 | 3633 | 18.5 |
| Biogases | 20 | 44 | 282 | 46 | 48 | 273 | 154 | 7.6 |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| <i>of which:</i> | | | | | | | | |
| CHP plants | 3377 | 1610 | 4758 | 18787 | 21906 | 21772 | .. | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | 1806 | 699 | 1285 | 9747 | 11689 | 11105 | .. | - |
| Municipal waste non-renew. | 1318 | 664 | 1140 | 8303 | 9563 | 9473 | .. | - |
| Solid biofuels | 233 | 203 | 2051 | 691 | 606 | 921 | .. | - |
| Biogases | 20 | 44 | 282 | 46 | 48 | 273 | .. | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| Heat only plants | - | 4734 | 6994 | 359 | 738 | 1151 | .. | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | - | 2427 | 3707 | - | - | - | - | - |
| Municipal waste non-renew. | - | 2307 | 3287 | - | - | - | - | - |
| Solid biofuels | - | - | - | 359 | 738 | 1151 | .. | - |
| Biogases | - | - | - | - | - | - | - | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |

1. Waste heat and heat production from heat pumps are not included and are reported separately in Table 5B.

Table 5B. Heat production from heat pumps and waste heat (TJ)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|----------------------------|----------|----------|----------|----------|----------|----------|----------|--|
| Total heat | - | - | - | - | - | - | - | - |
| Heat pumps ¹ | - | - | - | - | - | - | - | - |
| (-) Input to heat pumps | - | - | - | - | - | - | - | - |
| Other sources ² | - | - | - | - | - | - | - | - |

1. Installations producing heat for own use are not included.

2. Refers to production from hydrogen, purchased steam from industry, and waste heat.

Source: IEA/OECD *Electricity Statistics*.

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Table 6. Renewable and waste balance for 2016

| thousand tonnes of oil equivalent | Hydro ¹ | Wind | Tide wave ocean | Solar PV | Geo-thermal | Solar thermal | Industrial waste | Mun. waste renew. |
|------------------------------------|--------------------|-------------|-----------------|-------------|-------------|---------------|------------------|-------------------|
| Production | 9 | 702 | - | 134 | 68 | 27 | - | 794 |
| Imports | - | - | - | - | - | - | - | 250 |
| Exports | - | - | - | - | - | - | - | -34 |
| Stock changes | - | - | - | - | - | - | - | - |
| TPES | 9 | 702 | - | 134 | 68 | 27 | - | 1010 |
| Statistical differences | - | - | - | - | - | - | - | - |
| Main activity electricity plants | -9 | -624 | - | -5 | - | - | - | - |
| Autoproducer electricity plants | - | -79 | - | -129 | - | - | - | - |
| Main activity CHP plants | - | - | - | - | - | - | - | - |
| Autoproducer CHP plants | - | - | - | - | - | - | - | -970 |
| Main heat plants | - | - | - | - | - | - | - | - |
| Autoproducer heat plants | - | - | - | - | - | - | - | - |
| Charcoal production plants | - | - | - | - | - | - | - | - |
| Other transformation | - | - | - | - | - | - | - | - |
| Energy Industry own use | - | - | - | - | - | - | - | - |
| Losses | - | - | - | - | - | - | - | - |
| TFC | - | - | - | - | 68 | 27 | - | 40 |
| Industry | - | - | - | - | - | - | - | - |
| Iron and steel | - | - | - | - | - | - | - | - |
| Chemical and petrochemical | - | - | - | - | - | - | - | - |
| Non-ferrous metals | - | - | - | - | - | - | - | - |
| Non-metallc minerals | - | - | - | - | - | - | - | - |
| Transport equipment | - | - | - | - | - | - | - | - |
| Machinery | - | - | - | - | - | - | - | - |
| Mining and quarrying | - | - | - | - | - | - | - | - |
| Food and tobacco | - | - | - | - | - | - | - | - |
| Paper, pulp and print | - | - | - | - | - | - | - | - |
| Wood and wood products | - | - | - | - | - | - | - | - |
| Construction | - | - | - | - | - | - | - | - |
| Textile and leather | - | - | - | - | - | - | - | - |
| Non-specified | - | - | - | - | - | - | - | - |
| Transport | - | - | - | - | - | - | - | - |
| Road | - | - | - | - | - | - | - | - |
| Other | - | - | - | - | - | - | - | - |
| Other | - | - | - | - | 68 | 27 | - | 40 |
| Residential | - | - | - | - | - | 22 | - | - |
| Commercial and public services | - | - | - | - | - | 5 | - | 40 |
| Agriculture/forestry | - | - | - | - | 68 | - | - | - |
| Fishing | - | - | - | - | - | - | - | - |
| Non-specified | - | - | - | - | - | - | - | - |
| Electricity generated - GWh | 100 | 8170 | - | 1560 | - | - | - | 2005 |
| <i>Electricity plants</i> | 100 | 8170 | - | 1560 | - | - | - | - |
| <i>CHP plants</i> | - | - | - | - | - | - | - | 2005 |
| Heat generated - TJ | - | - | - | - | - | - | - | 11105 |
| <i>CHP plants</i> | - | - | - | - | - | - | - | 11105 |
| <i>Heat plants</i> | - | - | - | - | - | - | - | - |

1. Hydro does not include pumped hydro.

Source: IEA/OECD *World Energy Balances*.

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Table 6. Renewable and waste balance for 2016 (continued)

| Mun. waste non-ren. | Wood/wood waste | Charcoal | Bio-gases | Bio-gasoline | Bio-diesel | Other liquid biofuels | Total renew. & waste sources ² | Share in total energy sources ³ |
|---------------------|-----------------|----------|------------|--------------|------------|-----------------------|---|--|
| 676 | 1366 | - | 319 | c | 1292 | - | 5387 | 11.7% |
| 213 | 100 | 6 | - | 139 | - | - | 708 | 0.3% |
| -29 | -257 | - | - | c | -1125 | - | -1445 | 0.8% |
| - | - | - | - | -8 | -9 | - | -17 | x |
| 860 | 1209 | 6 | 319 | 132 | 158 | - | 4634 | 6.2% |
| - | - | - | 3 | -11 | -19 | - | -27 | x |
| - | -159 | - | -3 | - | - | - | -800 | x |
| - | -145 | - | -8 | - | - | - | -361 | x |
| - | -125 | - | -8 | - | - | - | -133 | x |
| -826 | -86 | - | -130 | - | - | - | -2012 | x |
| - | -32 | - | - | - | - | - | -32 | x |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | -63 | - | - | - | -63 | x |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| 34 | 662 | 6 | 110 | 121 | 139 | - | 1207 | 2.1% |
| - | 112 | - | 17 | - | 9 | - | 138 | 1.0% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | 11 | - | - | - | 11 | 0.5% |
| - | - | - | 5 | - | - | - | 5 | 0.9% |
| - | 33 | - | - | - | - | - | 33 | 44.3% |
| - | 3 | - | - | - | 9 | - | 12 | 2.0% |
| - | - | - | - | - | - | - | - | - |
| - | 76 | - | 1 | - | - | - | 77 | 19.7% |
| - | - | - | - | 121 | 121 | - | 242 | 2.3% |
| - | - | - | - | 121 | 120 | - | 241 | 2.4% |
| - | - | - | - | - | 1 | - | 1 | 0.2% |
| 34 | 550 | 6 | 92 | - | 9 | - | 826 | 4.0% |
| - | 448 | 6 | - | - | - | - | 476 | 4.8% |
| 34 | 30 | - | 37 | - | - | - | 146 | 2.2% |
| - | 72 | - | 56 | - | 9 | - | 205 | 5.6% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| 1708 | 1906 | - | 993 | - | - | - | 16442 | 14.3% |
| - | 1115 | - | 34 | - | - | - | 10979 | 15.0% |
| 1708 | 791 | - | 959 | - | - | - | 5463 | 13.1% |
| 9473 | 2072 | - | 273 | - | - | - | 22923 | 19.3% |
| 9473 | 921 | - | 273 | - | - | - | 21772 | 20.9% |
| - | 1151 | - | - | - | - | - | 1151 | 7.9% |

2. Total includes non-renewable waste.

3. Share of renewables on TFC excludes electricity and heat generated from renewable sources.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|--|-------|-------|-------|-------|-------|-------|-------|---|
| Geothermal (TJ) | | | | | | | | |
| Production | - | - | 318 | 1502 | 2448 | 2844 | 3041 | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | 318 | 1502 | 2448 | 2844 | 3041 | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | 318 | 1502 | 2448 | 2844 | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | 318 | 1502 | 2448 | 2844 | .. | - |
| Solar thermal (TJ) | | | | | | | | |
| Production | 100 | 454 | 994 | 1128 | 1137 | 1147 | 1147 | 6.0 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 100 | 454 | 994 | 1128 | 1137 | 1147 | 1147 | 6.0 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 100 | 454 | 994 | 1128 | 1137 | 1147 | .. | 6.0 |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 100 | 454 | 994 | 1128 | 1137 | 1147 | .. | 6.0 |
| Industrial waste (TJ) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Municipal waste - renewables (TJ) | | | | | | | | |
| Production | 13205 | 25512 | 34208 | 33251 | 33095 | 33225 | 32863 | 1.7 |
| Net imports ¹ | - | - | - | 7014 | 7675 | 9057 | 9057 | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 13205 | 25512 | 34208 | 40265 | 40770 | 42282 | 41920 | 3.2 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | 12808 | 24090 | 31492 | 38255 | 38936 | 40602 | .. | 3.3 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 397 | 1422 | 2716 | 2010 | 1834 | 1680 | .. | 1.0 |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 397 | 1422 | 2716 | 2010 | 1834 | 1680 | .. | 1.0 |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics (continued)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|--|-------|-------|-------|-------|-------|-------|-------|---|
| Municipal waste - non-renewables (TJ) | | | | | | | | |
| Production | 9635 | 24255 | 30335 | 28325 | 27078 | 28302 | 27994 | 1.0 |
| Net imports ¹ | - | - | - | 5976 | 6280 | 7716 | 7716 | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 9635 | 24255 | 30335 | 34301 | 33358 | 36018 | 35710 | 2.5 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | 9345 | 22902 | 27927 | 32588 | 31857 | 34587 | .. | 2.6 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 290 | 1353 | 2408 | 1713 | 1501 | 1431 | .. | 0.4 |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 290 | 1353 | 2408 | 1713 | 1501 | 1431 | .. | 0.4 |
| Solid Biofuel excluding charcoal (TJ) | | | | | | | | |
| Production | 15414 | 26079 | 50605 | 53945 | 56797 | 57187 | 57230 | 5.0 |
| Net imports ¹ | - | -4232 | 12289 | -5913 | -7444 | -6564 | -6564 | 2.8 |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 15414 | 21847 | 62894 | 48032 | 49353 | 50623 | 50666 | 5.4 |
| Statistical differences | - | - | - | - | - | 2 | .. | - |
| Transformation processes | 740 | 5448 | 41148 | 22077 | 22006 | 22890 | .. | 9.4 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 14674 | 16399 | 21746 | 25955 | 27347 | 27735 | .. | 3.3 |
| <i>Industry</i> | 1308 | 1765 | 2749 | 4484 | 5384 | 4704 | .. | 6.3 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 13366 | 14634 | 18997 | 21471 | 21963 | 23031 | .. | 2.9 |
| Charcoal (kt) | | | | | | | | |
| Production | 5 | 6 | 6 | - | - | - | - | - |
| Net imports ¹ | 4 | 3 | 3 | 9 | 9 | 9 | 9 | 7.1 |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 9 | 9 | 9 | 9 | 9 | 9 | 9 | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 9 | 9 | 9 | 9 | 9 | 9 | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 9 | 9 | 9 | 9 | 9 | 9 | .. | - |
| Biogases (TJ) | | | | | | | | |
| Production | 2376 | 5211 | 11984 | 13094 | 13693 | 13339 | 13325 | 6.1 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 2376 | 5211 | 11984 | 13094 | 13693 | 13339 | 13325 | 6.1 |
| Statistical differences | - | - | - | - | - | 114 | .. | - |
| Transformation processes | 717 | 2887 | 8196 | 8121 | 8633 | 8865 | .. | 7.3 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 1659 | 2324 | 3788 | 4973 | 5060 | 4588 | .. | 4.3 |
| <i>Industry</i> | 421 | 807 | 959 | 1056 | 901 | 722 | .. | -0.7 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 1238 | 1517 | 2829 | 3917 | 4159 | 3866 | .. | 6.0 |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics (continued)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|-----------------------------------|------|------|------|-------|-------|-------|-------|---|
| Biogasoline (kt) | | | | | | | | |
| Production | - | - | c | c | c | c | - | .. |
| Net imports ¹ | - | - | 164 | 180 | 228 | 216 | 207 | - |
| Stock changes | - | - | 7 | 14 | 2 | -12 | -7 | - |
| Gross consumption | - | - | 171 | 194 | 230 | 204 | 200 | - |
| Statistical differences | - | - | 37 | 5 | -10 | -17 | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | 208 | 199 | 220 | 187 | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | 208 | 199 | 220 | 187 | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Biodiesel (kt) | | | | | | | | |
| Production | - | - | 382 | 1720 | 1629 | 1462 | 1932 | - |
| Net imports ¹ | - | - | -339 | -1512 | -1390 | -1273 | -1602 | - |
| Stock changes | - | - | 64 | 71 | 12 | -10 | -104 | - |
| Gross consumption | - | - | 107 | 279 | 251 | 179 | 226 | - |
| Statistical differences | - | - | - | - | -49 | -22 | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | 107 | 279 | 202 | 157 | .. | - |
| <i>Industry</i> | - | - | - | 15 | 13 | 10 | .. | - |
| <i>Transport</i> | - | - | 107 | 250 | 176 | 137 | .. | - |
| <i>Other</i> | - | - | - | 14 | 13 | 10 | .. | - |
| Other liquid biofuels (kt) | | | | | | | | |
| Production | - | - | 30 | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | 30 | - | - | - | - | - |
| Statistical differences | - | - | 1 | - | - | - | .. | - |
| Transformation processes | - | - | 14 | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | 17 | - | - | - | .. | - |
| <i>Industry</i> | - | - | 17 | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Figure 1. Contribution of renewables in 1990

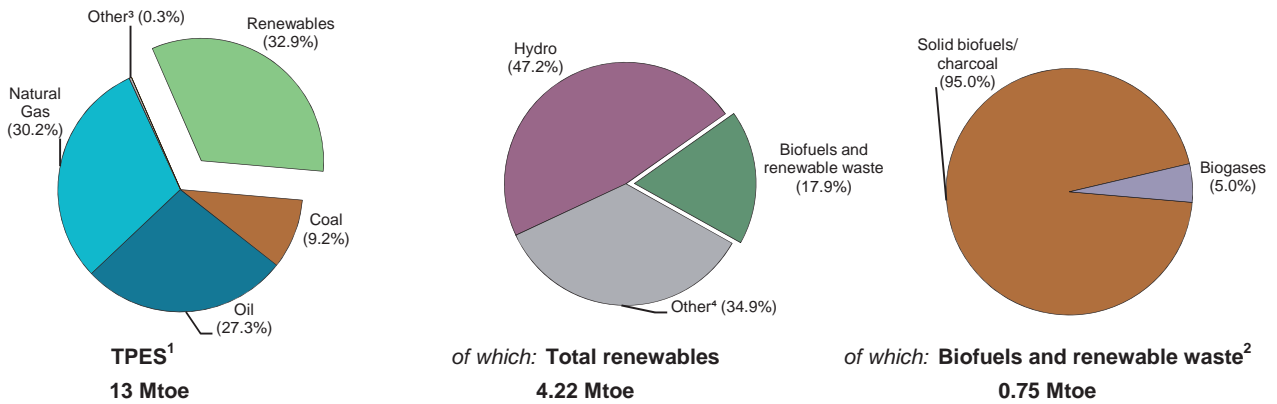


Figure 2. Contribution of renewables in 2017 provisional

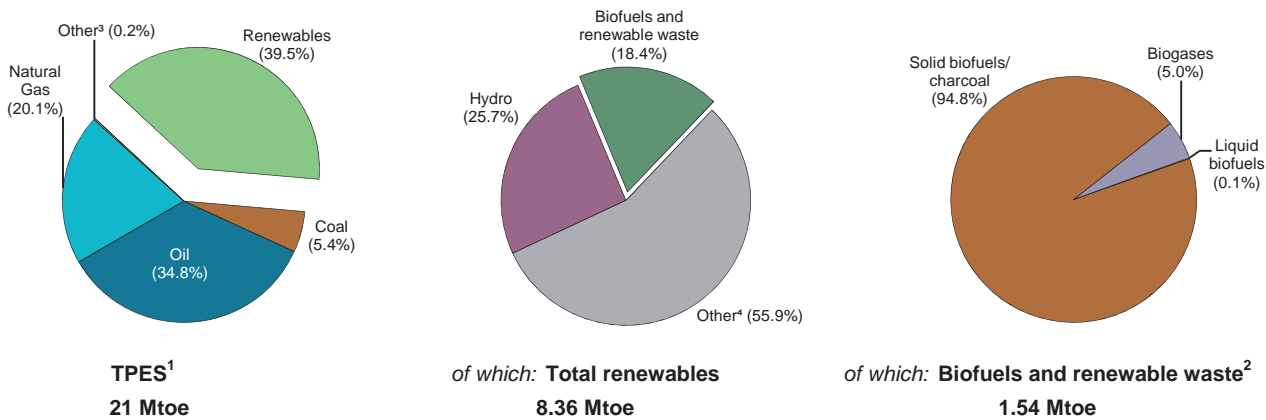
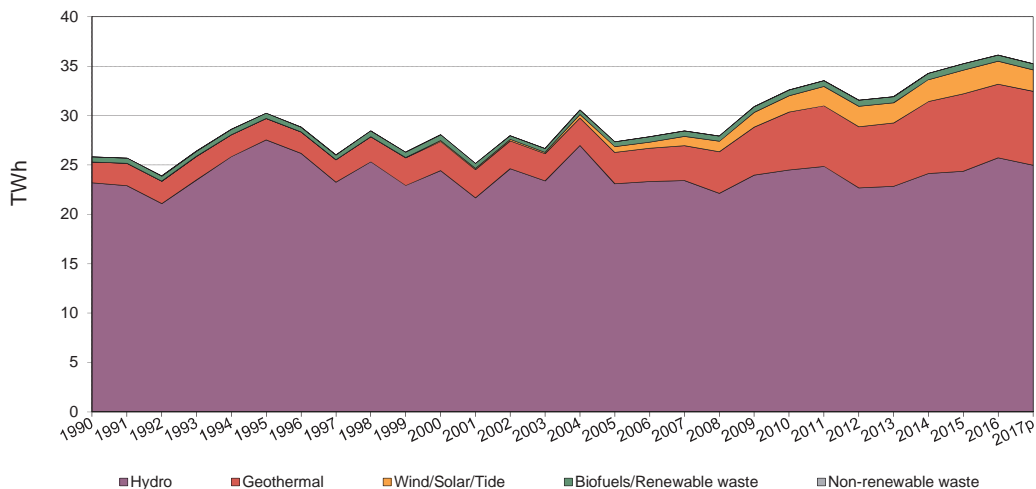


Figure 3. Electricity production by renewables and waste energy source



1. Total primary energy supply includes electricity trade.
 2. Biofuels and renewable waste include solid biofuels, liquid biofuels, biogases, and renewable municipal waste.
 3. Includes non-renewable municipal waste, industrial waste, peat, shale oil, electricity trade, and other sources of primary energy. (In the case of negative values, the net exports of electricity are greater than the other products in this category).
 4. Includes geothermal, solar, wind and tide.

Note: Totals may not sum due to rounding.
Source: IEA/OECD *World Energy Balances*.

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Table 1. Energy supply, GDP and population

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|---|-------|--------|--------|--------|--------|--------|--------|--|
| TPES (Mtoe) | 12.84 | 17.10 | 18.36 | 20.48 | 20.61 | 21.01 | 21.18 | 1.3 |
| of which: Renewables (Mtoe) ¹ | 4.22 | 5.19 | 7.10 | 8.13 | 8.35 | 8.72 | 8.36 | 2.8 |
| Renewables/TPES(%) | 32.9 | 30.3 | 38.7 | 39.7 | 40.5 | 41.5 | 39.5 | 1.6 |
| GDP (billion 2010 US dollars) | 82.68 | 111.77 | 146.58 | 162.99 | 170.22 | 176.13 | 181.46 | 2.9 |
| TPES/GDP ² | 0.16 | 0.15 | 0.13 | 0.13 | 0.12 | 0.12 | 0.12 | -1.6 |
| TPES/GDP (year 2010 = 100) | 124 | 122 | 100 | 100 | 97 | 95 | 93 | -1.6 |
| Population (millions) | 3.37 | 3.87 | 4.36 | 4.53 | 4.62 | 4.72 | 4.82 | 1.3 |
| TPES/population (toe per capita) | 3.81 | 4.43 | 4.21 | 4.52 | 4.46 | 4.45 | 4.39 | -0.0 |
| Electricity generation (TWh) ³ | 32.3 | 39.2 | 44.6 | 43.3 | 44.0 | 43.0 | 43.1 | 0.5 |
| of which: Renewables (TWh) ^{1,3} | 25.81 | 28.06 | 32.58 | 34.27 | 35.24 | 36.12 | 35.23 | 1.3 |
| Renew./Total Elec.(%) ^{1,4} | 80.0 | 71.5 | 73.0 | 79.1 | 80.0 | 83.9 | 81.8 | 0.8 |
| Road energy consumption (Mtoe) | 2.5 | 3.5 | 4.1 | 4.2 | 4.3 | 4.5 | .. | .. |
| of which: Liquid biofuels (Mtoe) | - | - | 0.00 | 0.00 | 0.00 | 0.00 | .. | .. |
| Liq. biofuels/road tr.(%) ⁵ | - | - | 0.1 | 0.1 | 0.1 | 0.1 | - | - |

1. Renewables do not include industrial waste, non-renewable municipal waste and pumped storage production.

2. In units of toe per thousand 2010 US dollars.

3. Electricity generation = gross production - amount of electricity produced in pumped storage plants.

4. Electricity share generated from renewables over the total electricity production.

5. Energy from liquid biofuels consumed in road transport over the total energy consumed in road transport.

Source: IEA/OECD *World Energy Balances* and OECD *Main Economic Indicators*.

Table 2. Net generating capacity of renewable and waste sources (MWe)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | Average annual percent change 00-16 |
|---|-------------|-------------|-------------|-------------|-------------|-------------|--|
| Total capacity | 4956 | 5732 | 6630 | 7131 | 7170 | 7179 | 1.4 |
| Hydro | 4619 | 5193 | 5254 | 5329 | 5340 | 5360 | 0.2 |
| Hydro <1MW | - | 3 | 9 | 9 | 9 | 9 | 7.1 |
| Hydro 1-10MW | - | 112 | 98 | 103 | 103 | 123 | 0.6 |
| Hydro 10+MW | - | 5078 | 5147 | 5217 | 5228 | 5227 | 0.2 |
| Mixed plants | - | - | - | - | - | - | - |
| Pure pumped storage | - | - | - | - | - | - | - |
| Geothermal | 261 | 418 | 731 | 979 | 986 | 971 | 5.4 |
| Solar photovoltaic | - | - | 3 | 19 | 38 | 42 | - |
| Solar thermal | - | - | - | - | - | - | - |
| Tide, wave, ocean | - | - | - | - | - | - | - |
| Wind | - | 36 | 524 | 683 | 683 | 688 | 20.2 |
| Industrial waste | - | - | - | - | - | - | - |
| Municipal waste | - | - | - | - | - | - | - |
| Solid biofuels | 57 | 68 | 77 | 77 | 77 | 77 | 0.8 |
| Biogases | 19 | 17 | 41 | 44 | 46 | 41 | 5.7 |
| Liquid biofuels | - | - | - | - | - | - | - |
| Solar collectors surface (1000 m ²) | - | - | 128 | 128 | 128 | 200 | - |
| Cap. of solar collectors (MW _{th}) ¹ | - | - | 90 | 90 | 90 | 140 | - |

1. Converted at 0.7 kW_{th}/m² of solar collector area, as estimated by the IEA Solar Heating & Cooling Programme.

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Table 3. Capacity factors (%)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 |
|--|--------------|--------------|--------------|--------------|--------------|--------------|
| Total plants¹ | 59.46 | 55.89 | 56.09 | 54.86 | 56.10 | 57.43 |
| Hydro | 57.30 | 53.71 | 53.19 | 51.68 | 52.06 | 54.80 |
| <i>of which: <1MW</i> | - | - | 58.17 | 61.47 | 62.07 | 64.54 |
| <i>of which: 1-10MW</i> | - | - | 46.37 | 59.36 | 60.17 | 52.55 |
| <i>of which: 10+MW</i> | - | - | 53.31 | 51.51 | 51.89 | 54.85 |
| <i>of which: pure pumped storage²</i> | - | - | - | - | - | - |
| Geothermal | 93.23 | 79.78 | 91.81 | 84.92 | 90.94 | 87.29 |
| Solar photovoltaic | - | - | 14.42 | 10.40 | 10.19 | 14.06 |
| Solar thermal | - | - | - | - | - | - |
| Tide, wave and ocean | - | - | - | - | - | - |
| Wind | - | 38.11 | 35.66 | 37.01 | 39.38 | 38.22 |
| Industrial waste | - | - | - | - | - | - |
| Municipal waste | - | - | - | - | - | - |
| Solid biofuels | 72.10 | 80.22 | 54.85 | 56.15 | 55.08 | 49.34 |
| Biogases | 84.07 | 73.85 | 57.88 | 65.36 | 65.08 | 76.48 |
| Biodiesels | - | - | - | - | - | - |
| Other liquid biofuels | - | - | - | - | - | - |

1. The capacity factor is defined as: the annual gross electricity generation divided by the reported net capacity times 365 (days/year) times 24 (hours/day).

2. In case a country has at least one mixed hydro plants, it is impossible to calculate capacity factor thus it is shown as 'not applicable'.

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Table 4. Gross electricity production from renewable and waste sources (GWh)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|--------------------------------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|-------------------------------------|
| Total electricity¹ | 25814 | 28062 | 32579 | 34268 | 35235 | 36118 | 35233 | 1.3 |
| Hydro | 23183 | 24433 | 24481 | 24123 | 24355 | 25730 | 24971 | 0.1 |
| <i>of which: pumped storage</i> | - | - | - | - | - | - | - | - |
| Geothermal | 2131 | 2922 | 5879 | 7283 | 7855 | 7425 | 7502 | 5.7 |
| Solar photovoltaic | - | - | 4 | 17 | 34 | 52 | 72 | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Tide, wave, ocean | - | - | - | - | - | - | - | - |
| Wind | - | 120 | 1637 | 2214 | 2356 | 2303 | 2070 | 18.2 |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | - | - | - | - | - |
| Solid biofuels | 360 | 478 | 370 | 379 | 372 | 333 | 331 | -2.1 |
| Biogases | 140 | 109 | 208 | 252 | 263 | 275 | 287 | 5.9 |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| of which: | | | | | | | | |
| Electricity only plants | 25284 | 27509 | 31997 | 33648 | 34621 | 35539 | .. | - |
| Hydro | 23183 | 24433 | 24481 | 24123 | 24355 | 25730 | .. | - |
| <i>of which: pumped storage</i> | - | - | - | - | - | - | - | - |
| Geothermal | 2074 | 2880 | 5825 | 7212 | 7784 | 7358 | .. | - |
| Solar photovoltaic | - | - | 4 | 17 | 34 | 52 | .. | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Tide, wave, ocean | - | - | - | - | - | - | - | - |
| Wind | - | 120 | 1637 | 2214 | 2356 | 2303 | .. | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | - | - | - | - | - |
| Solid biofuels | - | - | - | - | - | - | - | - |
| Biogases | 27 | 76 | 50 | 82 | 92 | 96 | .. | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| CHP plants | 530 | 553 | 582 | 620 | 614 | 579 | .. | - |
| Geothermal | 57 | 42 | 54 | 71 | 71 | 67 | .. | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | - | - | - | - | - |
| Solid biofuels | 360 | 478 | 370 | 379 | 372 | 333 | .. | - |
| Biogases | 113 | 33 | 158 | 170 | 171 | 179 | .. | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |

1. **Total electricity** includes the electricity produced from industrial waste, non-renewable municipal waste and pumped storage. Electricity from renewable sources does *not* include the electricity produced from industrial waste, non-renewable municipal waste and pumped storage production.

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Table 5A. Heat production¹ from renewable and waste sources in the transformation sector (TJ)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|----------------------------|------|------|------|------|------|------|-------|--|
| Total heat | - | - | - | - | - | - | - | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | - | - | - | - | - |
| Solid biofuels | - | - | - | - | - | - | - | - |
| Biogases | - | - | - | - | - | - | - | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| <i>of which:</i> | | | | | | | | |
| CHP plants | - | - | - | - | - | - | - | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | - | - | - | - | - |
| Solid biofuels | - | - | - | - | - | - | - | - |
| Biogases | - | - | - | - | - | - | - | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| Heat only plants | - | - | - | - | - | - | - | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | - | - | - | - | - |
| Solid biofuels | - | - | - | - | - | - | - | - |
| Biogases | - | - | - | - | - | - | - | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |

1. Waste heat and heat production from heat pumps are not included and are reported separately in Table 5B.

Table 5B. Heat production from heat pumps and waste heat (TJ)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|----------------------------|------|------|------|------|------|------|-------|--|
| Total heat | 1610 | 1610 | 1468 | 1321 | 1363 | 1413 | 1425 | -0.7 |
| Heat pumps ¹ | - | - | - | - | - | - | - | - |
| (-) Input to heat pumps | - | - | - | - | - | - | - | - |
| Other sources ² | 1610 | 1610 | 1468 | 1321 | 1363 | 1413 | 1425 | -0.7 |

1. Installations producing heat for own use are not included.

2. Refers to production from hydrogen, purchased steam from industry, and waste heat.

Source: IEA/OECD *Electricity Statistics*.

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Table 6. Renewable and waste balance for 2016

| thousand tonnes of oil equivalent | Hydro ¹ | Wind | Tide wave ocean | Solar PV | Geo-thermal | Solar thermal | Industrial waste | Mun. waste renew. |
|------------------------------------|--------------------|-------------|-----------------|-----------|-------------|---------------|------------------|-------------------|
| Production | 2212 | 198 | - | 4 | 4821 | 9 | - | - |
| Imports | - | - | - | - | - | - | - | - |
| Exports | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| TPES | 2212 | 198 | - | 4 | 4821 | 9 | - | - |
| Statistical differences | - | - | - | - | - | - | - | - |
| Main activity electricity plants | -2212 | -198 | - | - | -4597 | - | - | - |
| Autoproducer electricity plants | -1 | - | - | -4 | - | - | - | - |
| Main activity CHP plants | - | - | - | - | - | - | - | - |
| Autoproducer CHP plants | - | - | - | - | -41 | - | - | - |
| Main heat plants | - | - | - | - | - | - | - | - |
| Autoproducer heat plants | - | - | - | - | - | - | - | - |
| Charcoal production plants | - | - | - | - | - | - | - | - |
| Other transformation | - | - | - | - | - | - | - | - |
| Energy Industry own use | - | - | - | - | - | - | - | - |
| Losses | - | - | - | - | - | - | - | - |
| TFC | - | - | - | - | 183 | 9 | - | - |
| Industry | - | - | - | - | 108 | - | - | - |
| Iron and steel | - | - | - | - | - | - | - | - |
| Chemical and petrochemical | - | - | - | - | - | - | - | - |
| Non-ferrous metals | - | - | - | - | - | - | - | - |
| Non-metallc minerals | - | - | - | - | - | - | - | - |
| Transport equipment | - | - | - | - | - | - | - | - |
| Machinery | - | - | - | - | - | - | - | - |
| Mining and quarrying | - | - | - | - | - | - | - | - |
| Food and tobacco | - | - | - | - | - | - | - | - |
| Paper, pulp and print | - | - | - | - | 108 | - | - | - |
| Wood and wood products | - | - | - | - | - | - | - | - |
| Construction | - | - | - | - | - | - | - | - |
| Textile and leather | - | - | - | - | - | - | - | - |
| Non-specified | - | - | - | - | - | - | - | - |
| Transport | - | - | - | - | - | - | - | - |
| Road | - | - | - | - | - | - | - | - |
| Other | - | - | - | - | - | - | - | - |
| Other | - | - | - | - | 75 | 9 | - | - |
| Residential | - | - | - | - | 7 | 9 | - | - |
| Commercial and public services | - | - | - | - | 54 | - | - | - |
| Agriculture/forestry | - | - | - | - | 14 | - | - | - |
| Fishing | - | - | - | - | - | - | - | - |
| Non-specified | - | - | - | - | - | - | - | - |
| Electricity generated - GWh | 25730 | 2303 | - | 52 | 7425 | - | - | - |
| <i>Electricity plants</i> | 25730 | 2303 | - | 52 | 7358 | - | - | - |
| <i>CHP plants</i> | - | - | - | - | 67 | - | - | - |
| Heat generated - TJ | - | - | - | - | - | - | - | - |
| <i>CHP plants</i> | - | - | - | - | - | - | - | - |
| <i>Heat plants</i> | - | - | - | - | - | - | - | - |

1. Hydro does not include pumped hydro.

Source: IEA/OECD *World Energy Balances*.

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Table 6. Renewable and waste balance for 2016 (continued)

| Mun. waste non-ren. | Wood/wood waste | Charcoal | Bio-gases | Bio-gasoline | Bio-diesel | Other liquid biofuels | Total renew. & waste sources ² | Share in total energy sources ³ |
|---------------------|-----------------|----------|------------|--------------|------------|-----------------------|---|--|
| - | 1392 | - | 76 | 3 | - | - | 8715 | 53.0% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | 1392 | - | 76 | 3 | - | - | 8715 | 41.5% |
| - | - | - | 1 | - | - | - | 1 | x |
| - | - | - | -24 | - | - | - | -7031 | x |
| - | - | - | - | - | - | - | -5 | x |
| - | - | - | - | - | - | - | - | - |
| - | -111 | - | -46 | - | - | - | -198 | x |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | 1281 | - | 6 | 3 | - | - | 1482 | 10.1% |
| - | 1087 | - | 1 | - | - | - | 1196 | 25.7% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | 1 | - | - | - | 1 | 0.1% |
| - | - | - | - | - | - | - | 108 | 35.9% |
| - | 1087 | - | - | - | - | - | 1087 | 86.3% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | 3 | - | - | 3 | 0.1% |
| - | - | - | - | 3 | - | - | 3 | 0.1% |
| - | - | - | - | - | - | - | - | - |
| - | 194 | - | 5 | - | - | - | 283 | 8.2% |
| - | 194 | - | - | - | - | - | 210 | 14.1% |
| - | - | - | 5 | - | - | - | 59 | 4.8% |
| - | - | - | - | - | - | - | 14 | 2.1% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | 333 | - | 275 | - | - | - | 36118 | 83.9% |
| - | - | - | 96 | - | - | - | 35539 | 87.2% |
| - | 333 | - | 179 | - | - | - | 579 | 25.7% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |

2. Total includes non-renewable waste.

3. Share of renewables on TFC excludes electricity and heat generated from renewable sources.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|--|-------|-------|--------|--------|--------|--------|--------|---|
| Geothermal (TJ) | | | | | | | | |
| Production | 61811 | 81636 | 152237 | 196424 | 203813 | 201839 | 187711 | 5.8 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 61811 | 81636 | 152237 | 196424 | 203813 | 201839 | 187711 | 5.8 |
| Statistical differences | 1 | 1 | - | 2 | -1 | - | .. | .. |
| Transformation processes | 54714 | 73512 | 142971 | 189093 | 196468 | 194191 | .. | 6.3 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 7098 | 8125 | 9266 | 7333 | 7344 | 7648 | .. | -0.4 |
| <i>Industry</i> | 4632 | 5712 | 5747 | 4052 | 4052 | 4506 | .. | -1.5 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 2466 | 2413 | 3519 | 3281 | 3292 | 3142 | .. | 1.7 |
| Solar thermal (TJ) | | | | | | | | |
| Production | - | - | 353 | 364 | 364 | 364 | 364 | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | 353 | 364 | 364 | 364 | 364 | - |
| Statistical differences | - | - | - | - | - | - | .. | .. |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | 353 | 364 | 364 | 364 | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | 353 | 364 | 364 | 364 | .. | - |
| Industrial waste (TJ) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | .. |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Municipal waste - renewables (TJ) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | .. |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics (continued)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|--|-------|-------|-------|-------|-------|-------|-------|---|
| Municipal waste - non-renewables (TJ) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Solid Biofuel excluding charcoal (TJ) | | | | | | | | |
| Production | 30008 | 45754 | 47688 | 45797 | 46147 | 58272 | 61000 | 1.5 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 30008 | 45754 | 47688 | 45797 | 46147 | 58272 | 61000 | 1.5 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | 4059 | 5162 | 3976 | 3917 | 3787 | 4655 | .. | -0.6 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 25949 | 40592 | 43712 | 41880 | 42360 | 53617 | .. | 1.8 |
| <i>Industry</i> | 19632 | 33835 | 37073 | 35457 | 35973 | 45500 | .. | 1.9 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 6317 | 6757 | 6639 | 6423 | 6387 | 8117 | .. | 1.2 |
| Charcoal (kt) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Biogases (TJ) | | | | | | | | |
| Production | 1592 | 1347 | 2788 | 2935 | 2940 | 3185 | 3230 | 5.5 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 1592 | 1347 | 2788 | 2935 | 2940 | 3185 | 3230 | 5.5 |
| Statistical differences | 1 | - | -290 | 40 | 146 | 34 | .. | - |
| Transformation processes | 1518 | 1193 | 2245 | 2722 | 2833 | 2966 | .. | 5.9 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 75 | 154 | 253 | 253 | 253 | 253 | .. | 3.2 |
| <i>Industry</i> | 39 | 39 | 39 | 39 | 39 | 39 | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 36 | 115 | 214 | 214 | 214 | 214 | .. | 4.0 |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics (continued)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|-----------------------------------|------|------|------|------|------|------|-------|---|
| Biogasoline (kt) | | | | | | | | |
| Production | - | - | 2 | 3 | 4 | 4 | 3 | - |
| Net imports ¹ | - | - | 2 | 2 | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | 4 | 5 | 4 | 4 | 3 | - |
| Statistical differences | - | - | - | -1 | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | 4 | 4 | 4 | 4 | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | 4 | 4 | 4 | 4 | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Biodiesel (kt) | | | | | | | | |
| Production | - | - | 1 | 1 | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | 1 | 1 | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | 1 | 1 | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | 1 | 1 | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Other liquid biofuels (kt) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Figure 1. Contribution of renewables in 1990

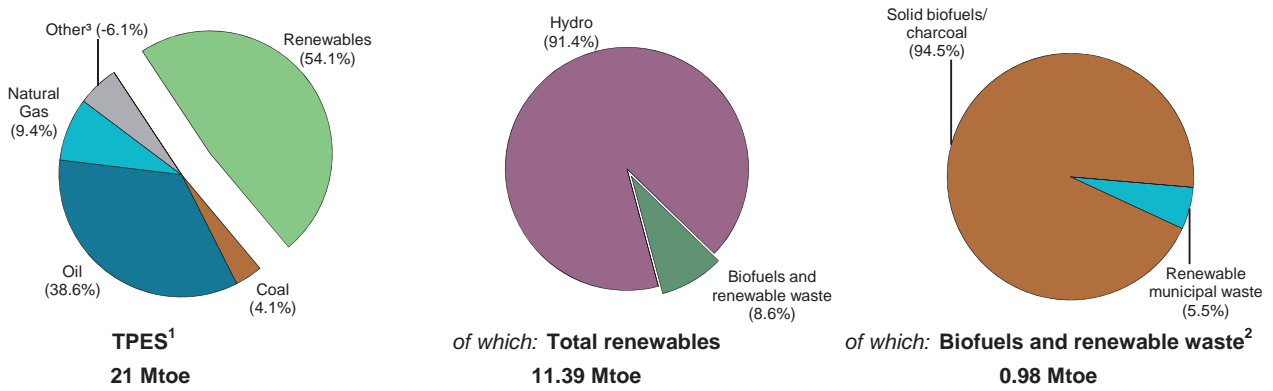


Figure 2. Contribution of renewables in 2017 provisional

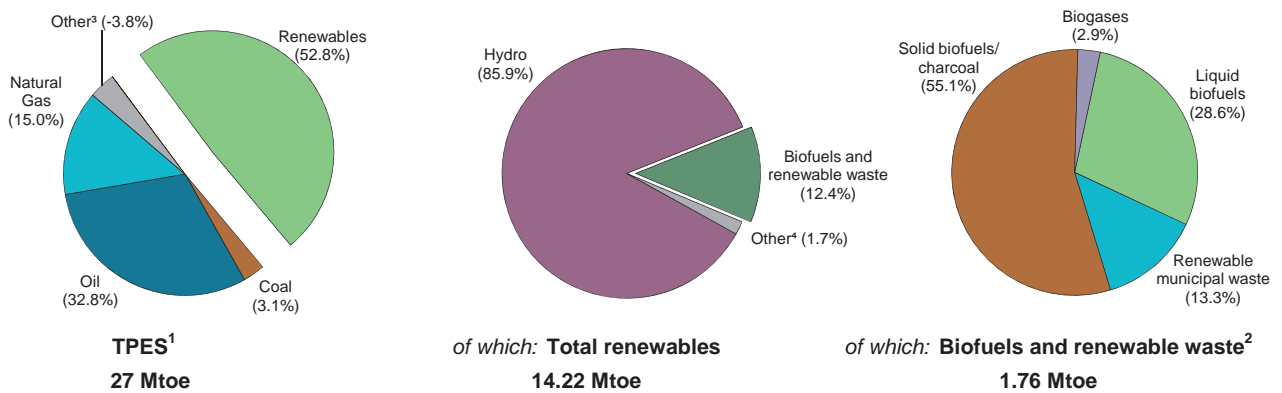
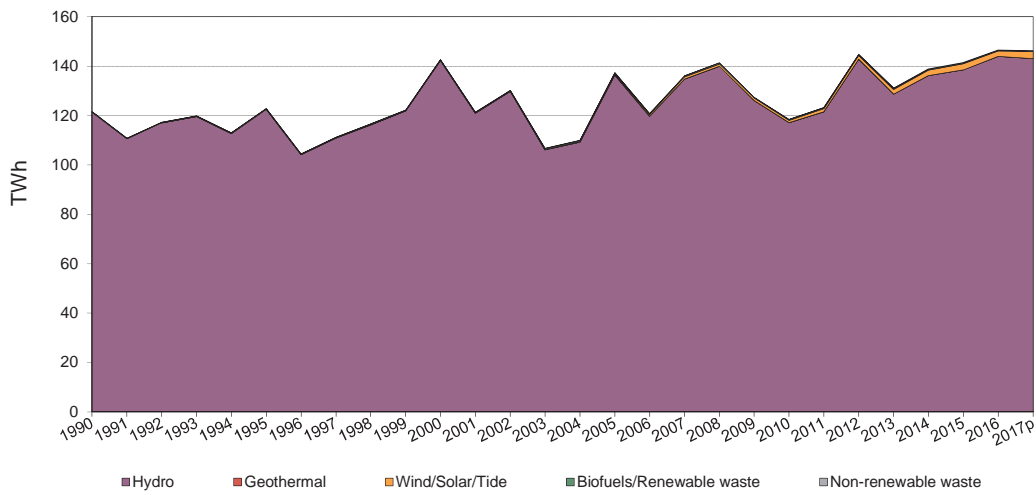


Figure 3. Electricity production by renewables and waste energy source



1. Total primary energy supply includes electricity trade.
 2. Biofuels and renewable waste include solid biofuels, liquid biofuels, biogases, and renewable municipal waste.
 3. Includes non-renewable municipal waste, industrial waste, peat, shale oil, electricity trade, and other sources of primary energy. (In the case of negative values, the net exports of electricity are greater than the other products in this category).
 4. Includes geothermal, solar, wind and tide.

Note: Totals may not sum due to rounding.
Source: IEA/OECD World Energy Balances.

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Table 1. Energy supply, GDP and population

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|---|--------|--------|--------|--------|--------|--------|--------|-------------------------------------|
| TPES (Mtoe) | 21.07 | 26.16 | 29.41 | 28.37 | 28.43 | 27.24 | 26.92 | 0.2 |
| of which: Renewables (Mtoe) ¹ | 11.39 | 13.49 | 11.72 | 13.00 | 13.29 | 13.94 | 14.22 | 0.3 |
| Renewables/TPES(%) | 54.1 | 51.5 | 39.8 | 45.8 | 46.8 | 51.2 | 52.8 | 0.1 |
| GDP (billion 2010 US dollars) | 255.63 | 366.96 | 429.13 | 458.63 | 467.66 | 472.77 | 481.84 | 1.6 |
| TPES/GDP ² | 0.08 | 0.07 | 0.07 | 0.06 | 0.06 | 0.06 | 0.06 | -1.4 |
| TPES/GDP (year 2010 = 100) | 120 | 104 | 100 | 90 | 89 | 84 | 82 | -1.4 |
| Population (millions) | 4.24 | 4.49 | 4.89 | 5.14 | 5.19 | 5.24 | 5.28 | 1.0 |
| TPES/population (toe per capita) | 4.97 | 5.83 | 6.02 | 5.52 | 5.48 | 5.20 | 5.10 | -0.8 |
| Electricity generation (TWh) ³ | 121.6 | 142.5 | 123.2 | 141.3 | 143.4 | 148.6 | 148.3 | 0.2 |
| of which: Renewables (TWh) ^{1,3} | 121.36 | 142.11 | 117.96 | 137.95 | 140.07 | 145.36 | 145.06 | 0.1 |
| Renew./Total Elec.(%) ^{1,4} | 99.8 | 99.7 | 95.7 | 97.7 | 97.7 | 97.8 | 97.8 | -0.1 |
| Road energy consumption (Mtoe) | 2.6 | 3.0 | 3.3 | 3.3 | 3.3 | 3.4 | .. | .. |
| of which: Liquid biofuels (Mtoe) | - | - | 0.12 | 0.13 | 0.15 | 0.35 | .. | .. |
| Liq. biofuels/road tr.(%) ⁵ | - | - | 3.6 | 3.8 | 4.5 | 10.1 | - | - |

1. Renewables do not include industrial waste, non-renewable municipal waste and pumped storage production.

2. In units of toe per thousand 2010 US dollars.

3. Electricity generation = gross production - amount of electricity produced in pumped storage plants.

4. Electricity share generated from renewables over the total electricity production.

5. Energy from liquid biofuels consumed in road transport over the total energy consumed in road transport.

Source: IEA/OECD *World Energy Balances* and OECD *Main Economic Indicators*.

Table 2. Net generating capacity of renewable and waste sources (MWe)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | Average annual percent change 00-16 |
|---|--------------|----------------|--------------|--------------|--------------|--------------|-------------------------------------|
| Total capacity | 26951 | 28206 e | 30269 | 32282 | 32422 | 32854 | 1.0 |
| Hydro | 26884 | 28126 | 29693 | 31240 | 31372 | 31834 | 0.8 |
| Hydro <1MW | 42 e | 48 | 48 | 61 | 61 | 61 | 1.5 |
| Hydro 1-10MW | 800 e | 843 | 1395 | 1606 | 1996 | 1996 | 5.5 |
| Hydro 10+MW | 24975 e | 25875 | 26924 | 28222 | 27882 | 28241 | 0.5 |
| Mixed plants | 1067 | 1360 | 1326 | 1351 | 1433 | 1536 | 0.8 |
| Pure pumped storage | - | - | - | - | - | - | - |
| Geothermal | - | - | - | - | - | - | - |
| Solar photovoltaic | - | 6 e | .. | .. | .. | .. | - |
| Solar thermal | - | - | - | - | - | - | - |
| Tide, wave, ocean | - | - | - | - | - | - | - |
| Wind | - | 13 | 425 | 859 | 867 | 883 | 30.2 |
| Industrial waste | - | - | - | - | - | - | - |
| Municipal waste | 26 e | 26 e | 59 | 87 | 87 | 100 | 8.8 |
| Solid biofuels | 41 e | 35 e | 79 | 79 | 79 | 27 | -1.6 |
| Biogases | - | - | 13 | 17 | 17 | 10 | - |
| Liquid biofuels | - | - | - | - | - | - | - |
| Solar collectors surface (1000 m ²) | - | - | .. | .. | .. | .. | .. |
| Cap. of solar collectors (MW _{th}) ¹ | - | - | .. | .. | .. | .. | .. |

1. Converted at 0.7 kW_{th}/m² of solar collector area, as estimated by the IEA Solar Heating & Cooling Programme.

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Table 3. Capacity factors (%)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 |
|--|--------------|----------------|--------------|--------------|--------------|--------------|
| Total plants¹ | 51.52 | 57.72 e | 44.68 | 49.11 | 49.81 | 50.92 |
| Hydro | 51.54 | 57.75 | 45.04 | 49.76 | 50.38 | 51.64 |
| <i>of which: <1MW</i> | - e | 55.65 | 40.43 | 47.31 | 48.29 | 48.29 |
| <i>of which: 1-10MW</i> | - e | 58.46 | 40.57 | 52.84 | 43.40 | 43.40 |
| <i>of which: 10+MW</i> | 55.37 e | 60.56 | 47.32 | 51.69 | 53.00 | 54.63 |
| <i>of which: pure pumped storage²</i> | x | x | x | x | x | x |
| Geothermal | - | - | - | - | - | - |
| Solar photovoltaic | - | x | x | x | x | x |
| Solar thermal | - | - | - | - | - | - |
| Tide, wave and ocean | - | - | - | - | - | - |
| Wind | - | 27.22 | 23.61 | 29.46 | 33.11 | 27.36 |
| Industrial waste | - | - | - | - | - | - |
| Municipal waste | 25.47 e | 26.34 e | 37.73 | 56.42 | 62.19 | 45.09 |
| Solid biofuels | 51.23 e | 73.71 e | 35.26 | 3.18 | 2.46 | 11.84 |
| Biogases | - | - | 2.63 | 17.46 | 14.10 | 14.84 |
| Biodiesels | - | - | - | - | - | - |
| Other liquid biofuels | - | - | - | - | - | - |

1. The capacity factor is defined as: the annual gross electricity generation divided by the reported net capacity times 365 (days/year) times 24 (hours/day).

2. In case a country has at least one mixed hydro plants, it is impossible to calculate capacity factor thus it is shown as 'not applicable'.

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Table 4. Gross electricity production from renewable and waste sources (GWh)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|--------------------------------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---|
| Total electricity¹ | 121624 | 142606 | 118473 | 138880 | 141477 | 146557 | 146236 | 0.1 |
| Hydro | 121382 | 142289 | 117152 | 136185 | 138450 | 144005 | 142993 | 0.0 |
| <i>of which: pumped storage</i> | 237 | 471 | 413 | 715 | 1148 | 999 | 999 | 4.5 |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar photovoltaic | - | .. | .. | .. | .. | .. | .. | .. |
| Solar thermal | - | - | - | - | - | - | .. | .. |
| Tide, wave, ocean | - | - | - | - | - | - | - | - |
| Wind | - | 31 | 879 | 2217 | 2515 | 2116 | 2852 | 30.5 |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | 29 | 30 | 97 | 210 | 218 | 192 | 182 | 11.2 |
| Municipal waste non-renew. | 29 | 30 | 98 | 220 | 256 | 203 | 182 | 11.2 |
| Solid biofuels | 184 | 226 | 244 | 22 | 17 | 28 | 6 | -19.2 |
| Biogases | - | - | 3 | 26 | 21 | 13 | 21 | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| <i>of which:</i> | | | | | | | | |
| Electricity only plants | 121566 | 142546 | 118279 | 138446 | 141032 | 146164 | .. | - |
| Hydro | 121382 | 142289 | 117152 | 136185 | 138450 | 144005 | .. | - |
| <i>of which: pumped storage</i> | 237 | 471 | 413 | 715 | 1148 | 999 | .. | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar photovoltaic | - | .. | .. | .. | .. | .. | - | .. |
| Solar thermal | - | - | - | - | - | - | - | .. |
| Tide, wave, ocean | - | - | - | - | - | - | - | - |
| Wind | - | 31 | 879 | 2217 | 2515 | 2116 | .. | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | 1 | 10 | 38 | 11 | .. | - |
| Solid biofuels | 184 | 226 | 244 | 12 | 8 | 19 | .. | - |
| Biogases | - | - | 3 | 22 | 21 | 13 | .. | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| CHP plants | 58 | 60 | 194 | 434 | 445 | 393 | .. | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | 29 | 30 | 97 | 210 | 218 | 192 | .. | - |
| Municipal waste non-renew. | 29 | 30 | 97 | 210 | 218 | 192 | .. | - |
| Solid biofuels | - | - | - | 10 | 9 | 9 | .. | - |
| Biogases | - | - | - | 4 | - | - | - | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |

1. **Total electricity** includes the electricity produced from industrial waste, non-renewable municipal waste and pumped storage. Electricity from renewable sources does *not* include the electricity produced from industrial waste, non-renewable municipal waste and pumped storage production.

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Table 5A. Heat production¹ from renewable and waste sources in the transformation sector (TJ)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|----------------------------|---------------|-------------|-------------|--------------|--------------|--------------|--------------|-------------------------------------|
| Total heat | 3669 e | 4051 | 8945 | 12386 | 13765 | 14639 | 14541 | 7.8 |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | 1798 e | 1939 e | 2815 | 4481 | 4816 | 4954 | 4822 | 5.5 |
| Municipal waste non-renew. | 1798 e | 1940 e | 2815 | 4481 | 4816 | 4954 | 4822 | 5.5 |
| Solid biofuels | 73 e | 160 | 3237 | 3144 | 3912 | 4462 | 4683 | 22.0 |
| Biogases | - | 12 | 78 | 157 | 107 | 86 | 89 | 12.5 |
| Liquid biofuels | - | - | - | 123 | 114 | 183 | 125 | - |
| <i>of which:</i> | | | | | | | | |
| CHP plants | 1421 | 1777 | 3494 | 5984 | 5615 | 6032 | .. | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | 711 e | 888 e | 1747 | 2964 | 2776 | 2930 | .. | - |
| Municipal waste non-renew. | 710 e | 889 e | 1747 | 2964 | 2776 | 2930 | .. | - |
| Solid biofuels | - | - | - | 29 | 39 | 141 | .. | - |
| Biogases | - | - | - | 22 | 15 | 24 | .. | - |
| Liquid biofuels | - | - | - | 5 | 9 | 7 | .. | - |
| Heat only plants | 2248 e | 2274 | 5451 | 6402 | 8150 | 8607 | .. | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | 1087 e | 1051 e | 1068 | 1517 | 2040 | 2024 | .. | - |
| Municipal waste non-renew. | 1088 e | 1051 e | 1068 | 1517 | 2040 | 2024 | .. | - |
| Solid biofuels | 73 e | 160 | 3237 | 3115 | 3873 | 4321 | .. | - |
| Biogases | - | 12 | 78 | 135 | 92 | 62 | .. | - |
| Liquid biofuels | - | - | - | 118 | 105 | 176 | .. | - |

1. Waste heat and heat production from heat pumps are not included and are reported separately in Table 5B.

Table 5B. Heat production from heat pumps and waste heat (TJ)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|----------------------------|--------------|--------------|-------------|-------------|-------------|-------------|-------------|-------------------------------------|
| Total heat | 740 e | 868 e | 2026 | 2281 | 2503 | 2584 | 2008 | 5.1 |
| Heat pumps ¹ | 56 | 309 | 1868 | 2161 | 2434 | 2634 | 2125 | 12.0 |
| (-) Input to heat pumps | 25 | 130 | 680 | 810 | 756 | 842 | 673 | 10.2 |
| Other sources ² | 709 e | 689 e | 838 | 930 | 825 | 792 | 556 | -1.3 |

1. Installations producing heat for own use are not included.

2. Refers to production from hydrogen, purchased steam from industry, and waste heat.

Source: IEA/OECD *Electricity Statistics*.

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Table 6. Renewable and waste balance for 2016

| thousand tonnes of oil equivalent | Hydro ¹ | Wind | Tide wave ocean | Solar PV | Geo-thermal | Solar thermal | Industrial waste | Mun. waste renew. |
|------------------------------------|--------------------|-------------|-----------------|-----------|-------------|---------------|------------------|-------------------|
| Production | 12296 | 182 | - | .. | - | - | 80 | 189 |
| Imports | - | - | - | - | - | - | - | - |
| Exports | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| TPES | 12296 | 182 | - | .. | - | - | 80 | 189 |
| Statistical differences | - | - | - | - | - | - | - | - |
| Main activity electricity plants | -12296 | -182 | - | .. | - | - | - | - |
| Autoproducer electricity plants | - | - | - | - | - | - | - | - |
| Main activity CHP plants | - | - | - | - | - | - | - | -103 |
| Autoproducer CHP plants | - | - | - | - | - | - | - | - |
| Main heat plants | - | - | - | - | - | - | - | -57 |
| Autoproducer heat plants | - | - | - | - | - | - | - | - |
| Charcoal production plants | - | - | - | - | - | - | - | - |
| Other transformation | - | - | - | - | - | - | - | - |
| Energy Industry own use | - | - | - | - | - | - | - | - |
| Losses | - | - | - | - | - | - | - | - |
| TFC | - | - | - | - | - | - | 80 | 29 |
| Industry | - | - | - | - | - | - | 80 | 29 |
| Iron and steel | - | - | - | - | - | - | 2 | - |
| Chemical and petrochemical | - | - | - | - | - | - | 25 | - |
| Non-ferrous metals | - | - | - | - | - | - | - | - |
| Non-metallc minerals | - | - | - | - | - | - | 46 | 15 |
| Transport equipment | - | - | - | - | - | - | - | - |
| Machinery | - | - | - | - | - | - | - | - |
| Mining and quarrying | - | - | - | - | - | - | - | - |
| Food and tobacco | - | - | - | - | - | - | - | - |
| Paper, pulp and print | - | - | - | - | - | - | 7 | 13 |
| Wood and wood products | - | - | - | - | - | - | - | 1 |
| Construction | - | - | - | - | - | - | - | - |
| Textile and leather | - | - | - | - | - | - | - | - |
| Non-specified | - | - | - | - | - | - | - | - |
| Transport | - | - | - | - | - | - | - | - |
| Road | - | - | - | - | - | - | - | - |
| Other | - | - | - | - | - | - | - | - |
| Other | - | - | - | - | - | - | - | - |
| Residential | - | - | - | - | - | - | - | - |
| Commercial and public services | - | - | - | - | - | - | - | - |
| Agriculture/forestry | - | - | - | - | - | - | - | - |
| Fishing | - | - | - | - | - | - | - | - |
| Non-specified | - | - | - | - | - | - | - | - |
| Electricity generated - GWh | 143006 | 2116 | - | .. | - | - | - | 192 |
| <i>Electricity plants</i> | 143006 | 2116 | - | .. | - | - | - | - |
| <i>CHP plants</i> | - | - | - | - | - | - | - | 192 |
| Heat generated - TJ | - | - | - | - | - | - | - | 4954 |
| <i>CHP plants</i> | - | - | - | - | - | - | - | 2930 |
| <i>Heat plants</i> | - | - | - | - | - | - | - | 2024 |

1. Hydro does not include pumped hydro.

Source: IEA/OECD *World Energy Balances*.

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Table 6. Renewable and waste balance for 2016 (continued)

| Mun. waste non-ren. | Wood/wood waste | Charcoal | Bio-gases | Bio-gasoline | Bio-diesel | Other liquid biofuels | Total renew. & waste sources ² | Share in total energy sources ³ |
|---------------------|-----------------|----------|-----------|--------------|------------|-----------------------|---|--|
| 168 | 849 | - | 29 | - | - | - | 13793 | 6.6% |
| - | 62 | - | - | 31 | 343 | 10 | 446 | 5.3% |
| - | -16 | - | - | - | -33 | - | -49 | 0.0% |
| - | - | - | - | - | - | - | - | - |
| 168 | 895 | - | 29 | 31 | 310 | 10 | 14190 | 52.1% |
| - | - | - | 1 | 1 | -1 | - | 1 | x |
| - | -2 | - | -2 | - | - | - | -12482 | x |
| - | - | - | - | - | - | - | - | - |
| -103 | -6 | - | -1 | - | - | - | -213 | x |
| - | - | - | - | - | - | - | - | - |
| -57 | -175 | - | -2 | - | - | -4 | -295 | x |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| 8 | 711 | - | 24 | 32 | 309 | 5 | 1198 | 5.8% |
| - | 201 | - | 2 | - | - | 5 | 317 | 5.4% |
| - | 2 | - | - | - | - | - | 4 | 0.6% |
| - | 47 | - | 2 | - | - | 1 | 75 | 5.3% |
| - | - | - | - | - | - | - | - | - |
| - | 12 | - | - | - | - | - | 73 | 22.9% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | 1 | - | - | - | - | 1 | 2 | 0.5% |
| - | 56 | - | - | - | - | - | 76 | 17.9% |
| - | 83 | - | - | - | - | - | 84 | 53.0% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | 1 | - | - | - | - | 4 | 5 | 10.1% |
| - | - | - | 10 | 26 | 309 | - | 345 | 7.2% |
| - | - | - | 10 | 26 | 309 | - | 345 | 10.1% |
| - | - | - | - | - | - | - | - | - |
| 8 | 510 | - | 12 | 6 | - | - | 536 | 7.1% |
| - | 489 | - | - | 6 | - | - | 495 | 11.6% |
| 8 | 21 | - | 12 | - | - | - | 41 | 1.4% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| 203 | 28 | - | 13 | - | - | - | 145558 | 97.9% |
| 11 | 19 | - | 13 | - | - | - | 145165 | 99.7% |
| 192 | 9 | - | - | - | - | - | 393 | 13.0% |
| 4954 | 4462 | - | 86 | - | - | 183 | 14639 | 66.0% |
| 2930 | 141 | - | 24 | - | - | 7 | 6032 | 93.1% |
| 2024 | 4321 | - | 62 | - | - | 176 | 8607 | 54.7% |

2. Total includes non-renewable waste.

3. Share of renewables on TFC excludes electricity and heat generated from renewable sources.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|--|--------|--------|------|------|------|------|-------|---|
| Geothermal (TJ) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Solar thermal (TJ) | | | | | | | | |
| Production | - | - | - | - | - | - | .. | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | .. | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Industrial waste (TJ) | | | | | | | | |
| Production | - | 471 | 2657 | 3497 | 3519 | 3356 | 3196 | 13.1 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | 471 | 2657 | 3497 | 3519 | 3356 | 3196 | 13.1 |
| Statistical differences | - | -471 | 5 | - | 3 | 1 | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | 1 | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | 2662 | 3497 | 3521 | 3357 | .. | - |
| <i>Industry</i> | - | - | 2662 | 3497 | 3521 | 3357 | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Municipal waste - renewables (TJ) | | | | | | | | |
| Production | 2258 e | 2688 | 5824 | 7425 | 7949 | 7915 | 9834 | 7.0 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 2258 e | 2688 | 5824 | 7425 | 7949 | 7915 | 9834 | 7.0 |
| Statistical differences | - | - | - | -1 | - | - | .. | - |
| Transformation processes | 2258 e | 2489 e | 4052 | 6398 | 6905 | 6704 | .. | 6.4 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | 199 | 1772 | 1026 | 1044 | 1211 | .. | 11.9 |
| <i>Industry</i> | - | 199 | 1772 | 1026 | 1044 | 1211 | .. | 11.9 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics (continued)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|--|---------|--------|-------|-------|-------|-------|-------|--|
| Municipal waste - non-renewables (TJ) | | | | | | | | |
| Production | 2257 e | 2690 | 4120 | 6744 | 7253 | 7050 | 6945 | 6.2 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 2257 e | 2690 | 4120 | 6744 | 7253 | 7050 | 6945 | 6.2 |
| Statistical differences | - | - | -6 | - | -2 | - | .. | .. |
| Transformation processes | 2257 e | 2489 e | 4052 | 6398 | 6905 | 6704 | .. | 6.4 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | 201 | 62 | 346 | 346 | 346 | .. | 3.5 |
| <i>Industry</i> | - | 201 | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | 62 | 346 | 346 | 346 | .. | - |
| Solid Biofuel excluding charcoal (TJ) | | | | | | | | |
| Production | 38669 | 50008 | 50107 | 32524 | 35784 | 35528 | 40768 | -2.1 |
| Net imports ¹ | - | 207 | 2442 | 2011 | 1993 | 1926 | -78 | 15.0 |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 38669 e | 50215 | 52549 | 34535 | 37777 | 37454 | 40690 | -1.8 |
| Statistical differences | - | - | 112 | 54 | -156 | -17 | .. | .. |
| Transformation processes | 1072 e | 1459 | 4779 | 5526 | 6801 | 7652 | .. | 10.9 |
| Energy industry own use | - | - | 7 | 2 | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 37597 | 48756 | 47875 | 29061 | 30820 | 29785 | .. | -3.0 |
| <i>Industry</i> | 15977 | 24603 | 17144 | 8986 | 9604 | 8424 | .. | -6.5 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 21620 | 24153 | 30731 | 20075 | 21216 | 21361 | .. | -0.8 |
| Charcoal (kt) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | .. |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Biogases (TJ) | | | | | | | | |
| Production | - | 1078 | 700 | 600 | 1100 | 1200 | 2195 | 0.7 |
| Net imports ¹ | - | - | - | - | - | - | -42 | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | 1078 | 700 | 600 | 1100 | 1200 | 2153 | 0.7 |
| Statistical differences | - | - | 111 | 229 | 171 | 31 | .. | .. |
| Transformation processes | - | 14 | 211 | 329 | 271 | 230 | .. | 19.1 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | 1064 | 600 | 500 | 1000 | 1001 | .. | -0.4 |
| <i>Industry</i> | - | - | - | 100 | 100 | 101 | .. | - |
| <i>Transport</i> | - | - | - | - | 400 | 400 | .. | - |
| <i>Other</i> | - | 1064 | 600 | 400 | 500 | 500 | .. | -4.6 |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics (continued)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|-----------------------------------|------|------|------|------|------|------|-------|---|
| Biogasoline (kt) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | 8 | 16 | 16 | 49 | 51 | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | 8 | 16 | 16 | 49 | 51 | - |
| Statistical differences | - | - | - | - | - | 1 | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | 8 | 16 | 16 | 50 | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | 7 | 13 | 13 | 41 | .. | - |
| <i>Other</i> | - | - | 1 | 3 | 3 | 9 | .. | - |
| Biodiesel (kt) | | | | | | | | |
| Production | - | - | - | - | - | - | 276 | - |
| Net imports ¹ | - | - | 127 | 135 | 149 | 353 | 249 | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | 127 | 135 | 149 | 353 | 525 | - |
| Statistical differences | - | - | - | -1 | - | -1 | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | 127 | 134 | 149 | 352 | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | 127 | 134 | 149 | 352 | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Other liquid biofuels (kt) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | 86 | 15 | 12 | 11 | 12 | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | 86 | 15 | 12 | 11 | 12 | - |
| Statistical differences | - | - | - | - | -1 | - | .. | - |
| Transformation processes | - | - | 61 | 3 | 3 | 5 | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | 25 | 12 | 8 | 6 | .. | - |
| <i>Industry</i> | - | - | 25 | 12 | 8 | 6 | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Figure 1. Contribution of renewables in 1990

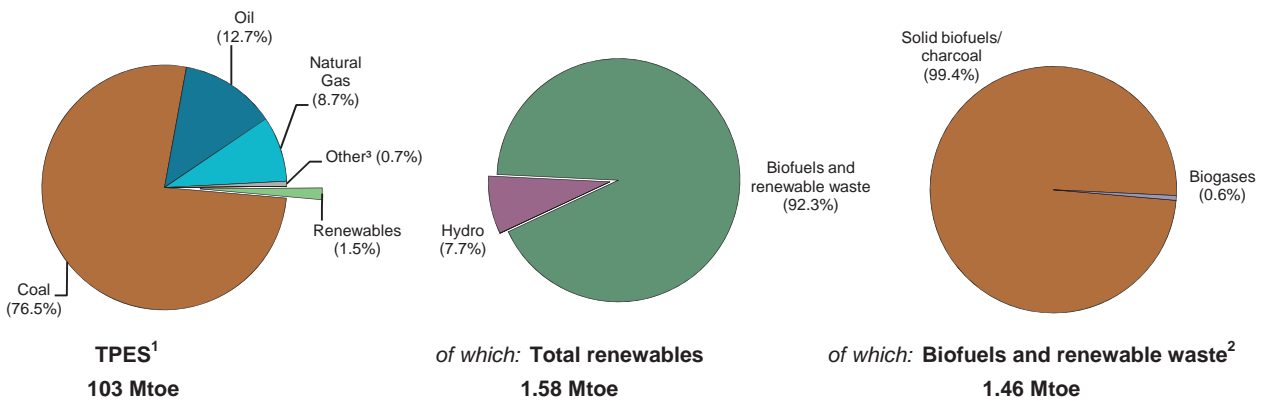


Figure 2. Contribution of renewables in 2017 provisional

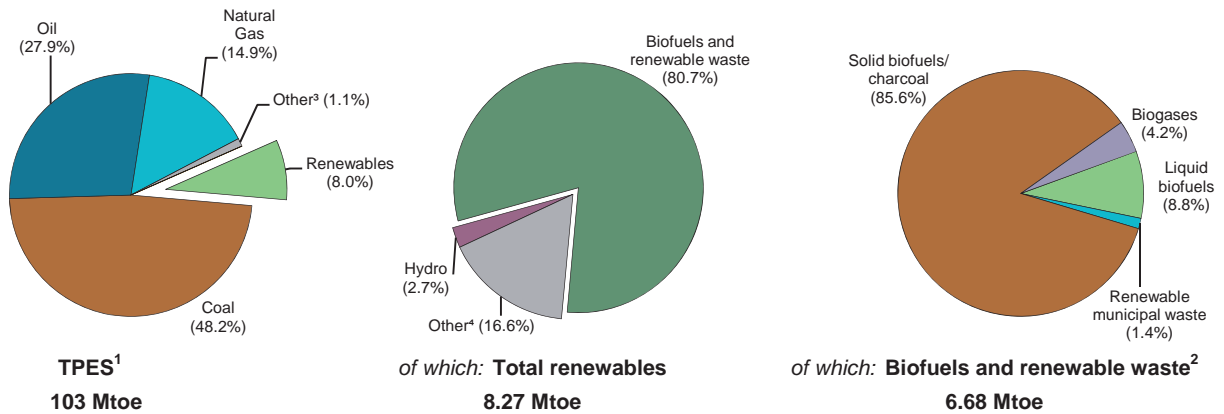
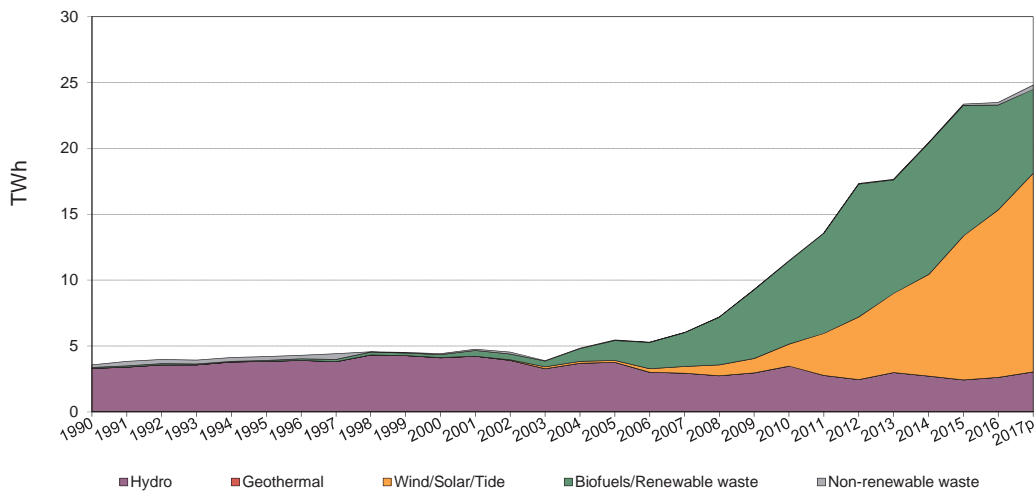


Figure 3. Electricity production by renewables and waste energy source



1. Total primary energy supply includes electricity trade.
 2. Biofuels and renewable waste include solid biofuels, liquid biofuels, biogases, and renewable municipal waste.
 3. Includes non-renewable municipal waste, industrial waste, peat, shale oil, electricity trade, and other sources of primary energy. (In the case of negative values, the net exports of electricity are greater than the other products in this category).
 4. Includes geothermal, solar, wind and tide.

Note: Totals may not sum due to rounding.
Source: IEA/OECD World Energy Balances.

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Table 1. Energy supply, GDP and population

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|---|--------|--------|--------|--------|--------|--------|--------|--|
| TPES (Mtoe) | 103.12 | 88.83 | 100.51 | 94.03 | 94.92 | 99.31 | 103.48 | 0.9 |
| of which: Renewables (Mtoe) ¹ | 1.58 | 3.80 | 7.27 | 8.61 | 8.97 | 8.77 | 8.27 | 4.7 |
| Renewables/TPES(%) | 1.5 | 4.3 | 7.2 | 9.2 | 9.5 | 8.8 | 8.0 | 3.7 |
| GDP (billion 2010 US dollars) | 226.66 | 326.21 | 479.32 | 535.61 | 556.20 | 572.72 | 599.35 | 3.6 |
| TPES/GDP ² | 0.45 | 0.27 | 0.21 | 0.18 | 0.17 | 0.17 | 0.17 | -2.6 |
| TPES/GDP (year 2010 = 100) | 217 | 130 | 100 | 84 | 81 | 83 | 82 | -2.6 |
| Population (millions) | 38.03 | 38.26 | 38.52 | 38.48 | 38.46 | 38.43 | 38.42 | 0.0 |
| TPES/population (toe per capita) | 2.71 | 2.32 | 2.61 | 2.44 | 2.47 | 2.58 | 2.69 | 0.9 |
| Electricity generation (TWh) ³ | 134.4 | 143.2 | 157.1 | 158.5 | 164.3 | 166.2 | 169.9 | 1.0 |
| of which: Renewables (TWh) ^{1,3} | 1.47 | 2.33 | 10.89 | 19.84 | 22.68 | 22.81 | 24.00 | 14.7 |
| Renew./Total Elec.(%) ^{1,4} | 1.1 | 1.6 | 6.9 | 12.5 | 13.8 | 13.7 | 14.1 | 13.6 |
| Road energy consumption (Mtoe) | 6.0 | 8.9 | 16.3 | 14.9 | 15.8 | 17.8 | .. | .. |
| of which: Liquid biofuels (Mtoe) | - | - | 0.87 | 0.71 | 0.65 | 0.46 | .. | .. |
| Liq. biofuels/road tr.(%) ⁵ | - | - | 5.3 | 4.7 | 4.1 | 2.6 | - | - |

1. Renewables do not include industrial waste, non-renewable municipal waste and pumped storage production.

2. In units of toe per thousand 2010 US dollars.

3. Electricity generation = gross production - amount of electricity produced in pumped storage plants.

4. Electricity share generated from renewables over the total electricity production.

5. Energy from liquid biofuels consumed in road transport over the total energy consumed in road transport.

Source: IEA/OECD *World Energy Balances* and OECD *Main Economic Indicators*.

Table 2. Net generating capacity of renewable and waste sources (MWe)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | Average annual percent change 00-16 |
|---|-------------|-------------|-------------|-------------|-------------|-------------|--|
| Total capacity | 1888 | 2199 | 3587 | 7046 | 8335 | 9318 | 9.4 |
| Hydro | 1888 | 2183 | 2342 | 2364 | 2370 | 2385 | 0.6 |
| Hydro <1MW | 31 | 57 | 78 | 89 | 91 | 93 | 3.1 |
| Hydro 1-10MW | 130 | 145 | 185 | 185 | 188 | 186 | 1.6 |
| Hydro 10+MW | 306 | 307 | 297 | 308 | 309 | 317 | 0.2 |
| Mixed plants | 216 | 308 | 376 | 376 | 376 | 376 | 1.3 |
| Pure pumped storage | 1205 | 1366 | 1406 | 1406 | 1406 | 1413 | 0.2 |
| Geothermal | - | - | - | - | - | - | - |
| Solar photovoltaic | - | - | - | 27 | 108 | 187 | - |
| Solar thermal | - | - | - | - | - | - | - |
| Tide, wave, ocean | - | - | - | - | - | - | - |
| Wind | - | 4 | 1108 | 3836 | 4886 | 5747 | 57.5 |
| Industrial waste | - | 3 | 3 | 3 | 3 | 3 | - |
| Municipal waste | - | - | - | - | 15 | 44 | - |
| Solid biofuels | - | - | 53 | 629 | 737 | 727 | - |
| Biogases | - | 9 | 81 | 187 | 216 | 225 | 22.3 |
| Liquid biofuels | - | - | - | - | - | - | - |
| Solar collectors surface (1000 m ²) | - | - | 656 | 1730 | 1900 | 2016 | - |
| Cap. of solar collectors (MW _{th}) ¹ | - | - | 459 | 1211 | 1330 | 1411 | - |

1. Converted at 0.7 kW_{th}/m² of solar collector area, as estimated by the IEA Solar Heating & Cooling Programme.

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Table 3. Capacity factors (%)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 |
|--|--------------|--------------|--------------|--------------|--------------|--------------|
| Total plants¹ | 21.59 | 22.94 | 36.61 | 33.12 | 32.00 | 28.79 |
| Hydro | 20.03 | 21.52 | 17.00 | 13.20 | 11.73 | 12.55 |
| <i>of which: <1MW</i> | 33.88 | 59.68 | 45.18 | 41.30 | 41.14 | 39.34 |
| <i>of which: 1-10MW</i> | 26.34 | 33.22 | 44.84 | 34.84 | 29.97 | 36.11 |
| <i>of which: 10+MW</i> | 38.24 | 51.54 | 72.43 | 48.03 | 37.34 | 44.32 |
| <i>of which: pure pumped storage²</i> | x | x | x | x | x | x |
| Geothermal | - | - | - | - | - | - |
| Solar photovoltaic | - | - | - | 2.91 | 5.99 | 7.56 |
| Solar thermal | - | - | - | - | - | - |
| Tide, wave and ocean | - | - | - | - | - | - |
| Wind | - | 14.27 | 17.15 | 22.84 | 25.37 | 25.00 |
| Industrial waste | - | x | x | x | x | x |
| Municipal waste | - | - | - | - | 26.02 | 50.08 |
| Solid biofuels | - | - | x | x | x | x |
| Biogases | - | 39.32 | 56.14 | 49.83 | 47.90 | 52.14 |
| Biodiesels | - | - | - | - | - | - |
| Other liquid biofuels | - | - | - | - | - | - |

1. The capacity factor is defined as: the annual gross electricity generation divided by the reported net capacity times 365 (days/year) times 24 (hours/day).

2. In case a country has at least one mixed hydro plants, it is impossible to calculate capacity factor thus it is shown as 'not applicable'.

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Table 4. Gross electricity production from renewable and waste sources (GWh)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|--------------------------------------|-------------|-------------|--------------|--------------|--------------|--------------|--------------|---|
| Total electricity¹ | 3571 | 4419 | 11501 | 20444 | 23361 | 23502 | 24807 | 10.7 |
| Hydro | 3313 | 4116 | 3488 | 2734 | 2435 | 2622 | 3030 | -1.8 |
| <i>of which: pumped storage</i> | 1896 | 2010 | 568 | 551 | 603 | 482 | 474 | -8.1 |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar photovoltaic | - | - | - | 7 | 57 | 124 | 167 | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Tide, wave, ocean | - | - | - | - | - | - | - | - |
| Wind | - | 5 | 1664 | 7676 | 10858 | 12588 | 14906 | 60.1 |
| Industrial waste | 203 | 77 | 35 | 37 | 41 | 33 | 44 | -3.2 |
| Municipal waste renew. | - | - | - | - | - | 12 | 77 | - |
| Municipal waste non-renew. | - | - | 10 | 13 | 34 | 180 | 288 | - |
| Solid biofuels | 55 | 190 | 5905 | 9161 | 9026 | 6913 | 5222 | 21.5 |
| Biogases | - | 31 | 398 | 816 | 906 | 1027 | 1071 | 23.2 |
| Liquid biofuels | - | - | 1 | - | 4 | 3 | 2 | - |
| of which: | | | | | | | | |
| Electricity only plants | 3313 | 4152 | 5394 | 12309 | 15307 | 17386 | .. | - |
| Hydro | 3313 | 4116 | 3488 | 2734 | 2435 | 2622 | .. | - |
| <i>of which: pumped storage</i> | 1896 | 2010 | 568 | 551 | 603 | 482 | .. | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar photovoltaic | - | - | - | 7 | 57 | 124 | .. | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Tide, wave, ocean | - | - | - | - | - | - | - | - |
| Wind | - | 5 | 1664 | 7676 | 10858 | 12588 | .. | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | - | - | - | - | - |
| Solid biofuels | - | - | 242 | 1892 | 1957 | 2052 | .. | - |
| Biogases | - | 31 | - | - | - | - | - | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| CHP plants | 258 | 267 | 6107 | 8135 | 8054 | 6116 | .. | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Industrial waste | 203 | 77 | 35 | 37 | 41 | 33 | .. | - |
| Municipal waste renew. | - | - | - | - | - | 12 | .. | - |
| Municipal waste non-renew. | - | - | 10 | 13 | 34 | 180 | .. | - |
| Solid biofuels | 55 | 190 | 5663 | 7269 | 7069 | 4861 | .. | - |
| Biogases | - | - | 398 | 816 | 906 | 1027 | .. | - |
| Liquid biofuels | - | - | 1 | - | 4 | 3 | .. | - |

1. **Total electricity** includes the electricity produced from industrial waste, non-renewable municipal waste and pumped storage. Electricity from renewable sources does *not* include the electricity produced from industrial waste, non-renewable municipal waste and pumped storage production.

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Table 5A. Heat production¹ from renewable and waste sources in the transformation sector (TJ)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|----------------------------|--------------|-------------|--------------|--------------|--------------|--------------|--------------|-------------------------------------|
| Total heat | 13980 | 2064 | 10988 | 14609 | 13586 | 15397 | 12988 | 11.4 |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | 2966 | 225 | 82 | 160 | 271 | 293 | 349 | 2.6 |
| Municipal waste renew. | - | - | - | 13 | 7 | 16 | 33 | - |
| Municipal waste non-renew. | - | - | 251 | 178 | 433 | 1129 | 1027 | - |
| Solid biofuels | 11004 | 1802 | 10548 | 13960 | 12420 | 13370 | 10645 | 11.0 |
| Biogases | 10 | 37 | 106 | 298 | 436 | 589 | 913 | 20.8 |
| Liquid biofuels | - | - | 1 | - | 19 | - | 21 | - |
| <i>of which:</i> | | | | | | | | |
| CHP plants | 11011 | 1567 | 9415 | 13052 | 12188 | 13082 | .. | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | 2902 | 220 | 17 | 89 | 201 | 156 | .. | - |
| Municipal waste renew. | - | - | - | - | - | 11 | .. | - |
| Municipal waste non-renew. | - | - | 251 | 97 | 333 | 976 | .. | - |
| Solid biofuels | 8109 | 1347 | 9052 | 12579 | 11211 | 11363 | .. | - |
| Biogases | - | - | 94 | 287 | 424 | 576 | .. | - |
| Liquid biofuels | - | - | 1 | - | 19 | - | - | - |
| Heat only plants | 2969 | 497 | 1573 | 1557 | 1398 | 2315 | .. | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | 64 | 5 | 65 | 71 | 70 | 137 | .. | - |
| Municipal waste renew. | - | - | - | 13 | 7 | 5 | .. | - |
| Municipal waste non-renew. | - | - | - | 81 | 100 | 153 | .. | - |
| Solid biofuels | 2895 | 455 | 1496 | 1381 | 1209 | 2007 | .. | - |
| Biogases | 10 | 37 | 12 | 11 | 12 | 13 | .. | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |

1. Waste heat and heat production from heat pumps are not included and are reported separately in Table 5B.

Table 5B. Heat production from heat pumps and waste heat (TJ)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|----------------------------|----------|----------|------------|-----------|-----------|-----------|-----------|-------------------------------------|
| Total heat | - | - | 122 | 80 | 99 | 58 | 59 | - |
| Heat pumps ¹ | - | - | 3 | 4 | 3 | 4 | 5 | - |
| (-) Input to heat pumps | - | - | - | - | - | - | - | - |
| Other sources ² | - | - | 119 | 76 | 96 | 54 | 54 | - |

1. Installations producing heat for own use are not included.

2. Refers to production from hydrogen, purchased steam from industry, and waste heat.

Source: IEA/OECD *Electricity Statistics*.

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Table 6. Renewable and waste balance for 2016

| thousand tonnes of oil equivalent | Hydro ¹ | Wind | Tide wave ocean | Solar PV | Geo-thermal | Solar thermal | Industrial waste | Mun. waste renew. |
|------------------------------------|--------------------|--------------|-----------------|------------|-------------|---------------|------------------|-------------------|
| Production | 184 | 1082 | - | 11 | 22 | 52 | 449 | 77 |
| Imports | - | - | - | - | - | - | - | - |
| Exports | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| TPES | 184 | 1082 | - | 11 | 22 | 52 | 449 | 77 |
| Statistical differences | - | - | - | - | - | - | - | - |
| Main activity electricity plants | -184 | -1082 | - | - | - | - | - | - |
| Autoproducer electricity plants | - | - | - | -11 | - | - | - | - |
| Main activity CHP plants | - | - | - | - | - | - | - | - |
| Autoproducer CHP plants | - | - | - | - | - | - | -9 | -8 |
| Main heat plants | - | - | - | - | - | - | - | - |
| Autoproducer heat plants | - | - | - | - | - | - | -4 | - |
| Charcoal production plants | - | - | - | - | - | - | - | - |
| Other transformation | - | - | - | - | - | - | - | - |
| Energy Industry own use | - | - | - | - | - | - | - | - |
| Losses | - | - | - | - | - | - | - | - |
| TFC | - | - | - | - | 22 | 52 | 436 | 69 |
| Industry | - | - | - | - | - | - | 433 | 50 |
| Iron and steel | - | - | - | - | - | - | - | - |
| Chemical and petrochemical | - | - | - | - | - | - | 16 | - |
| Non-ferrous metals | - | - | - | - | - | - | - | - |
| Non-metallc minerals | - | - | - | - | - | - | 412 | 50 |
| Transport equipment | - | - | - | - | - | - | - | - |
| Machinery | - | - | - | - | - | - | - | - |
| Mining and quarrying | - | - | - | - | - | - | - | - |
| Food and tobacco | - | - | - | - | - | - | - | - |
| Paper, pulp and print | - | - | - | - | - | - | 5 | - |
| Wood and wood products | - | - | - | - | - | - | - | - |
| Construction | - | - | - | - | - | - | - | - |
| Textile and leather | - | - | - | - | - | - | - | - |
| Non-specified | - | - | - | - | - | - | 1 | - |
| Transport | - | - | - | - | - | - | - | - |
| Road | - | - | - | - | - | - | - | - |
| Other | - | - | - | - | - | - | - | - |
| Other | - | - | - | - | 22 | 52 | 3 | 19 |
| Residential | - | - | - | - | 17 | 46 | - | - |
| Commercial and public services | - | - | - | - | 5 | 6 | 3 | 19 |
| Agriculture/forestry | - | - | - | - | - | - | - | - |
| Fishing | - | - | - | - | - | - | - | - |
| Non-specified | - | - | - | - | - | - | - | - |
| Electricity generated - GWh | 2140 | 12588 | - | 124 | - | - | 33 | 12 |
| <i>Electricity plants</i> | 2140 | 12588 | - | 124 | - | - | - | - |
| <i>CHP plants</i> | - | - | - | - | - | - | 33 | 12 |
| Heat generated - TJ | - | - | - | - | - | - | 293 | 16 |
| <i>CHP plants</i> | - | - | - | - | - | - | 156 | 11 |
| <i>Heat plants</i> | - | - | - | - | - | - | 137 | 5 |

1. Hydro does not include pumped hydro.

Source: IEA/OECD *World Energy Balances*.

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Table 6. Renewable and waste balance for 2016 (continued)

| Mun. waste non-ren. | Wood/wood waste | Charcoal | Bio-gases | Bio-gasoline | Bio-diesel | Other liquid biofuels | Total renew. & waste sources ² | Share in total energy sources ³ |
|---------------------|-----------------|----------|-------------|--------------|------------|-----------------------|---|--|
| 293 | 6415 | - | 261 | 126 | 794 | 2 | 9768 | 14.7% |
| - | 581 | - | - | 44 | 208 | - | 833 | 1.6% |
| - | -375 | - | - | -2 | -704 | - | -1081 | 5.2% |
| - | - | - | - | -1 | -7 | - | -8 | x |
| 293 | 6620 | - | 261 | 168 | 290 | 2 | 9511 | 9.6% |
| - | - | - | - | - | - | - | - | - |
| - | -456 | - | - | - | - | - | -1722 | x |
| - | - | - | - | - | - | - | -11 | x |
| - | -974 | - | -104 | - | - | - | -1078 | x |
| -86 | -281 | - | -68 | - | - | -2 | -454 | x |
| - | -52 | - | - | - | - | - | -52 | x |
| -5 | -6 | - | - | - | - | - | -15 | x |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | -1 | - | -1 | - | - | - | -2 | x |
| - | - | - | - | - | - | - | - | - |
| 201 | 4851 | - | 87 | 168 | 290 | - | 6176 | 8.7% |
| 195 | 1492 | - | 14 | - | - | - | 2184 | 14.9% |
| - | - | - | - | - | - | - | - | - |
| - | 3 | - | - | - | - | - | 19 | 0.8% |
| - | - | - | - | - | - | - | - | - |
| 195 | 12 | - | 1 | - | - | - | 670 | 23.6% |
| - | - | - | - | - | - | - | - | - |
| - | 3 | - | - | - | - | - | 3 | 0.4% |
| - | - | - | - | - | - | - | - | - |
| - | 33 | - | 10 | - | - | - | 43 | 2.2% |
| - | 726 | - | 3 | - | - | - | 734 | 44.8% |
| - | 592 | - | 1 | - | - | - | 593 | 61.3% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | 122 | - | - | - | - | - | 123 | 16.1% |
| - | - | - | - | 168 | 290 | - | 458 | 2.5% |
| - | - | - | - | 168 | 290 | - | 458 | 2.6% |
| - | - | - | - | - | - | - | - | - |
| 6 | 3358 | - | 73 | - | - | - | 3533 | 11.1% |
| - | 2662 | - | - | - | - | - | 2725 | 13.8% |
| 6 | 184 | - | 64 | - | - | - | 287 | 3.4% |
| - | 513 | - | 9 | - | - | - | 522 | 14.8% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| 180 | 6913 | - | 1027 | - | - | 3 | 23020 | 13.9% |
| - | 2052 | - | - | - | - | - | 16904 | 88.9% |
| 180 | 4861 | - | 1027 | - | - | 3 | 6116 | 4.2% |
| 1129 | 13370 | - | 589 | - | - | - | 15397 | 5.3% |
| 976 | 11363 | - | 576 | - | - | - | 13082 | 6.9% |
| 153 | 2007 | - | 13 | - | - | - | 2315 | 2.2% |

2. Total includes non-renewable waste.

3. Share of renewables on TFC excludes electricity and heat generated from renewable sources.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|--|-------|------|-------|-------|-------|-------|-------|---|
| Geothermal (TJ) | | | | | | | | |
| Production | - | 124 | 563 | 847 | 909 | 930 | 946 | 13.4 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | 124 | 563 | 847 | 909 | 930 | 946 | 13.4 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | 124 | 563 | 847 | 909 | 930 | .. | 13.4 |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | 124 | 563 | 847 | 909 | 930 | .. | 13.4 |
| Solar thermal (TJ) | | | | | | | | |
| Production | - | - | 420 | 1455 | 1885 | 2189 | 2250 | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | 420 | 1455 | 1885 | 2189 | 2250 | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | 420 | 1455 | 1885 | 2189 | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | 420 | 1455 | 1885 | 2189 | .. | - |
| Industrial waste (TJ) | | | | | | | | |
| Production | 32311 | 4306 | 11760 | 16993 | 16997 | 18795 | 23719 | 9.6 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | -29 | - | - | - | - | - | - |
| Gross consumption | 32311 | 4277 | 11760 | 16993 | 16997 | 18795 | 23719 | 9.7 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | 5265 | 889 | 442 | 470 | 693 | 545 | .. | -3.0 |
| Energy industry own use | 5222 | 229 | 2 | 2 | 2 | 5 | .. | -21.3 |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 21824 | 3159 | 11316 | 16521 | 16302 | 18245 | .. | 11.6 |
| <i>Industry</i> | 21320 | 3155 | 11295 | 16442 | 16157 | 18129 | .. | 11.5 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 504 | 4 | 21 | 79 | 145 | 116 | .. | 23.4 |
| Municipal waste - renewables (TJ) | | | | | | | | |
| Production | - | 32 e | 123 | 1544 | 1673 | 3233 | 3845 | 33.4 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | 4 e | - | - | - | - | - | - |
| Gross consumption | - | 36 e | 123 | 1544 | 1673 | 3233 | 3845 | 32.5 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | 16 | 9 | 331 | .. | - |
| Energy industry own use | - | 4 e | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | 32 e | 123 | 1528 | 1664 | 2902 | .. | 32.5 |
| <i>Industry</i> | - | - | 123 | 1528 | 1664 | 2094 | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | 32 e | - | - | - | 808 | .. | 22.4 |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics (continued)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|--|-------|--------|--------|--------|--------|--------|--------|--|
| Municipal waste - non-renewables (TJ) | | | | | | | | |
| Production | - | 32 e | 4884 | 4555 | 4920 | 12251 | 13852 | 45.0 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | 4 e | - | - | - | - | - | - |
| Gross consumption | - | 36 e | 4884 | 4555 | 4920 | 12251 | 13852 | 44.0 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | 367 | 343 | 859 | 3833 | .. | - |
| Energy industry own use | - | 4 e | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | 32 e | 4517 | 4212 | 4061 | 8418 | .. | 41.7 |
| <i>Industry</i> | - | - | 4512 | 4060 | 4011 | 8179 | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | 32 e | 5 | 152 | 50 | 239 | .. | 13.4 |
| Solid Biofuel excluding charcoal (TJ) | | | | | | | | |
| Production | 60643 | 150485 | 245606 | 258723 | 276199 | 268577 | 239960 | 3.7 |
| Net imports ¹ | - | - | - | 24112 | 12005 | 8596 | -770 | - |
| Stock changes | - | -292 | - | - | - | - | - | - |
| Gross consumption | 60643 | 150193 | 245606 | 282835 | 288204 | 277173 | 239190 | 3.9 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | 14571 | 3461 | 65114 | 96989 | 95657 | 74057 | .. | 21.1 |
| Energy industry own use | 6 | 6 | 349 | 39 | - | 26 | .. | 9.6 |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 46066 | 146726 | 180143 | 185807 | 192547 | 203090 | .. | 2.1 |
| <i>Industry</i> | 7191 | 26112 | 38280 | 54491 | 56853 | 62482 | .. | 5.6 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 38875 | 120614 | 141863 | 131316 | 135694 | 140608 | .. | 1.0 |
| Charcoal (kt) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Biogases (TJ) | | | | | | | | |
| Production | 393 | 1211 | 4797 | 8685 | 9581 | 10930 | 11816 | 14.7 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 393 | 1211 | 4797 | 8685 | 9581 | 10930 | 11816 | 14.7 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | 14 | 443 | 2778 | 5732 | 6314 | 7247 | .. | 19.1 |
| Energy industry own use | - | 27 | - | - | - | 22 | .. | -1.3 |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 379 | 741 | 2019 | 2953 | 3267 | 3661 | .. | 10.5 |
| <i>Industry</i> | - | 63 | 150 | 507 | 521 | 604 | .. | 15.2 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 379 | 678 | 1869 | 2446 | 2746 | 3057 | .. | 9.9 |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics (continued)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|-----------------------------------|------|------|------|------|------|------|-------|---|
| Biogasoline (kt) | | | | | | | | |
| Production | - | - | 153 | 143 | 174 | 195 | 191 | - |
| Net imports ¹ | - | - | 117 | 62 | 64 | 66 | 60 | - |
| Stock changes | - | - | -3 | 1 | 1 | -1 | -3 | |
| Gross consumption | - | - | 267 | 206 | 239 | 260 | 248 | - |
| Statistical differences | - | - | -1 | - | -1 | - | .. | |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | |
| Final energy consumption | - | - | 266 | 206 | 238 | 260 | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | 266 | 206 | 238 | 260 | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Biodiesel (kt) | | | | | | | | |
| Production | - | - | 380 | 739 | 787 | 898 | 897 | - |
| Net imports ¹ | - | - | 385 | -88 | -209 | -562 | -411 | - |
| Stock changes | - | - | -3 | -3 | -12 | -8 | -3 | |
| Gross consumption | - | - | 762 | 648 | 566 | 328 | 483 | - |
| Statistical differences | - | - | -1 | - | - | - | .. | |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | |
| Final energy consumption | - | - | 761 | 648 | 566 | 328 | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | 761 | 648 | 566 | 328 | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Other liquid biofuels (kt) | | | | | | | | |
| Production | - | - | - | - | 2 | 2 | 2 | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | |
| Gross consumption | - | - | - | - | 2 | 2 | 2 | - |
| Statistical differences | - | - | - | - | - | - | .. | |
| Transformation processes | - | - | - | - | 2 | 2 | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Figure 1. Contribution of renewables in 1990

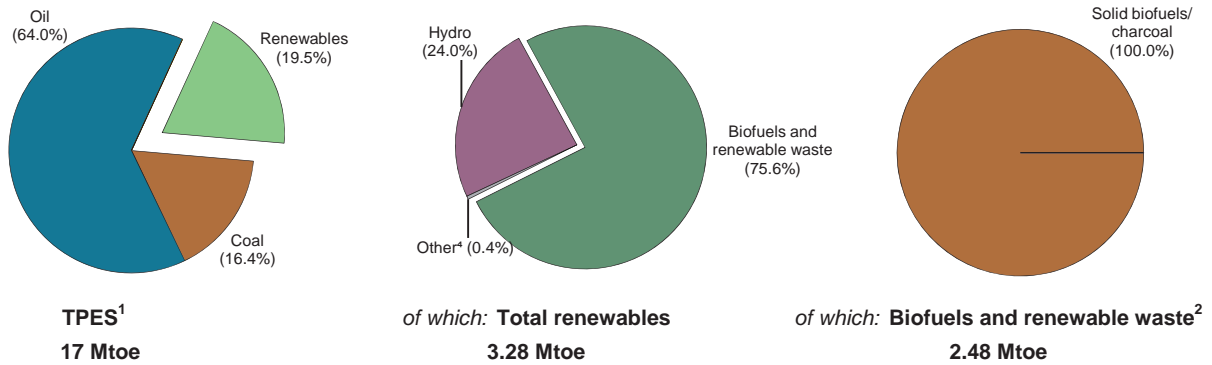


Figure 2. Contribution of renewables in 2017 provisional

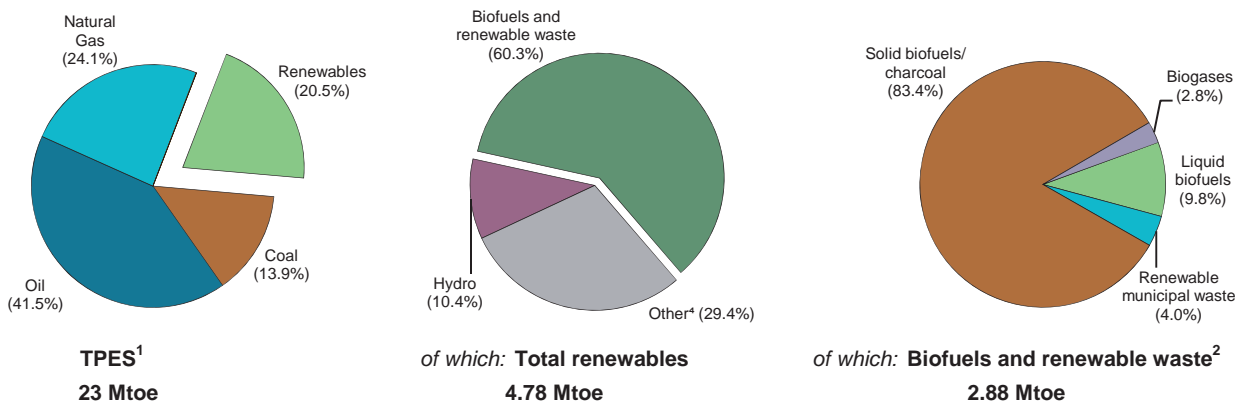
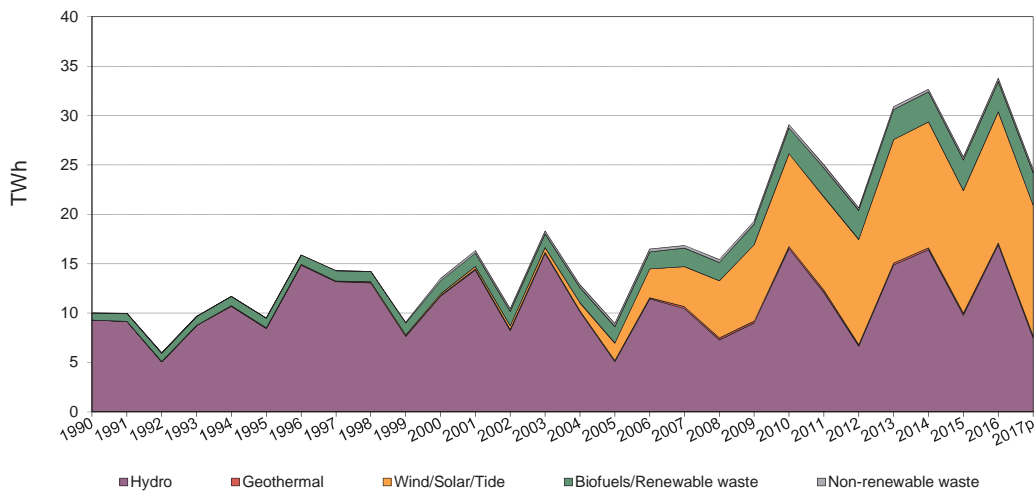


Figure 3. Electricity production by renewables and waste energy source



1. Total primary energy supply includes electricity trade.
 2. Biofuels and renewable waste include solid biofuels, liquid biofuels, biogases, and renewable municipal waste.
 3. Includes non-renewable municipal waste, industrial waste, peat, shale oil, electricity trade, and other sources of primary energy. (In the case of negative values, the net exports of electricity are greater than the other products in this category).
 4. Includes geothermal, solar, wind and tide.

Note: Totals may not sum due to rounding.
Source: IEA/OECD *World Energy Balances*.

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Table 1. Energy supply, GDP and population

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|---|--------|--------|--------|--------|--------|--------|--------|--|
| TPES (Mtoe) | 16.78 | 24.59 | 23.50 | 21.17 | 21.99 | 22.12 | 23.25 | -0.3 |
| of which: Renewables (Mtoe) ¹ | 3.28 | 3.76 | 5.46 | 5.51 | 4.97 | 5.62 | 4.78 | 1.4 |
| Renewables/TPES(%) | 19.5 | 15.3 | 23.2 | 26.0 | 22.6 | 25.4 | 20.5 | 1.8 |
| GDP (billion 2010 US dollars) | 166.59 | 221.37 | 238.30 | 223.97 | 228.05 | 231.75 | 237.96 | 0.4 |
| TPES/GDP ² | 0.10 | 0.11 | 0.10 | 0.09 | 0.10 | 0.10 | 0.10 | -0.8 |
| TPES/GDP (year 2010 = 100) | 102 | 113 | 100 | 96 | 98 | 97 | 99 | -0.8 |
| Population (millions) | 10.00 | 10.29 | 10.57 | 10.40 | 10.36 | 10.33 | 10.30 | 0.0 |
| TPES/population (toe per capita) | 1.68 | 2.39 | 2.22 | 2.04 | 2.12 | 2.14 | 2.26 | -0.3 |
| Electricity generation (TWh) ³ | 28.3 | 43.4 | 53.7 | 52.0 | 51.3 | 59.1 | 57.6 | 1.7 |
| of which: Renewables (TWh) ^{1,3} | 9.84 | 12.87 | 28.35 | 31.56 | 24.37 | 32.26 | 22.48 | 3.3 |
| Renew./Total Elec.(%) ^{1,4} | 34.7 | 29.7 | 52.8 | 60.7 | 47.5 | 54.6 | 39.0 | 1.6 |
| Road energy consumption (Mtoe) | 3.0 | 5.6 | 6.1 | 5.2 | 5.3 | 5.3 | .. | .. |
| of which: Liquid biofuels (Mtoe) | - | - | 0.31 | 0.26 | 0.32 | 0.26 | .. | .. |
| Liq. biofuels/road tr.(%) ⁵ | - | - | 5.1 | 5.0 | 6.2 | 5.0 | - | - |

1. Renewables do not include industrial waste, non-renewable municipal waste and pumped storage production.

2. In units of toe per thousand 2010 US dollars.

3. Electricity generation = gross production - amount of electricity produced in pumped storage plants.

4. Electricity share generated from renewables over the total electricity production.

5. Energy from liquid biofuels consumed in road transport over the total energy consumed in road transport.

Source: IEA/OECD *World Energy Balances* and OECD *Main Economic Indicators*.

Table 2. Net generating capacity of renewable and waste sources (MWe)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | Average annual percent change 00-16 |
|---|-------------|-------------|-------------|--------------|--------------|--------------|--|
| Total capacity | 3550 | 4917 | 9657 | 11626 | 12196 | 13202 | 6.4 |
| Hydro | 3356 | 4535 | 5106 | 5715 | 6168 | 6960 | 2.7 |
| Hydro <1MW | 8 | 27 | 34 | 32 | 31 | 31 | 0.9 |
| Hydro 1-10MW | 72 | 236 | 343 | 356 | 363 | 373 | 2.9 |
| Hydro 10+MW | 2614 | 3610 | 3635 | 3911 | 3985 | 3985 | 0.6 |
| Mixed plants | 662 | 662 | 1094 | 1416 | 1789 | 2571 | 8.8 |
| Pure pumped storage | - | - | - | - | - | - | - |
| Geothermal | 1 | 14 | 25 | 25 | 25 | 25 | 3.7 |
| Solar photovoltaic | - | 1 | 134 | 415 | 447 | 462 | 46.7 |
| Solar thermal | - | - | - | - | - | - | - |
| Tide, wave, ocean | - | - | - | 1 | - | - | - |
| Wind | 1 | 83 | 3796 | 4856 | 4937 | 5124 | 29.4 |
| Industrial waste | - | - | 12 | 15 | 3 | 3 | - |
| Municipal waste | - | 64 | 77 | 77 | 79 | 83 | 1.6 |
| Solid biofuels | 192 e | 219 | 482 | 456 | 471 | 477 | 5.0 |
| Biogases | - | 1 | 25 | 66 | 66 | 68 | 30.2 |
| Liquid biofuels | - | - | - | - | - | - | - |
| Solar collectors surface (1000 m ²) | 150 | 238 | 752 | 1079 | 1121 | 1176 | 10.5 |
| Cap. of solar collectors (MW _{th}) ¹ | 105 | 167 | 526 | 755 | 785 | 823 | 10.5 |

1. Converted at 0.7 kW_{th}/m² of solar collector area, as estimated by the IEA Solar Heating & Cooling Programme.

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Table 3. Capacity factors (%)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 |
|--|--------------|--------------|--------------|--------------|--------------|--------------|
| Total plants¹ | 32.15 | 31.38 | 34.37 | 32.06 | 24.16 | 29.20 |
| Hydro | 31.64 | 29.49 | 36.99 | 32.78 | 18.14 | 27.73 |
| <i>of which: <1MW</i> | 21.75 | 30.86 | 34.82 | 38.66 | 27.77 | 35.16 |
| <i>of which: 1-10MW</i> | 85.76 | 38.94 | 36.60 | 42.09 | 22.63 | 37.18 |
| <i>of which: 10+MW</i> | 37.50 | 33.03 | 46.93 | 41.29 | 22.53 | 41.29 |
| <i>of which: pure pumped storage²</i> | x | x | x | x | x | x |
| Geothermal | 45.66 | 65.23 | 90.00 | 93.78 | 92.95 | 78.35 |
| Solar photovoltaic | - | 11.42 | 18.00 | 17.26 | 20.33 | 20.32 |
| Solar thermal | - | - | - | - | - | - |
| Tide, wave and ocean | - | - | - | 0.30 | - | - |
| Wind | 11.42 | 23.11 | 27.61 | 28.47 | 26.84 | 27.79 |
| Industrial waste | - | - | 36.78 | 6.95 | 29.47 | 58.05 |
| Municipal waste | - | 91.68 e | 85.54 | 71.30 | 84.38 | 83.84 |
| Solid biofuels | 40.97 e | 54.05 | 52.71 | 63.34 | 61.03 | 59.38 |
| Biogases | - | 22.83 | 45.49 | 47.93 | 50.84 | 47.77 |
| Biodiesels | - | - | - | - | - | - |
| Other liquid biofuels | - | - | - | - | - | - |

1. The capacity factor is defined as: the annual gross electricity generation divided by the reported net capacity times 365 (days/year) times 24 (hours/day).

2. In case a country has at least one mixed hydro plants, it is impossible to calculate capacity factor thus it is shown as 'not applicable'.

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Table 4. Gross electricity production from renewable and waste sources (GWh)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|--------------------------------------|-------------|--------------|--------------|--------------|--------------|--------------|--------------|---|
| Total electricity¹ | 9998 | 13517 | 29079 | 32652 | 25810 | 33768 | 24540 | 3.6 |
| Hydro | 9303 | 11715 | 16547 | 16412 | 9799 | 16909 | 7501 | -2.6 |
| <i>of which: pumped storage</i> | 159 | 392 | 399 | 843 | 1139 | 1186 | 1735 | 9.1 |
| Geothermal | 4 | 80 | 197 | 205 | 204 | 172 | 206 | 5.7 |
| Solar photovoltaic | 1 | 1 | 211 | 627 | 796 | 822 | 971 | 49.9 |
| Solar thermal | - | - | - | - | - | - | - | - |
| Tide, wave, ocean | - | - | - | - | - | - | - | - |
| Wind | 1 | 168 | 9182 | 12111 | 11607 | 12474 | 12246 | 28.7 |
| Industrial waste | - | - | 39 | 9 | 8 | 15 | 11 | - |
| Municipal waste renew. | - | 257 | 289 | 240 | 292 | 305 | 315 | 1.2 |
| Municipal waste non-renew. | - | 257 | 288 | 240 | 292 | 305 | 315 | 1.2 |
| Solid biofuels | 689 | 1037 | 2226 | 2530 | 2518 | 2481 | 2688 | 5.8 |
| Biogases | - | 2 | 100 | 278 | 294 | 285 | 287 | 33.9 |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| of which: | | | | | | | | |
| Electricity only plants | 9309 | 12485 | 27504 | 30864 | 24064 | 32015 | .. | - |
| Hydro | 9303 | 11715 | 16547 | 16412 | 9799 | 16909 | .. | - |
| <i>of which: pumped storage</i> | 159 | 392 | 399 | 843 | 1139 | 1186 | .. | - |
| Geothermal | 4 | 80 | 197 | 205 | 204 | 172 | .. | - |
| Solar photovoltaic | 1 | 1 | 211 | 627 | 796 | 822 | .. | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Tide, wave, ocean | - | - | - | - | - | - | - | - |
| Wind | 1 | 168 | 9182 | 12111 | 11607 | 12474 | .. | - |
| Industrial waste | - | - | 34 | - | - | - | - | - |
| Municipal waste renew. | - | 257 | 289 | 240 | 292 | 305 | .. | - |
| Municipal waste non-renew. | - | 257 | 288 | 240 | 292 | 305 | .. | - |
| Solid biofuels | - | 7 | 666 | 765 | 795 | 760 | .. | - |
| Biogases | - | - | 90 | 264 | 279 | 268 | .. | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| CHP plants | 689 | 1032 | 1575 | 1788 | 1746 | 1753 | .. | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | 5 | 9 | 8 | 15 | .. | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | - | - | - | - | - |
| Solid biofuels | 689 | 1030 | 1560 | 1765 | 1723 | 1721 | .. | - |
| Biogases | - | 2 | 10 | 14 | 15 | 17 | .. | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |

1. **Total electricity** includes the electricity produced from industrial waste, non-renewable municipal waste and pumped storage. Electricity from renewable sources does *not* include the electricity produced from industrial waste, non-renewable municipal waste and pumped storage production.

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Table 5A. Heat production¹ from renewable and waste sources in the transformation sector (TJ)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|----------------------------|------|------|------|------|------|------|-------|--|
| Total heat | - | - | - | - | - | - | - | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | - | - | - | - | - |
| Solid biofuels | - | - | - | - | - | - | - | - |
| Biogases | - | - | - | - | - | - | - | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| <i>of which:</i> | | | | | | | | |
| CHP plants | - | - | - | - | - | - | - | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | - | - | - | - | - |
| Solid biofuels | - | - | - | - | - | - | - | - |
| Biogases | - | - | - | - | - | - | - | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| Heat only plants | - | - | - | - | - | - | - | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | - | - | - | - | - |
| Solid biofuels | - | - | - | - | - | - | - | - |
| Biogases | - | - | - | - | - | - | - | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |

1. Waste heat and heat production from heat pumps are not included and are reported separately in Table 5B.

Table 5B. Heat production from heat pumps and waste heat (TJ)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|----------------------------|------|------|------|------|------|------|-------|--|
| Total heat | - | - | - | - | - | - | - | - |
| Heat pumps ¹ | - | - | - | - | - | - | - | - |
| (-) Input to heat pumps | - | - | - | - | - | - | - | - |
| Other sources ² | - | - | - | - | - | - | - | - |

1. Installations producing heat for own use are not included.

2. Refers to production from hydrogen, purchased steam from industry, and waste heat.

Source: IEA/OECD *Electricity Statistics*.

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Table 6. Renewable and waste balance for 2016

| thousand tonnes of oil equivalent | Hydro ¹ | Wind | Tide wave ocean | Solar PV | Geo-thermal | Solar thermal | Industrial waste | Mun. waste renew. |
|------------------------------------|--------------------|--------------|-----------------|------------|-------------|---------------|------------------|-------------------|
| Production | 1352 | 1073 | - | 71 | 158 | 84 | 71 | 104 |
| Imports | - | - | - | - | - | - | 34 | - |
| Exports | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| TPES | 1352 | 1073 | - | 71 | 158 | 84 | 104 | 104 |
| Statistical differences | - | - | - | - | - | - | - | - |
| Main activity electricity plants | -1350 | -1073 | - | -42 | -156 | - | - | - |
| Autoproducer electricity plants | -2 | - | - | -29 | - | - | - | -104 |
| Main activity CHP plants | - | - | - | - | - | - | - | - |
| Autoproducer CHP plants | - | - | - | - | - | - | -14 | - |
| Main heat plants | - | - | - | - | - | - | - | - |
| Autoproducer heat plants | - | - | - | - | - | - | - | - |
| Charcoal production plants | - | - | - | - | - | - | - | - |
| Other transformation | - | - | - | - | - | - | - | - |
| Energy Industry own use | - | - | - | - | - | - | - | - |
| Losses | - | - | - | - | - | - | - | - |
| TFC | - | - | - | - | 1 | 84 | 90 | - |
| Industry | - | - | - | - | - | - | 90 | - |
| Iron and steel | - | - | - | - | - | - | - | - |
| Chemical and petrochemical | - | - | - | - | - | - | - | - |
| Non-ferrous metals | - | - | - | - | - | - | - | - |
| Non-metallc minerals | - | - | - | - | - | - | 90 | - |
| Transport equipment | - | - | - | - | - | - | - | - |
| Machinery | - | - | - | - | - | - | - | - |
| Mining and quarrying | - | - | - | - | - | - | - | - |
| Food and tobacco | - | - | - | - | - | - | - | - |
| Paper, pulp and print | - | - | - | - | - | - | - | - |
| Wood and wood products | - | - | - | - | - | - | - | - |
| Construction | - | - | - | - | - | - | - | - |
| Textile and leather | - | - | - | - | - | - | - | - |
| Non-specified | - | - | - | - | - | - | 1 | - |
| Transport | - | - | - | - | - | - | - | - |
| Road | - | - | - | - | - | - | - | - |
| Other | - | - | - | - | - | - | - | - |
| Other | - | - | - | - | 1 | 84 | - | - |
| Residential | - | - | - | - | - | 50 | - | - |
| Commercial and public services | - | - | - | - | 1 | 34 | - | - |
| Agriculture/forestry | - | - | - | - | - | - | - | - |
| Fishing | - | - | - | - | - | - | - | - |
| Non-specified | - | - | - | - | - | - | - | - |
| Electricity generated - GWh | 15723 | 12474 | - | 822 | 172 | - | 15 | 305 |
| <i>Electricity plants</i> | 15723 | 12474 | - | 822 | 172 | - | - | 305 |
| <i>CHP plants</i> | - | - | - | - | - | - | 15 | - |
| Heat generated - TJ | - | - | - | - | - | - | - | - |
| <i>CHP plants</i> | - | - | - | - | - | - | - | - |
| <i>Heat plants</i> | - | - | - | - | - | - | - | - |

1. Hydro does not include pumped hydro.

Source: IEA/OECD *World Energy Balances*.

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Table 6. Renewable and waste balance for 2016 (continued)

| Mun. waste non-ren. | Wood/wood waste | Charcoal | Bio-gases | Bio-gasoline | Bio-diesel | Other liquid biofuels | Total renew. & waste sources ² | Share in total energy sources ³ |
|---------------------|-----------------|-----------|------------|--------------|------------|-----------------------|---|--|
| 104 | 2605 | - | 80 | - | 295 | 3 | 6000 | 99.9% |
| - | 77 | 23 | - | 23 | 4 | - | 161 | 0.6% |
| - | -280 | -4 | - | - | -52 | - | -336 | 4.2% |
| - | - | - | - | 2 | 4 | - | 6 | x |
| 104 | 2402 | 19 | 80 | 25 | 251 | 3 | 5830 | 26.4% |
| - | - | - | - | - | -3 | - | -3 | x |
| - | -236 | - | - | - | -1 | - | -2858 | x |
| -104 | -49 | - | -67 | - | - | - | -355 | x |
| - | - | - | - | - | - | - | - | - |
| - | -329 | - | -4 | - | - | - | -347 | x |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | -15 | 6 | - | - | - | - | -9 | x |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | 1773 | 25 | 9 | 25 | 247 | 3 | 2257 | 14.1% |
| - | 1004 | 1 | 9 | - | 7 | - | 1111 | 25.7% |
| - | - | - | - | - | - | - | - | - |
| - | 1 | - | - | - | - | - | 1 | 0.3% |
| - | - | - | - | - | - | - | - | - |
| - | 71 | - | - | - | 1 | - | 162 | 15.9% |
| - | - | - | - | - | - | - | - | - |
| - | 1 | - | - | - | - | - | 1 | 0.7% |
| - | - | - | - | - | 2 | - | 2 | 3.4% |
| - | 27 | - | 1 | - | 1 | - | 29 | 6.4% |
| - | 856 | - | 7 | - | - | - | 863 | 63.1% |
| - | 43 | - | - | - | - | - | 43 | 36.8% |
| - | - | - | - | - | 4 | - | 4 | 2.5% |
| - | 3 | 1 | - | - | - | - | 4 | 1.4% |
| - | 1 | - | - | - | - | - | 2 | 3.2% |
| - | - | - | - | 25 | 236 | 3 | 264 | 4.7% |
| - | - | - | - | 25 | 234 | 3 | 262 | 5.0% |
| - | - | - | - | - | 2 | - | 2 | 0.7% |
| - | 769 | 25 | - | - | 4 | - | 883 | 17.7% |
| - | 757 | 7 | - | - | - | - | 814 | 31.1% |
| - | 11 | 18 | - | - | 1 | - | 65 | 3.4% |
| - | 1 | - | - | - | 2 | - | 3 | 0.9% |
| - | - | - | - | - | 1 | - | 1 | 1.3% |
| - | - | - | - | - | 1 | - | 1 | 3.6% |
| 305 | 2481 | - | 285 | - | - | - | 32582 | 55.1% |
| 305 | 760 | - | 268 | - | - | - | 30829 | 59.2% |
| - | 1721 | - | 17 | - | - | - | 1753 | 25.0% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |

2. Total includes non-renewable waste.

3. Share of renewables on TFC excludes electricity and heat generated from renewable sources.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|--|------|--------|------|------|------|------|-------|---|
| Geothermal (TJ) | | | | | | | | |
| Production | 134 | 2921 | 7560 | 7889 | 7829 | 6602 | 7473 | 5.2 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 134 | 2921 | 7560 | 7889 | 7829 | 6602 | 7473 | 5.2 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | 134 | 2879 | 7518 | 7834 | 7765 | 6545 | .. | 5.3 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | 42 | 42 | 55 | 64 | 57 | .. | 1.9 |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | 42 | 42 | 55 | 64 | 57 | .. | 1.9 |
| Solar thermal (TJ) | | | | | | | | |
| Production | 458 | 770 | 2013 | 3218 | 3360 | 3515 | 3683 | 10.0 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 458 | 770 | 2013 | 3218 | 3360 | 3515 | 3683 | 10.0 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 458 | 770 | 2013 | 3218 | 3360 | 3515 | .. | 10.0 |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 458 | 770 | 2013 | 3218 | 3360 | 3515 | .. | 10.0 |
| Industrial waste (TJ) | | | | | | | | |
| Production | - | - | 2629 | 2680 | 1011 | 2961 | 3188 | - |
| Net imports ¹ | - | - | - | 1014 | 1407 | 1407 | 1201 | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | 2629 | 3694 | 2418 | 4368 | 4389 | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | 343 | 91 | 79 | 580 | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | 2286 | 3603 | 2339 | 3788 | .. | - |
| <i>Industry</i> | - | - | 2286 | 3603 | 2339 | 3788 | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Municipal waste - renewables (TJ) | | | | | | | | |
| Production | - | 3648 e | 4015 | 3423 | 4078 | 4340 | 4851 | 1.1 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | 3648 e | 4015 | 3423 | 4078 | 4340 | 4851 | 1.1 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | 3648 e | 4015 | 3423 | 4078 | 4340 | .. | 1.1 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics (continued)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|--|--------|--------|--------|--------|--------|--------|--------|---|
| Municipal waste - non-renewables (TJ) | | | | | | | | |
| Production | - | 3647 e | 4015 | 3422 | 4077 | 4340 | 4851 | 1.1 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | 3647 e | 4015 | 3422 | 4077 | 4340 | 4851 | 1.1 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | 3647 e | 4015 | 3422 | 4077 | 4340 | .. | 1.1 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Solid Biofuel excluding charcoal (TJ) | | | | | | | | |
| Production | 103699 | 108637 | 117488 | 111814 | 108984 | 109052 | 107879 | 0.0 |
| Net imports ¹ | - | - | -9375 | -13439 | -11071 | -8483 | -8238 | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 103699 | 108637 | 108113 | 98375 | 97913 | 100569 | 99641 | -0.5 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | 6253 | 7551 | 18060 | 25485 | 25940 | 26345 | .. | 8.1 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 97446 | 101086 | 90053 | 72890 | 71973 | 74224 | .. | -1.9 |
| <i>Industry</i> | 49297 | 52937 | 60247 | 40484 | 39761 | 42019 | .. | -1.4 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 48149 | 48149 | 29806 | 32406 | 32212 | 32205 | .. | -2.5 |
| Charcoal (kt) | | | | | | | | |
| Production | - | - | - | 8 | 8 | 9 | 19 | - |
| Net imports ¹ | - | - | - | 35 | 35 | 27 | 29 | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | 43 | 43 | 36 | 48 | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | 43 | 43 | 36 | .. | - |
| <i>Industry</i> | - | - | - | 1 | 1 | 1 | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | 42 | 42 | 35 | .. | - |
| Biogases (TJ) | | | | | | | | |
| Production | - | 48 | 1287 | 3432 | 3457 | 3364 | 3386 | 30.4 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | 48 | 1287 | 3432 | 3457 | 3364 | 3386 | 30.4 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | 48 | 1287 | 3078 | 3121 | 2996 | .. | 29.5 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | 354 | 336 | 368 | .. | - |
| <i>Industry</i> | - | - | - | 354 | 336 | 368 | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics (continued)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|-----------------------------------|------|------|------|------|------|------|-------|---|
| Biogasoline (kt) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | 3 | 37 | 36 | 8 | - |
| Stock changes | - | - | - | - | -5 | 3 | 2 | - |
| Gross consumption | - | - | - | 3 | 32 | 39 | 10 | - |
| Statistical differences | - | - | - | - | 1 | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | 3 | 33 | 39 | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | 3 | 33 | 39 | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Biodiesel (kt) | | | | | | | | |
| Production | - | - | 317 | 335 | 359 | 334 | 354 | - |
| Net imports ¹ | - | - | 18 | -29 | 11 | -54 | -59 | - |
| Stock changes | - | - | 30 | -2 | -7 | 4 | 12 | - |
| Gross consumption | - | - | 365 | 304 | 363 | 284 | 307 | - |
| Statistical differences | - | - | - | - | 1 | -3 | .. | - |
| Transformation processes | - | - | - | 1 | 2 | 1 | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | 365 | 303 | 362 | 280 | .. | - |
| <i>Industry</i> | - | - | 14 | 9 | 13 | 8 | .. | - |
| <i>Transport</i> | - | - | 345 | 288 | 342 | 267 | .. | - |
| <i>Other</i> | - | - | 6 | 6 | 7 | 5 | .. | - |
| Other liquid biofuels (kt) | | | | | | | | |
| Production | - | - | 5 | 6 | 4 | 3 | 2 | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | 2 | - |
| Gross consumption | - | - | 5 | 6 | 4 | 3 | 4 | - |
| Statistical differences | - | - | - | -1 | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | 5 | 5 | 4 | 3 | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | 5 | 5 | 4 | 3 | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Figure 1. Contribution of renewables in 1990

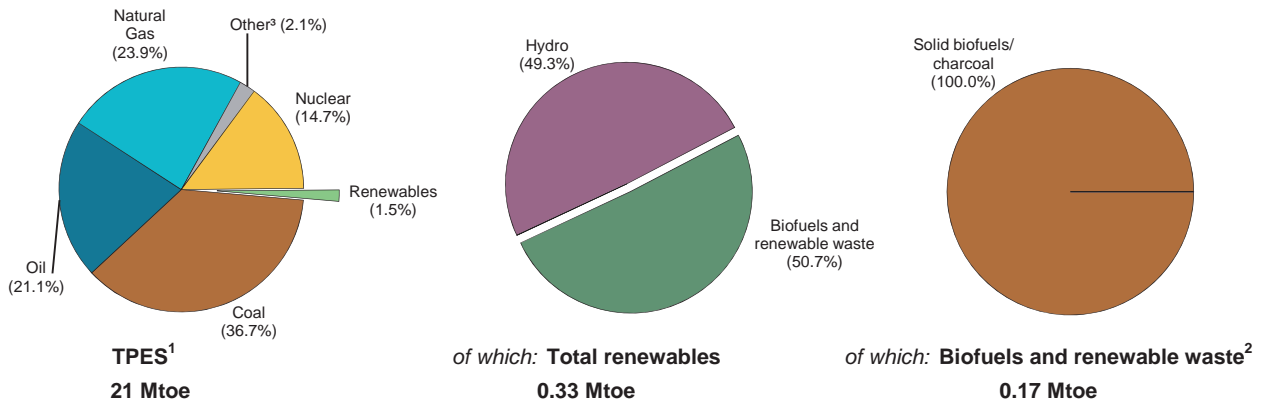


Figure 2. Contribution of renewables in 2017 provisional

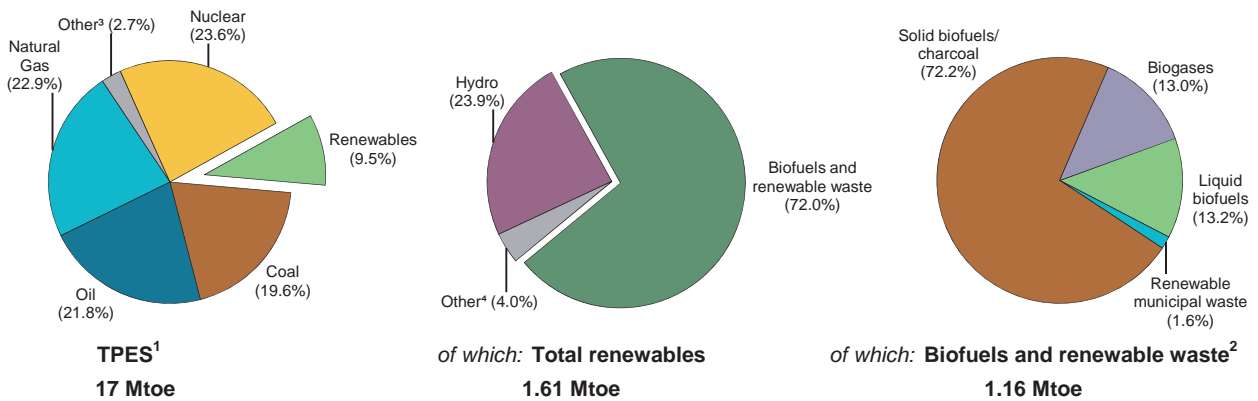
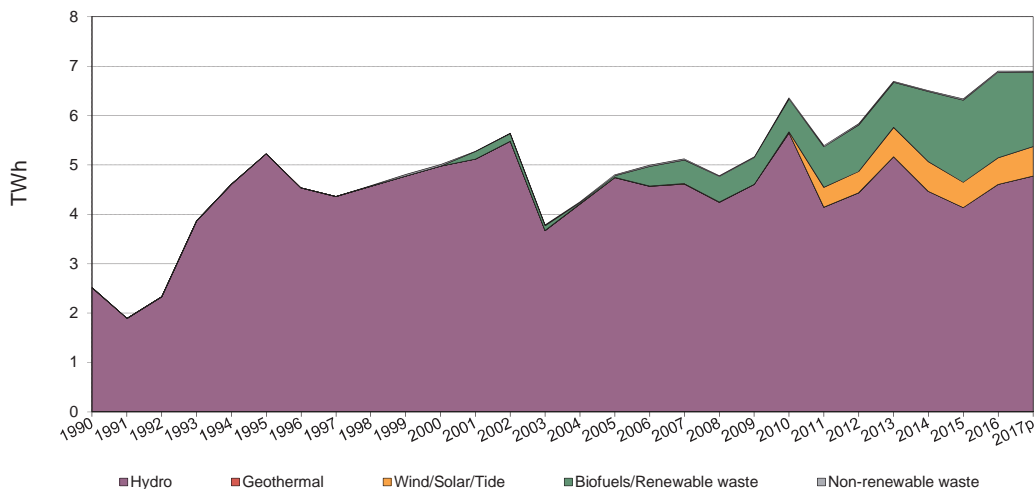


Figure 3. Electricity production by renewables and waste energy source



1. Total primary energy supply includes electricity trade.
 2. Biofuels and renewable waste include solid biofuels, liquid biofuels, biogases, and renewable municipal waste.
 3. Includes non-renewable municipal waste, industrial waste, peat, shale oil, electricity trade, and other sources of primary energy. (In the case of negative values, the net exports of electricity are greater than the other products in this category).
 4. Includes geothermal, solar, wind and tide.

Note: Totals may not sum due to rounding.
Source: IEA/OECD World Energy Balances.

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Table 1. Energy supply, GDP and population

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|---|-------|-------|-------|-------|--------|--------|--------|-------------------------------------|
| TPES (Mtoe) | 21.33 | 17.74 | 17.83 | 15.95 | 16.39 | 16.50 | 17.00 | -0.3 |
| of which: Renewables (Mtoe) ¹ | 0.33 | 0.49 | 1.32 | 1.42 | 1.58 | 1.58 | 1.61 | 7.3 |
| Renewables/TPES(%) | 1.5 | 2.8 | 7.4 | 8.9 | 9.6 | 9.6 | 9.5 | 7.5 |
| GDP (billion 2010 US dollars) | 51.10 | 55.49 | 89.50 | 97.56 | 101.31 | 104.68 | 108.24 | 4.0 |
| TPES/GDP ² | 0.42 | 0.32 | 0.20 | 0.16 | 0.16 | 0.16 | 0.16 | -4.1 |
| TPES/GDP (year 2010 = 100) | 210 | 161 | 100 | 82 | 81 | 79 | 79 | -4.1 |
| Population (millions) | 5.30 | 5.40 | 5.43 | 5.42 | 5.42 | 5.43 | 5.44 | 0.0 |
| TPES/population (toe per capita) | 4.03 | 3.29 | 3.28 | 2.94 | 3.02 | 3.04 | 3.13 | -0.3 |
| Electricity generation (TWh) ³ | 25.5 | 30.8 | 27.5 | 27.1 | 26.6 | 26.8 | 26.4 | -0.9 |
| of which: Renewables (TWh) ^{1,3} | 1.88 | 4.62 | 5.94 | 6.23 | 6.04 | 6.63 | 6.58 | 2.1 |
| Renew./Total Elec.(%) ^{1,4} | 7.4 | 15.0 | 21.6 | 22.9 | 22.7 | 24.7 | 25.0 | 3.1 |
| Road energy consumption (Mtoe) | 1.3 | 1.3 | 2.1 | 2.0 | 2.0 | 2.2 | .. | .. |
| of which: Liquid biofuels (Mtoe) | - | - | 0.10 | 0.13 | 0.14 | 0.14 | .. | .. |
| Liq. biofuels/road tr.(%) ⁵ | - | - | 4.6 | 6.6 | 7.2 | 6.3 | - | - |

1. Renewables do not include industrial waste, non-renewable municipal waste and pumped storage production.

2. In units of toe per thousand 2010 US dollars.

3. Electricity generation = gross production - amount of electricity produced in pumped storage plants.

4. Electricity share generated from renewables over the total electricity production.

5. Energy from liquid biofuels consumed in road transport over the total energy consumed in road transport.

Source: IEA/OECD *World Energy Balances* and OECD *Main Economic Indicators*.

Table 2. Net generating capacity of renewable and waste sources (MWe)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | Average annual percent change 00-16 |
|---|------|-------------|-------------|-------------|-------------|-------------|-------------------------------------|
| Total capacity | .. | 2420 | 2723 | 3312 | 3316 | 3332 | 2.0 |
| Hydro | .. | 2420 | 2516 | 2523 | 2522 | 2524 | 0.3 |
| Hydro <1MW | - | - | 26 | 24 | 18 | 28 | - |
| Hydro 1-10MW | - | - | 66 | 48 | 57 | 49 | - |
| Hydro 10+MW | .. | .. | 1508 | 1535 | 1531 | 1531 | .. |
| Mixed plants | - | - | - | - | - | - | - |
| Pure pumped storage | .. | 735 e | 916 | 916 | 916 | 916 | 1.4 |
| Geothermal | - | - | - | - | - | - | - |
| Solar photovoltaic | - | - | 19 | 533 | 533 | 533 | - |
| Solar thermal | - | - | - | - | - | - | - |
| Tide, wave, ocean | - | - | - | - | - | - | - |
| Wind | - | - | 3 | 3 | 3 | 3 | - |
| Industrial waste | .. | .. | 2 | 11 | 11 | 10 | .. |
| Municipal waste | - | - | 5 | 11 | 11 | 19 | - |
| Solid biofuels | - | - | 169 | 153 | 145 | 150 | - |
| Biogases | - | - | 9 | 78 | 91 | 93 | - |
| Liquid biofuels | - | - | - | - | - | - | - |
| Solar collectors surface (1000 m ²) | - | - | 123 | 166 | 171 | 177 | - |
| Cap. of solar collectors (MW _{th}) ¹ | - | - | 86 | 116 | 120 | 124 | - |

1. Converted at 0.7 kW_{th}/m² of solar collector area, as estimated by the IEA Solar Heating & Cooling Programme.

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Table 3. Capacity factors (%)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 |
|--|-----------|--------------|--------------|--------------|--------------|--------------|
| Total plants¹ | x3 | 23.62 | 26.65 | 22.43 | 21.82 | 23.63 |
| Hydro | x | 23.47 | 25.63 | 20.19 | 18.73 | 20.83 |
| <i>of which: <1MW</i> | - | - | 24.15 | 21.40 | 23.47 | 21.61 |
| <i>of which: 1-10MW</i> | - | - | 8.48 | 24.73 | 16.02 | 21.90 |
| <i>of which: 10+MW</i> | x | x | 38.99 | 30.19 | 27.95 | 31.41 |
| <i>of which: pure pumped storage²</i> | x | 5.59 e | 4.91 | 3.15 | 3.38 | 3.08 |
| Geothermal | - | - | - | - | - | - |
| Solar photovoltaic | - | - | 10.18 | 12.79 | 10.84 | 11.42 |
| Solar thermal | - | - | - | - | - | - |
| Tide, wave and ocean | - | - | - | - | - | - |
| Wind | - | - | 22.83 | 22.83 | 22.83 | 22.83 |
| Industrial waste | x | x | 62.79 | 14.53 | 15.57 | 6.85 |
| Municipal waste | - | - | 79.91 | 34.25 | 34.25 | 25.23 |
| Solid biofuels | - | - | 40.93 | 68.34 | 86.52 | 85.92 |
| Biogases | - | - | 43.13 | 70.10 | 67.87 | 70.70 |
| Biodiesels | - | - | - | - | - | - |
| Other liquid biofuels | - | - | - | - | - | - |

1. The capacity factor is defined as: the annual gross electricity generation divided by the reported net capacity times 365 (days/year) times 24 (hours/day).

2. In case a country has at least one mixed hydro plants, it is impossible to calculate capacity factor thus it is shown as 'not applicable'.

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Table 4. Gross electricity production from renewable and waste sources (GWh)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|--------------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|---|
| Total electricity¹ | 2515 | 5007 | 6358 | 6507 | 6337 | 6898 | 6897 | 1.9 |
| Hydro | 2515 | 4975 | 5649 | 4462 | 4137 | 4606 | 4772 | -0.2 |
| <i>of which: pumped storage</i> | 635 | 360 | 394 | 253 | 271 | 247 | 299 | -1.1 |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar photovoltaic | - | - | 17 | 597 | 506 | 533 | 592 | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Tide, wave, ocean | - | - | - | - | - | - | - | - |
| Wind | - | - | 6 | 6 | 6 | 6 | 5 | - |
| Industrial waste | - | 32 | 11 | 14 | 15 | 6 | 5 | -10.3 |
| Municipal waste renew. | - | - | 22 | 22 | 22 | 26 | 22 | - |
| Municipal waste non-renew. | - | - | 13 | 11 | 11 | 16 | 10 | - |
| Solid biofuels | - | - | 606 | 916 | 1099 | 1129 | 1035 | - |
| Biogases | - | - | 34 | 479 | 541 | 576 | 456 | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| <i>of which:</i> | | | | | | | | |
| Electricity only plants | 2515 | 5007 | 5674 | 5247 | 4770 | 5262 | .. | - |
| Hydro | 2515 | 4975 | 5649 | 4462 | 4137 | 4606 | .. | - |
| <i>of which: pumped storage</i> | 635 | 360 | 394 | 253 | 271 | 247 | .. | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar photovoltaic | - | - | 17 | 597 | 506 | 533 | .. | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Tide, wave, ocean | - | - | - | - | - | - | - | - |
| Wind | - | - | 6 | 6 | 6 | 6 | .. | - |
| Industrial waste | - | 32 | - | - | - | - | - | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | - | - | - | - | - |
| Solid biofuels | - | - | - | 11 | 4 | 3 | .. | - |
| Biogases | - | - | 2 | 171 | 117 | 114 | .. | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| CHP plants | - | - | 684 | 1260 | 1567 | 1636 | .. | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | 11 | 14 | 15 | 6 | .. | - |
| Municipal waste renew. | - | - | 22 | 22 | 22 | 26 | .. | - |
| Municipal waste non-renew. | - | - | 13 | 11 | 11 | 16 | .. | - |
| Solid biofuels | - | - | 606 | 905 | 1095 | 1126 | .. | - |
| Biogases | - | - | 32 | 308 | 424 | 462 | .. | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |

1. **Total electricity** includes the electricity produced from industrial waste, non-renewable municipal waste and pumped storage. Electricity from renewable sources does *not* include the electricity produced from industrial waste, non-renewable municipal waste and pumped storage production.

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Table 5A. Heat production¹ from renewable and waste sources in the transformation sector (TJ)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|----------------------------|------|--------|------|------|------|------|-------|-------------------------------------|
| Total heat | - | 2892 e | 4440 | 5251 | 5594 | 5982 | 4948 | 3.2 |
| Geothermal | - | - | 139 | 120 | 121 | 140 | 140 | - |
| Solar thermal | - | - | 1 | 1 | 1 | 2 | 2 | - |
| Industrial waste | - | 2892 e | 72 | 42 | 4 | 4 | 4 | -32.1 |
| Municipal waste renew. | - | - | 52 | - | - | 62 | 38 | - |
| Municipal waste non-renew. | - | - | 50 | 7 | 23 | 51 | 41 | - |
| Solid biofuels | - | - | 4056 | 4752 | 4972 | 5252 | 4325 | - |
| Biogases | - | - | 70 | 329 | 473 | 471 | 398 | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| <i>of which:</i> | | | | | | | | |
| CHP plants | - | - | 2518 | 3395 | 3638 | 3715 | .. | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | 14 | 19 | 2 | 2 | .. | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | - | - | - | - | - |
| Solid biofuels | - | - | 2454 | 3047 | 3163 | 3242 | .. | - |
| Biogases | - | - | 50 | 329 | 473 | 471 | .. | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| Heat only plants | - | 2892 e | 1922 | 1856 | 1956 | 2267 | .. | - |
| Geothermal | - | - | 139 | 120 | 121 | 140 | .. | - |
| Solar thermal | - | - | 1 | 1 | 1 | 2 | .. | - |
| Industrial waste | - | 2892 e | 58 | 23 | 2 | 2 | .. | - |
| Municipal waste renew. | - | - | 52 | - | - | 62 | .. | - |
| Municipal waste non-renew. | - | - | 50 | 7 | 23 | 51 | .. | - |
| Solid biofuels | - | - | 1602 | 1705 | 1809 | 2010 | .. | - |
| Biogases | - | - | 20 | - | - | - | - | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |

1. Waste heat and heat production from heat pumps are not included and are reported separately in Table 5B.

Table 5B. Heat production from heat pumps and waste heat (TJ)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|----------------------------|------|------|------|------|------|------|-------|-------------------------------------|
| Total heat | - | - | 67 | 9 | 9 | 12 | 12 e | - |
| Heat pumps ¹ | - | - | 3 | 8 | 5 | 6 | 6 e | - |
| (-) Input to heat pumps | - | - | 4 | 7 | 4 | 4 | 4 | - |
| Other sources ² | - | - | 68 | 8 | 8 | 10 | 10 e | - |

1. Installations producing heat for own use are not included.

2. Refers to production from hydrogen, purchased steam from industry, and waste heat.

Source: IEA/OECD *Electricity Statistics*.

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Table 6. Renewable and waste balance for 2016

| thousand tonnes of oil equivalent | Hydro ¹ | Wind | Tide wave ocean | Solar PV | Geo-thermal | Solar thermal | Industrial waste | Mun. waste renew. |
|------------------------------------|--------------------|----------|-----------------|------------|-------------|---------------|------------------|-------------------|
| Production | 375 | 1 | - | 46 | 8 | 6 | 181 | 19 |
| Imports | - | - | - | - | - | - | 3 | - |
| Exports | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| TPES | 375 | 1 | - | 46 | 8 | 6 | 184 | 19 |
| Statistical differences | - | - | - | - | - | - | - | - |
| Main activity electricity plants | -366 | - | - | -13 | - | - | - | - |
| Autoproducer electricity plants | -8 | - | - | -33 | - | - | - | - |
| Main activity CHP plants | - | - | - | - | - | - | - | - |
| Autoproducer CHP plants | - | - | - | - | - | - | -3 | -16 |
| Main heat plants | - | - | - | - | -4 | - | - | - |
| Autoproducer heat plants | - | - | - | - | -2 | - | - | -2 |
| Charcoal production plants | - | - | - | - | - | - | - | - |
| Other transformation | - | - | - | - | - | - | - | - |
| Energy Industry own use | - | - | - | - | - | - | - | - |
| Losses | - | - | - | - | - | - | - | - |
| TFC | - | - | - | - | 2 | 6 | 181 | 2 |
| Industry | - | - | - | - | - | - | 180 | - |
| Iron and steel | - | - | - | - | - | - | - | - |
| Chemical and petrochemical | - | - | - | - | - | - | 31 | - |
| Non-ferrous metals | - | - | - | - | - | - | - | - |
| Non-metallc minerals | - | - | - | - | - | - | 148 | - |
| Transport equipment | - | - | - | - | - | - | - | - |
| Machinery | - | - | - | - | - | - | 1 | - |
| Mining and quarrying | - | - | - | - | - | - | - | - |
| Food and tobacco | - | - | - | - | - | - | - | - |
| Paper, pulp and print | - | - | - | - | - | - | - | - |
| Wood and wood products | - | - | - | - | - | - | - | - |
| Construction | - | - | - | - | - | - | - | - |
| Textile and leather | - | - | - | - | - | - | - | - |
| Non-specified | - | - | - | - | - | - | - | - |
| Transport | - | - | - | - | - | - | - | - |
| Road | - | - | - | - | - | - | - | - |
| Other | - | - | - | - | - | - | - | - |
| Other | - | - | - | - | 2 | 6 | 1 | 2 |
| Residential | - | - | - | - | - | 5 | - | - |
| Commercial and public services | - | - | - | - | 1 | 1 | - | 2 |
| Agriculture/forestry | - | - | - | - | 1 | - | 1 | - |
| Fishing | - | - | - | - | - | - | - | - |
| Non-specified | - | - | - | - | - | - | - | - |
| Electricity generated - GWh | 4359 | 6 | - | 533 | - | - | 6 | 26 |
| <i>Electricity plants</i> | 4359 | 6 | - | 533 | - | - | - | - |
| <i>CHP plants</i> | - | - | - | - | - | - | 6 | 26 |
| Heat generated - TJ | - | - | - | - | 140 | 2 | 4 | 62 |
| <i>CHP plants</i> | - | - | - | - | - | - | 2 | - |
| <i>Heat plants</i> | - | - | - | - | 140 | 2 | 2 | 62 |

1. Hydro does not include pumped hydro.

Source: IEA/OECD *World Energy Balances*.

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Table 6. Renewable and waste balance for 2016 (continued)

| Mun. waste non-ren. | Wood/wood waste | Charcoal | Bio-gases | Bio-gasoline | Bio-diesel | Other liquid biofuels | Total renew. & waste sources ² | Share in total energy sources ³ |
|---------------------|-----------------|----------|------------|--------------|------------|-----------------------|---|--|
| 17 | 835 | - | 152 | 59 | 104 | - | 1803 | 27.9% |
| - | - | - | - | - | 102 | - | 105 | 0.7% |
| - | -11 | - | - | -43 | -77 | - | -131 | 2.5% |
| - | 1 | - | - | -1 | 1 | - | 1 | x |
| 17 | 826 | - | 152 | 16 | 129 | - | 1779 | 10.8% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | -379 | x |
| - | -3 | - | -26 | - | - | - | -70 | x |
| - | -178 | - | -24 | - | - | - | -202 | x |
| -14 | -194 | - | -69 | - | - | - | -296 | x |
| - | -46 | - | - | - | - | - | -50 | x |
| -2 | -17 | - | - | - | - | - | -23 | x |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| 2 | 388 | - | 32 | 16 | 129 | - | 758 | 7.4% |
| - | 342 | - | - | - | - | - | 522 | 15.6% |
| - | 3 | - | - | - | - | - | 3 | 0.3% |
| - | - | - | - | - | - | - | 31 | 7.6% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | 148 | 32.2% |
| - | - | - | - | - | - | - | - | - |
| - | 4 | - | - | - | - | - | 5 | 2.3% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | 304 | - | - | - | - | - | 304 | 66.2% |
| - | 21 | - | - | - | - | - | 21 | 51.9% |
| - | 1 | - | - | - | - | - | 1 | 3.4% |
| - | - | - | - | - | - | - | - | - |
| - | 7 | - | - | - | - | - | 7 | 5.0% |
| - | - | - | - | 16 | 124 | - | 140 | 5.7% |
| - | - | - | - | 16 | 124 | - | 140 | 6.3% |
| - | - | - | - | - | - | - | - | - |
| 2 | 46 | - | 32 | - | 5 | - | 96 | 2.8% |
| - | 33 | - | - | - | - | - | 38 | 1.9% |
| 2 | 3 | - | 10 | - | - | - | 19 | 1.5% |
| - | 11 | - | 22 | - | 5 | - | 40 | 26.8% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| 16 | 1129 | - | 576 | - | - | - | 6651 | 24.8% |
| - | 3 | - | 114 | - | - | - | 5015 | 52.4% |
| 16 | 1126 | - | 462 | - | - | - | 1636 | 9.5% |
| 51 | 5252 | - | 471 | - | - | - | 5982 | 16.0% |
| - | 3242 | - | 471 | - | - | - | 3715 | 14.3% |
| 51 | 2010 | - | - | - | - | - | 2267 | 19.7% |

2. Total includes non-renewable waste.

3. Share of renewables on TFC excludes electricity and heat generated from renewable sources.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|--|------|-------|------|------|------|------|-------|---|
| Geothermal (TJ) | | | | | | | | |
| Production | - | - | 348 | 296 | 297 | 346 | 340 e | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | 348 | 296 | 297 | 346 | 340 e | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | 278 | 240 | 242 | 280 | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | 70 | 56 | 55 | 66 | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | 70 | 56 | 55 | 66 | .. | - |
| Solar thermal (TJ) | | | | | | | | |
| Production | - | - | 179 | 242 | 230 | 234 | 232 e | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | 179 | 242 | 230 | 234 | 232 e | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | 1 | 1 | 1 | 2 | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | 178 | 241 | 229 | 232 | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | 178 | 241 | 229 | 232 | .. | - |
| Industrial waste (TJ) | | | | | | | | |
| Production | 321 | 13473 | 731 | 5072 | 6905 | 7583 | 7500 | -3.5 |
| Net imports ¹ | - | - | 41 | 47 | 30 | 115 | .. | - |
| Stock changes | - | - | -3 | -10 | 4 | 1 | .. | - |
| Gross consumption | 321 | 13473 | 769 | 5109 | 6939 | 7699 | 7500 | -3.4 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | 3888 | 164 | 155 | 184 | 130 | .. | -19.1 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | 53 | 7 | - | - | .. | - |
| Final energy consumption | 321 | 9585 | 552 | 4947 | 6755 | 7569 | .. | -1.5 |
| <i>Industry</i> | 321 | 9573 | 546 | 4947 | 6755 | 7534 | .. | -1.5 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | 12 | 6 | - | - | 35 | .. | 6.9 |
| Municipal waste - renewables (TJ) | | | | | | | | |
| Production | - | - | 908 | 485 | 625 | 815 | 800 | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | -7 | - | - | - | - | - |
| Gross consumption | - | - | 901 | 485 | 625 | 815 | 800 | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | 549 | 485 | 625 | 736 | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | 352 | - | - | 79 | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | 352 | - | - | 79 | .. | - |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics (continued)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|--|------|--------|-------|-------|-------|-------|-------|---|
| Municipal waste - non-renewables (TJ) | | | | | | | | |
| Production | - | - | 705 | 1235 | 1043 | 715 | 700 | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | 705 | 1235 | 1043 | 715 | 700 | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | 373 | 297 | 493 | 644 | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | 4 | - | - | - | .. | - |
| Final energy consumption | - | - | 328 | 938 | 550 | 71 | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | 328 | 938 | 550 | 71 | .. | - |
| Solid Biofuel excluding charcoal (TJ) | | | | | | | | |
| Production | 6965 | 4169 e | 30999 | 31798 | 37254 | 34943 | 35000 | 14.2 |
| Net imports ¹ | - | - | -915 | -481 | -466 | -432 | .. | - |
| Stock changes | - | -346 e | 260 | 158 | 26 | 62 | .. | - |
| Gross consumption | 6965 | 3823 e | 30344 | 31475 | 36814 | 34573 | 35000 | 14.8 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | 12495 | 16063 | 18134 | 18322 | .. | - |
| Energy industry own use | - | - | - | 26 | 10 | 12 | .. | - |
| Losses | - | - | 127 | 11 | 28 | - | .. | - |
| Final energy consumption | 6965 | 3823 | 17722 | 15375 | 18642 | 16239 | .. | 9.5 |
| <i>Industry</i> | 6965 | 3798 | 15717 | 13529 | 17055 | 14310 | .. | 8.6 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | 25 e | 2005 | 1846 | 1587 | 1929 | .. | 31.2 |
| Charcoal (kt) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Biogases (TJ) | | | | | | | | |
| Production | - | - | 600 | 4025 | 6223 | 6357 | 6300 | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | 600 | 4025 | 6223 | 6357 | 6300 | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | 375 | 3857 | 4574 | 4991 | .. | - |
| Energy industry own use | - | - | - | 10 | - | 14 | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | 225 | 158 | 1649 | 1352 | .. | - |
| <i>Industry</i> | - | - | 21 | 2 | 3 | 4 | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | 204 | 156 | 1646 | 1348 | .. | - |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics (continued)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|-----------------------------------|------|------|------|------|------|------|-------|---|
| Biogasoline (kt) | | | | | | | | |
| Production | - | - | 97 | 106 | 112 | 117 | 118 | - |
| Net imports ¹ | - | - | -46 | -63 | -64 | -85 | -75 | - |
| Stock changes | - | - | -4 | 5 | - | -1 | -2 | - |
| Gross consumption | - | - | 47 | 48 | 48 | 31 | 41 | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | 47 | 48 | 48 | 31 | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | 47 | 48 | 48 | 31 | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Biodiesel (kt) | | | | | | | | |
| Production | - | - | 113 | 101 | 106 | 110 | 110 | - |
| Net imports ¹ | - | - | -36 | 19 | 29 | 26 | 32 | - |
| Stock changes | - | - | -3 | -1 | -1 | 1 | -2 | - |
| Gross consumption | - | - | 74 | 119 | 134 | 137 | 140 | - |
| Statistical differences | - | - | 1 | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | 75 | 119 | 134 | 137 | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | 75 | 119 | 134 | 132 | .. | - |
| <i>Other</i> | - | - | - | - | - | 5 | .. | - |
| Other liquid biofuels (kt) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Figure 1. Contribution of renewables in 1990

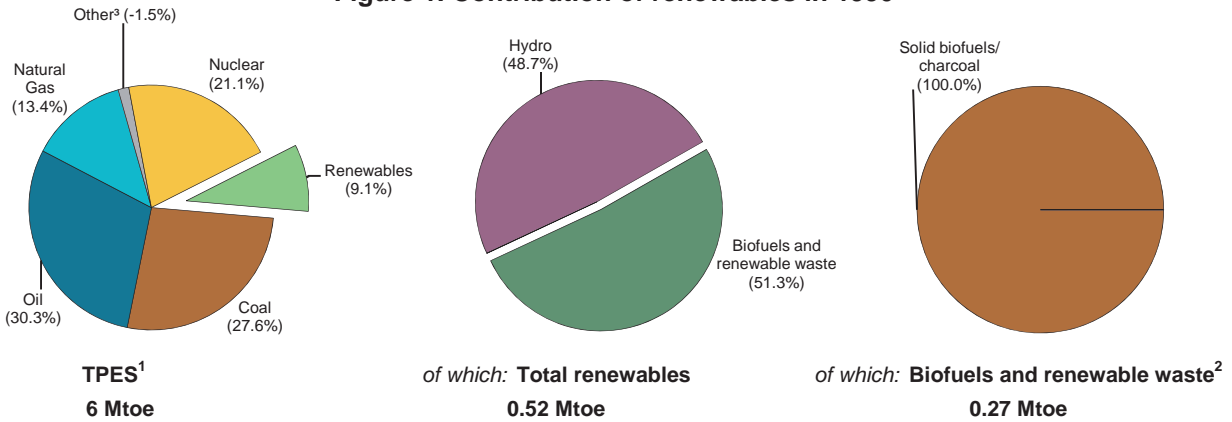


Figure 2. Contribution of renewables in 2017 provisional

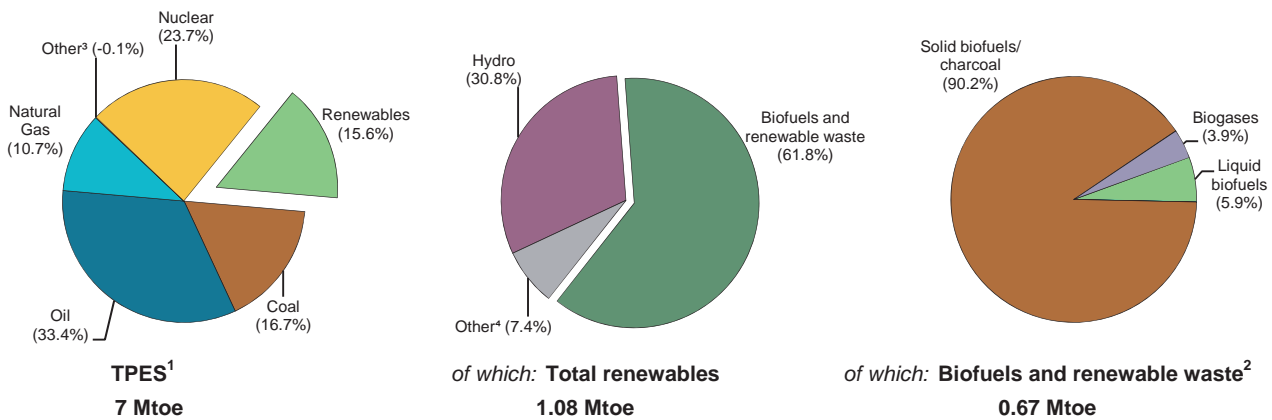
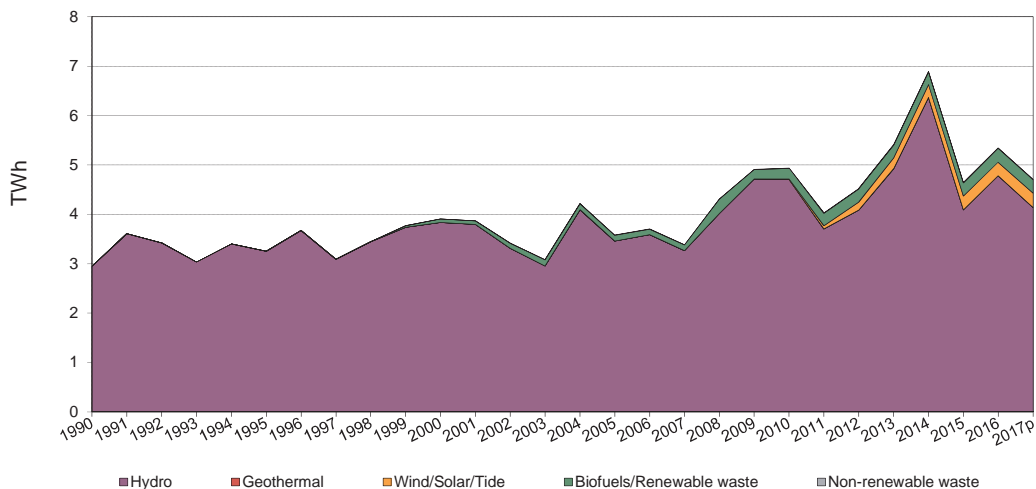


Figure 3. Electricity production by renewables and waste energy source



1. Total primary energy supply includes electricity trade.
 2. Biofuels and renewable waste include solid biofuels, liquid biofuels, biogases, and renewable municipal waste.
 3. Includes non-renewable municipal waste, industrial waste, peat, shale oil, electricity trade, and other sources of primary energy. (In the case of negative values, the net exports of electricity are greater than the other products in this category).
 4. Includes geothermal, solar, wind and tide.

Note: Totals may not sum due to rounding.
Source: IEA/OECD World Energy Balances.

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Table 1. Energy supply, GDP and population

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|---|-------|-------|-------|-------|-------|-------|-------|--|
| TPES (Mtoe) | 5.71 | 6.41 | 7.33 | 6.65 | 6.56 | 6.79 | 6.91 | 0.4 |
| of which: Renewables (Mtoe) ¹ | 0.52 | 0.79 | 1.12 | 1.20 | 1.05 | 1.12 | 1.08 | 1.9 |
| Renewables/TPES(%) | 9.1 | 12.3 | 15.3 | 18.1 | 16.0 | 16.6 | 15.6 | 1.4 |
| GDP (billion 2010 US dollars) | 30.86 | 36.94 | 48.01 | 47.89 | 48.97 | 50.51 | 53.04 | 2.2 |
| TPES/GDP ² | 0.19 | 0.17 | 0.15 | 0.14 | 0.13 | 0.13 | 0.13 | -1.7 |
| TPES/GDP (year 2010 = 100) | 121 | 114 | 100 | 91 | 88 | 88 | 85 | -1.7 |
| Population (millions) | 2.00 | 1.99 | 2.05 | 2.06 | 2.06 | 2.07 | 2.07 | 0.2 |
| TPES/population (toe per capita) | 2.86 | 3.22 | 3.58 | 3.23 | 3.18 | 3.29 | 3.35 | 0.2 |
| Electricity generation (TWh) ³ | 12.4 | 13.6 | 16.3 | 17.2 | 14.8 | 16.2 | 16.0 | 0.9 |
| of which: Renewables (TWh) ^{1,3} | 2.95 | 3.90 | 4.75 | 6.61 | 4.36 | 5.06 | 4.43 | 0.7 |
| Renew./Total Elec.(%) ^{1,4} | 23.7 | 28.7 | 29.2 | 38.5 | 29.4 | 31.2 | 27.7 | -0.2 |
| Road energy consumption (Mtoe) | 0.9 | 1.2 | 1.8 | 1.8 | 1.7 | 1.9 | .. | .. |
| of which: Liquid biofuels (Mtoe) | - | - | 0.05 | 0.04 | 0.03 | 0.02 | .. | .. |
| Liq. biofuels/road tr.(%) ⁵ | - | - | 2.6 | 2.5 | 1.7 | 1.0 | - | - |

1. Renewables do not include industrial waste, non-renewable municipal waste and pumped storage production.

2. In units of toe per thousand 2010 US dollars.

3. Electricity generation = gross production - amount of electricity produced in pumped storage plants.

4. Electricity share generated from renewables over the total electricity production.

5. Energy from liquid biofuels consumed in road transport over the total energy consumed in road transport.

Source: IEA/OECD World Energy Balances and OECD Main Economic Indicators.

Table 2. Net generating capacity of renewable and waste sources (MWe)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | Average annual percent change 00-16 |
|---|------------|------------|-------------|-------------|-------------|-------------|--|
| Total capacity | 755 | 860 | 1315 | 1587 | 1603 | 1593 | 3.9 |
| Hydro | 755 | 843 | 1254 | 1296 | 1295 | 1293 | 2.7 |
| Hydro <1MW | - | 95 | 118 | 119 | 119 | 118 | 1.4 |
| Hydro 1-10MW | - | 32 | 42 | 38 | 38 | 37 | 0.9 |
| Hydro 10+MW | - | 716 | 914 | 959 | 958 | 958 | 1.8 |
| Mixed plants | - | - | - | - | - | - | - |
| Pure pumped storage | - | - | 180 | 180 | 180 | 180 | - |
| Geothermal | - | - | - | - | - | - | - |
| Solar photovoltaic | - | - | 12 | 223 | 238 | 233 | - |
| Solar thermal | - | - | - | - | - | - | - |
| Tide, wave, ocean | - | - | - | - | - | - | - |
| Wind | - | - | - | 4 | 5 | 5 | - |
| Industrial waste | - | - | 2 | 2 | 2 | 2 | - |
| Municipal waste | - | - | - | - | - | - | - |
| Solid biofuels | - | 15 | 33 | 30 | 30 | 30 | 4.4 |
| Biogases | - | 2 | 14 | 31 | 32 | 29 | 18.2 |
| Liquid biofuels | - | - | - | 1 | 1 | 1 | - |
| Solar collectors surface (1000 m ²) | - | - | 178 | 236 | 239 | 245 | - |
| Cap. of solar collectors (MW _{th}) ¹ | - | - | 125 | 165 | 167 | 172 | - |

1. Converted at 0.7 kW_{th}/m² of solar collector area, as estimated by the IEA Solar Heating & Cooling Programme.

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Table 3. Capacity factors (%)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 |
|--|--------------|--------------|--------------|--------------|--------------|--------------|
| Total plants¹ | 44.60 | 51.83 | 42.86 | 49.58 | 33.08 | 38.31 |
| Hydro | 44.60 | 51.93 | 42.81 | 56.07 | 36.06 | 42.22 |
| <i>of which: <1MW</i> | - | 20.33 | 17.60 | 23.51 | 16.69 | 23.81 |
| <i>of which: 1-10MW</i> | - | 60.96 | 58.16 | 75.28 | 45.90 | 57.28 |
| <i>of which: 10+MW</i> | - | 55.72 | 51.49 | 66.61 | 41.47 | 48.52 |
| <i>of which: pure pumped storage²</i> | - | - | 11.71 | 17.41 | 17.95 | 17.68 |
| Geothermal | - | - | - | - | - | - |
| Solar photovoltaic | - | - | 12.23 | 13.15 | 13.15 | 13.10 |
| Solar thermal | - | - | - | - | - | - |
| Tide, wave and ocean | - | - | - | - | - | - |
| Wind | - | - | - | 12.01 | 13.76 | 13.19 |
| Industrial waste | - | - | 26.01 | 41.48 | 42.87 | 48.96 |
| Municipal waste | - | - | - | - | - | - |
| Solid biofuels | - | 44.08 | 41.35 | 47.49 | 49.96 | 51.97 |
| Biogases | - | 67.39 | 79.38 | 47.78 | 47.20 | 55.95 |
| Biodiesels | - | - | - | 44.18 | 46.70 | 34.81 |
| Other liquid biofuels | - | - | - | - | - | - |

1. The capacity factor is defined as: the annual gross electricity generation divided by the reported net capacity times 365 (days/year) times 24 (hours/day).

2. In case a country has at least one mixed hydro plants, it is impossible to calculate capacity factor thus it is shown as 'not applicable'.

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Table 4. Gross electricity production from renewable and waste sources (GWh)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|--------------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|---|
| Total electricity¹ | 2950 | 3904 | 4938 | 6892 | 4645 | 5346 | 4712 | 1.1 |
| Hydro | 2950 | 3834 | 4703 | 6366 | 4090 | 4782 | 4141 | 0.5 |
| <i>of which: pumped storage</i> | - | - | 185 | 274 | 283 | 279 | 273 | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar photovoltaic | - | - | 13 | 257 | 274 | 267 | 284 | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Tide, wave, ocean | - | - | - | - | - | - | - | - |
| Wind | - | - | - | 4 | 6 | 6 | 6 | - |
| Industrial waste | - | - | 5 | 7 | 8 | 9 | 9 | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | - | - | - | - | - |
| Solid biofuels | - | 58 | 120 | 125 | 131 | 137 | 137 | 5.2 |
| Biogases | - | 12 | 97 | 129 | 132 | 142 | 130 | 15.0 |
| Liquid biofuels | - | - | - | 4 | 4 | 3 | 5 | - |
| of which: | | | | | | | | |
| Electricity only plants | 2950 | 3834 | 4723 | 6631 | 4373 | 5057 | .. | - |
| Hydro | 2950 | 3834 | 4703 | 6366 | 4090 | 4782 | .. | - |
| <i>of which: pumped storage</i> | - | - | 185 | 274 | 283 | 279 | .. | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar photovoltaic | - | - | 13 | 257 | 274 | 267 | .. | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Tide, wave, ocean | - | - | - | - | - | - | - | - |
| Wind | - | - | - | 4 | 6 | 6 | .. | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | - | - | - | - | - |
| Solid biofuels | - | - | - | - | - | - | - | - |
| Biogases | - | - | 7 | 4 | 3 | 2 | .. | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| CHP plants | - | 70 | 215 | 261 | 272 | 289 | .. | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | 5 | 7 | 8 | 9 | .. | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | - | - | - | - | - |
| Solid biofuels | - | 58 | 120 | 125 | 131 | 137 | .. | - |
| Biogases | - | 12 | 90 | 125 | 129 | 140 | .. | - |
| Liquid biofuels | - | - | - | 4 | 4 | 3 | .. | - |

1. **Total electricity** includes the electricity produced from industrial waste, non-renewable municipal waste and pumped storage. Electricity from renewable sources does *not* include the electricity produced from industrial waste, non-renewable municipal waste and pumped storage production.

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Table 5A. Heat production¹ from renewable and waste sources in the transformation sector (TJ)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|----------------------------|------------|------------|------------|-------------|-------------|-------------|-------------|--|
| Total heat | 149 | 277 | 964 | 1326 | 1585 | 1620 | 1489 | 10.4 |
| Geothermal | - | - | 23 | 19 | 21 | 21 | 23 | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | 14 | - | 130 | 120 | 129 | 129 | 14.0 |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | - | - | - | - | - |
| Solid biofuels | 149 | 263 | 747 | 812 | 1127 | 1184 | 1098 | 8.8 |
| Biogases | - | - | 194 | 353 | 304 | 277 | 221 | - |
| Liquid biofuels | - | - | - | 12 | 13 | 9 | 18 | - |
| <i>of which:</i> | | | | | | | | |
| CHP plants | - | - | 732 | 1060 | 1210 | 1216 | .. | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | - | 130 | 120 | 129 | .. | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | - | - | - | - | - |
| Solid biofuels | - | - | 538 | 565 | 773 | 801 | .. | - |
| Biogases | - | - | 194 | 353 | 304 | 277 | .. | - |
| Liquid biofuels | - | - | - | 12 | 13 | 9 | .. | - |
| Heat only plants | 149 | 277 | 232 | 266 | 375 | 404 | .. | - |
| Geothermal | - | - | 23 | 19 | 21 | 21 | .. | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | 14 | - | - | - | - | - | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | - | - | - | - | - |
| Solid biofuels | 149 | 263 | 209 | 247 | 354 | 383 | .. | - |
| Biogases | - | - | - | - | - | - | - | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |

1. Waste heat and heat production from heat pumps are not included and are reported separately in Table 5B.

Table 5B. Heat production from heat pumps and waste heat (TJ)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|----------------------------|------|------|------|------|------|------|-------|--|
| Total heat | - | - | - | - | - | - | - | - |
| Heat pumps ¹ | - | - | - | - | - | - | - | - |
| (-) Input to heat pumps | - | - | - | - | - | - | - | - |
| Other sources ² | - | - | - | - | - | - | - | - |

1. Installations producing heat for own use are not included.

2. Refers to production from hydrogen, purchased steam from industry, and waste heat.

Source: IEA/OECD *Electricity Statistics*.

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Table 6. Renewable and waste balance for 2016

| thousand tonnes of oil equivalent | Hydro ¹ | Wind | Tide wave ocean | Solar PV | Geo-thermal | Solar thermal | Industrial waste | Mun. waste renew. |
|------------------------------------|--------------------|----------|-----------------|------------|-------------|---------------|------------------|-------------------|
| Production | 387 | 1 | - | 23 | 45 | 11 | 45 | - |
| Imports | - | - | - | - | - | - | - | - |
| Exports | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| TPES | 387 | 1 | - | 23 | 45 | 11 | 45 | - |
| Statistical differences | - | - | - | - | - | - | - | - |
| Main activity electricity plants | -368 | -1 | - | -1 | - | - | - | - |
| Autoproducer electricity plants | -20 | - | - | -22 | - | - | - | - |
| Main activity CHP plants | - | - | - | - | - | - | -9 | - |
| Autoproducer CHP plants | - | - | - | - | - | - | - | - |
| Main heat plants | - | - | - | - | -1 | - | - | - |
| Autoproducer heat plants | - | - | - | - | - | - | - | - |
| Charcoal production plants | - | - | - | - | - | - | - | - |
| Other transformation | - | - | - | - | - | - | - | - |
| Energy Industry own use | - | - | - | - | - | - | - | - |
| Losses | - | - | - | - | - | - | - | - |
| TFC | - | - | - | - | 43 | 11 | 36 | - |
| Industry | - | - | - | - | - | - | 36 | - |
| Iron and steel | - | - | - | - | - | - | - | - |
| Chemical and petrochemical | - | - | - | - | - | - | 2 | - |
| Non-ferrous metals | - | - | - | - | - | - | - | - |
| Non-metallc minerals | - | - | - | - | - | - | 35 | - |
| Transport equipment | - | - | - | - | - | - | - | - |
| Machinery | - | - | - | - | - | - | - | - |
| Mining and quarrying | - | - | - | - | - | - | - | - |
| Food and tobacco | - | - | - | - | - | - | - | - |
| Paper, pulp and print | - | - | - | - | - | - | - | - |
| Wood and wood products | - | - | - | - | - | - | - | - |
| Construction | - | - | - | - | - | - | - | - |
| Textile and leather | - | - | - | - | - | - | - | - |
| Non-specified | - | - | - | - | - | - | - | - |
| Transport | - | - | - | - | - | - | - | - |
| Road | - | - | - | - | - | - | - | - |
| Other | - | - | - | - | - | - | - | - |
| Other | - | - | - | - | 43 | 11 | - | - |
| Residential | - | - | - | - | 32 | 11 | - | - |
| Commercial and public services | - | - | - | - | 8 | - | - | - |
| Agriculture/forestry | - | - | - | - | 3 | - | - | - |
| Fishing | - | - | - | - | - | - | - | - |
| Non-specified | - | - | - | - | - | - | - | - |
| Electricity generated - GWh | 4503 | 6 | - | 267 | - | - | 8 | - |
| <i>Electricity plants</i> | 4503 | 6 | - | 267 | - | - | - | - |
| <i>CHP plants</i> | - | - | - | - | - | - | 8 | - |
| Heat generated - TJ | - | - | - | - | 21 | - | 129 | - |
| <i>CHP plants</i> | - | - | - | - | - | - | 129 | - |
| <i>Heat plants</i> | - | - | - | - | 21 | - | - | - |

1. Hydro does not include pumped hydro.

Source: IEA/OECD *World Energy Balances*.

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Table 6. Renewable and waste balance for 2016 (continued)

| Mun. waste non-ren. | Wood/wood waste | Charcoal | Bio-gases | Bio-gasoline | Bio-diesel | Other liquid biofuels | Total renew. & waste sources ² | Share in total energy sources ³ |
|---------------------|-----------------|----------|------------|--------------|------------|-----------------------|---|--|
| - | 608 | - | 30 | - | - | - | 1150 | 32.1% |
| - | - | - | - | 4 | 15 | - | 19 | 0.3% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | 608 | - | 30 | 4 | 15 | - | 1169 | 17.2% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | -370 | x |
| - | - | - | -1 | - | - | - | -43 | x |
| - | -30 | - | -25 | - | -1 | - | -65 | x |
| - | -12 | - | -3 | - | - | - | -15 | x |
| - | -10 | - | - | - | - | - | -11 | x |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | 556 | - | 2 | 4 | 14 | - | 666 | 13.4% |
| - | 73 | - | - | - | - | - | 109 | 8.8% |
| - | - | - | - | - | - | - | - | - |
| - | 22 | - | - | - | - | - | 24 | 14.7% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | 35 | 19.9% |
| - | - | - | - | - | - | - | - | - |
| - | 2 | - | - | - | - | - | 2 | 1.4% |
| - | - | - | - | - | - | - | - | - |
| - | 1 | - | - | - | - | - | 1 | 1.6% |
| - | 10 | - | - | - | - | - | 10 | 6.0% |
| - | 34 | - | - | - | - | - | 34 | 69.6% |
| - | - | - | - | - | - | - | - | - |
| - | 1 | - | - | - | - | - | 1 | 4.7% |
| - | 3 | - | - | - | - | - | 3 | 4.1% |
| - | - | - | - | 4 | 14 | - | 18 | 1.0% |
| - | - | - | - | 4 | 14 | - | 18 | 1.0% |
| - | - | - | - | - | - | - | - | - |
| - | 483 | - | 1 | - | - | - | 538 | 31.1% |
| - | 483 | - | - | - | - | - | 526 | 45.8% |
| - | - | - | 1 | - | - | - | 9 | 1.8% |
| - | - | - | - | - | - | - | 3 | 4.1% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | 136 | - | 142 | - | 3 | - | 5065 | 31.2% |
| - | - | - | 2 | - | - | - | 4778 | 45.5% |
| - | 136 | - | 140 | - | 3 | - | 287 | 5.0% |
| - | 1184 | - | 277 | - | 9 | - | 1620 | 18.0% |
| - | 801 | - | 277 | - | 9 | - | 1216 | 16.3% |
| - | 383 | - | - | - | - | - | 404 | 26.0% |

2. Total includes non-renewable waste.

3. Share of renewables on TFC excludes electricity and heat generated from renewable sources.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|--|------|------|------|------|------|------|-------|---|
| Geothermal (TJ) | | | | | | | | |
| Production | - | - | 1161 | 1548 | 1654 | 1877 | 1862 | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | 1161 | 1548 | 1654 | 1877 | 1862 | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | 83 | 62 | 65 | 61 | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | 1078 | 1486 | 1589 | 1816 | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | 1078 | 1486 | 1589 | 1816 | .. | - |
| Solar thermal (TJ) | | | | | | | | |
| Production | - | - | 341 | 452 | 456 | 457 | 457 | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | 341 | 452 | 456 | 457 | 457 | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | 341 | 452 | 456 | 457 | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | 341 | 452 | 456 | 457 | .. | - |
| Industrial waste (TJ) | | | | | | | | |
| Production | - | 14 | 975 | 1809 | 1802 | 1876 | 1588 | 35.8 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | 14 | 975 | 1809 | 1802 | 1876 | 1588 | 35.8 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | 14 | 21 | 321 | 330 | 357 | .. | 22.4 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | 954 | 1488 | 1472 | 1519 | .. | - |
| <i>Industry</i> | - | - | 954 | 1488 | 1472 | 1519 | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Municipal waste - renewables (TJ) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics (continued)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|--|-------|-------|-------|-------|-------|-------|-------|---|
| Municipal waste - non-renewables (TJ) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Solid Biofuel excluding charcoal (TJ) | | | | | | | | |
| Production | 9917 | 19021 | 25917 | 22300 | 24709 | 25475 | 25222 | 1.8 |
| Net imports ¹ | 1260 | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 11177 | 19021 | 25917 | 22300 | 24709 | 25475 | 25222 | 1.8 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | 159 | 848 | 1793 | 1754 | 2187 | 2181 | .. | 6.1 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 11018 | 18173 | 24124 | 20546 | 22522 | 23294 | .. | 1.6 |
| <i>Industry</i> | 2500 | 3128 | 2831 | 3259 | 3126 | 3053 | .. | -0.2 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 8518 | 15045 | 21293 | 17287 | 19396 | 20241 | .. | 1.9 |
| Charcoal (kt) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Biogases (TJ) | | | | | | | | |
| Production | - | 152 | 1273 | 1290 | 1242 | 1264 | 1077 | 14.2 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | 152 | 1273 | 1290 | 1242 | 1264 | 1077 | 14.2 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | 124 | 1166 | 1203 | 1163 | 1196 | .. | 15.2 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | 28 | 107 | 87 | 79 | 68 | .. | 5.7 |
| <i>Industry</i> | - | - | 11 | 15 | 15 | 15 | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | 28 | 96 | 72 | 64 | 53 | .. | 4.1 |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics (continued)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|-----------------------------------|------|------|------|------|------|------|-------|---|
| Biogasoline (kt) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | 5 | 9 | 9 | 6 | 7 | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | 5 | 9 | 9 | 6 | 7 | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | 5 | 9 | 9 | 6 | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | 5 | 9 | 9 | 6 | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Biodiesel (kt) | | | | | | | | |
| Production | - | - | 19 | - | - | - | - | - |
| Net imports ¹ | - | - | 29 | 42 | 28 | 17 | 40 | - |
| Stock changes | - | - | - | - | - | - | -1 | - |
| Gross consumption | - | - | 48 | 42 | 28 | 17 | 39 | - |
| Statistical differences | - | - | -1 | - | -1 | - | .. | - |
| Transformation processes | - | - | - | 1 | 1 | 1 | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | 47 | 41 | 26 | 16 | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | 47 | 41 | 26 | 16 | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Other liquid biofuels (kt) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

SPAIN

Figure 1. Contribution of renewables in 1990

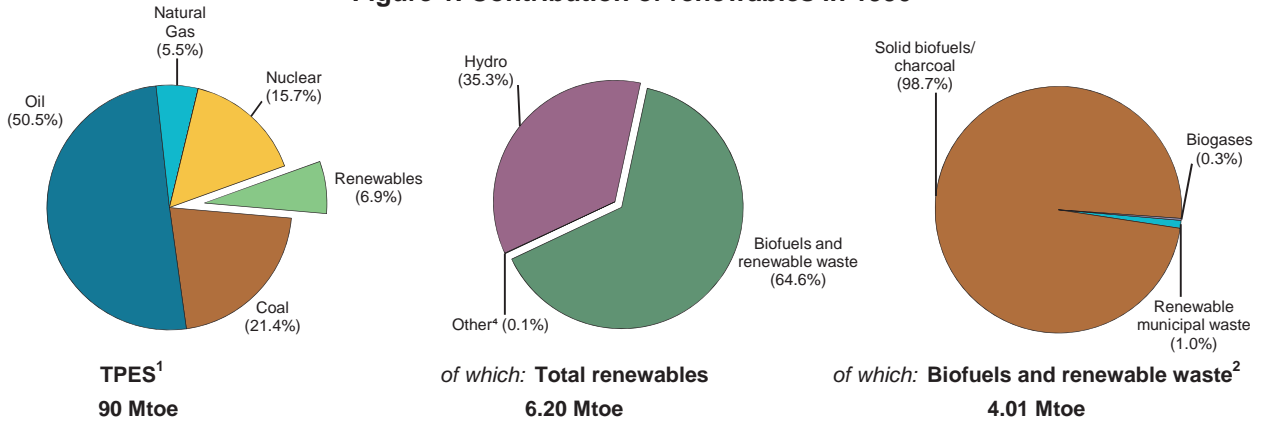


Figure 2. Contribution of renewables in 2017 provisional

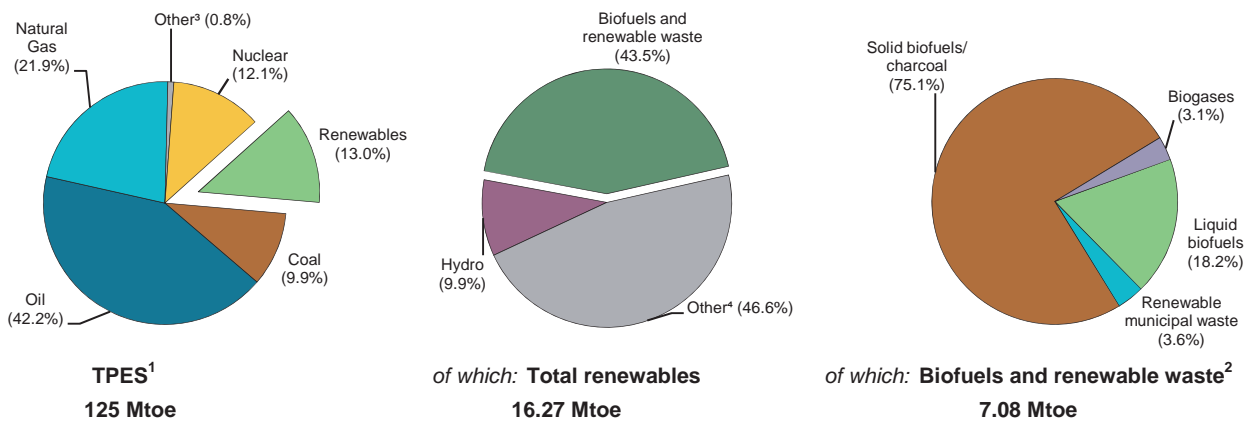
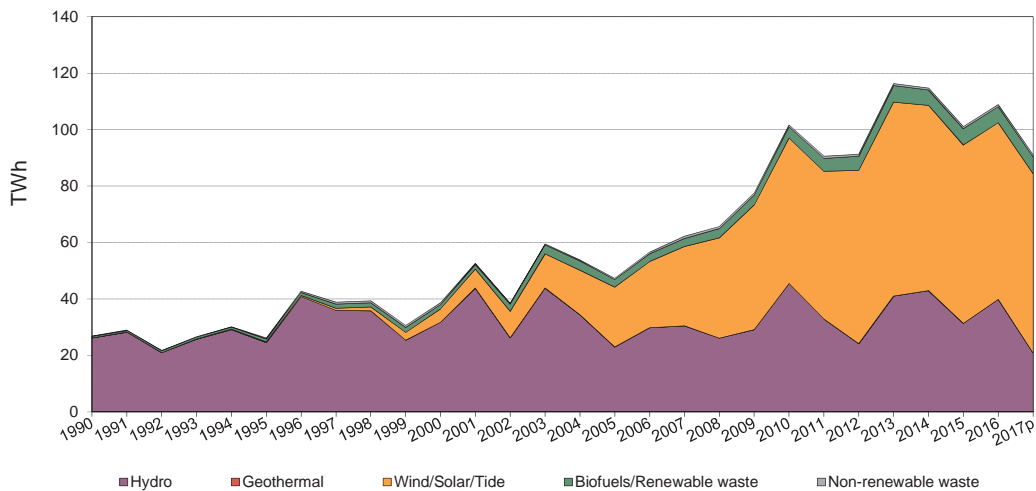


Figure 3. Electricity production by renewables and waste energy source



1. Total primary energy supply includes electricity trade.
 2. Biofuels and renewable waste include solid biofuels, liquid biofuels, biogases, and renewable municipal waste.
 3. Includes non-renewable municipal waste, industrial waste, peat, shale oil, electricity trade, and other sources of primary energy. (In the case of negative values, the net exports of electricity are greater than the other products in this category).
 4. Includes geothermal, solar, wind and tide.

Note: Totals may not sum due to rounding.
Source: IEA/OECD World Energy Balances.

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Table 1. Energy supply, GDP and population

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|---|--------|---------|---------|---------|---------|---------|---------|--|
| TPES (Mtoe) | 90.07 | 121.86 | 127.69 | 114.58 | 118.90 | 119.85 | 124.76 | 0.1 |
| of which: Renewables (Mtoe) ¹ | 6.20 | 6.82 | 15.05 | 17.77 | 16.62 | 17.43 | 16.27 | 5.3 |
| Renewables/TPES(%) | 6.9 | 5.6 | 11.8 | 15.5 | 14.0 | 14.5 | 13.0 | 5.1 |
| GDP (billion 2010 US dollars) | 873.14 | 1149.49 | 1431.62 | 1371.02 | 1418.08 | 1464.51 | 1509.20 | 1.6 |
| TPES/GDP ² | 0.10 | 0.11 | 0.09 | 0.08 | 0.08 | 0.08 | 0.08 | -1.5 |
| TPES/GDP (year 2010 = 100) | 116 | 119 | 100 | 94 | 94 | 92 | 93 | -1.5 |
| Population (millions) | 39.34 | 40.55 | 46.56 | 46.46 | 46.41 | 46.45 | 46.55 | 0.8 |
| TPES/population (toe per capita) | 2.29 | 3.00 | 2.74 | 2.47 | 2.56 | 2.58 | 2.68 | -0.7 |
| Electricity generation (TWh) ³ | 151.2 | 220.9 | 298.3 | 274.9 | 277.7 | 271.3 | 272.5 | 1.2 |
| of which: Renewables (TWh) ^{1,3} | 26.03 | 34.49 | 97.78 | 110.27 | 97.09 | 104.64 | 88.16 | 5.7 |
| Renew./Total Elec.(%) ^{1,4} | 17.2 | 15.6 | 32.8 | 40.1 | 35.0 | 38.6 | 32.4 | 4.4 |
| Road energy consumption (Mtoe) | 17.7 | 26.2 | 29.5 | 25.5 | 26.6 | 27.4 | .. | .. |
| of which: Liquid biofuels (Mtoe) | - | 0.07 | 1.44 | 0.95 | 0.96 | 1.09 | .. | .. |
| Liq. biofuels/road tr.(%) ⁵ | - | 0.3 | 4.9 | 3.7 | 3.6 | 4.0 | - | - |

1. Renewables do not include industrial waste, non-renewable municipal waste and pumped storage production.

2. In units of toe per thousand 2010 US dollars.

3. Electricity generation = gross production - amount of electricity produced in pumped storage plants.

4. Electricity share generated from renewables over the total electricity production.

5. Energy from liquid biofuels consumed in road transport over the total energy consumed in road transport.

Source: IEA/OECD *World Energy Balances* and OECD *Main Economic Indicators*.

Table 2. Net generating capacity of renewable and waste sources (MWe)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | Average annual percent change 00-16 |
|---|--------------|--------------|--------------|--------------|--------------|--------------|--|
| Total capacity | 15804 | 20472 | 44854 | 50486 | 51337 | 51517 | 5.9 |
| Hydro | 15657 | 17960 | 18535 | 19223 | 20053 | 20056 | 0.7 |
| Hydro <1MW | - | 228 | 273 | 280 | 280 | 279 | 1.3 |
| Hydro 1-10MW | - | 1339 | 1653 | 1668 | 1673 | 1668 | 1.4 |
| Hydro 10+MW | - | 11040 | 11349 | 12133 | 12133 | 12093 | 0.6 |
| Mixed plants | 2640 | 2935 | 2811 | 2687 | 2687 | 2687 | -0.6 |
| Pure pumped storage | 2418 | 2418 | 2449 | 2455 | 3280 | 3329 | 2.0 |
| Geothermal | - | - | - | - | - | - | - |
| Solar photovoltaic | 3 | 12 | 3921 | 4854 | 4856 | 4973 | 45.7 |
| Solar thermal | - | - | 732 | 2300 | 2300 | 2300 | - |
| Tide, wave, ocean | - | - | - | - | - | - | - |
| Wind | 2 | 2206 | 20693 | 22925 | 22943 | 23003 | 15.8 |
| Industrial waste | - | - | - | 50 | 50 | 50 | - |
| Municipal waste | 27 | 94 | 223 | 234 | 234 | 234 | 5.9 |
| Solid biofuels | 115 | 150 | 545 | 677 | 677 | 677 | 9.9 |
| Biogases | - | 50 | 205 | 223 | 224 | 224 | 9.8 |
| Liquid biofuels | - | - | - | - | - | - | - |
| Solar collectors surface (1000 m ²) | 281 | 403 | 2373 | 3350 | 3582 | 3796 | 15.0 |
| Cap. of solar collectors (MW _{th}) ¹ | 197 | 282 | 1661 | 2345 | 2507 | 2657 | 15.0 |

1. Converted at 0.7 kW_{th}/m² of solar collector area, as estimated by the IEA Solar Heating & Cooling Programme.

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Table 3. Capacity factors (%)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 |
|--|----------------|----------------|--------------|--------------|--------------|--------------|
| Total plants¹ | 19.41 e | 21.55 e | 25.87 | 25.95 | 22.48 | 24.12 |
| Hydro | 19.09 | 20.22 | 28.03 | 25.52 | 17.86 | 22.69 |
| <i>of which: <1MW</i> | - | 25.27 | 36.80 | 29.92 | 26.84 | 25.85 |
| <i>of which: 1-10MW</i> | - | 34.46 | 54.92 | 36.59 | 29.72 | 32.70 |
| <i>of which: 10+MW</i> | - | 24.52 | 33.67 | 31.13 | 21.76 | 29.25 |
| <i>of which: pure pumped storage²</i> | x | x | x | x | x | x |
| Geothermal | - | - | - | - | - | - |
| Solar photovoltaic | 22.83 | 17.12 | 18.70 | 19.33 | 19.43 | 18.52 |
| Solar thermal | - | - | 11.87 | 27.07 | 27.76 | 27.69 |
| Tide, wave and ocean | - | - | - | - | - | - |
| Wind | 79.91 | 24.46 | 24.42 | 25.90 | 24.54 | 24.27 |
| Industrial waste | - | - | x | x | x | x |
| Municipal waste | 67.65 e | 81.00 e | 67.47 | 66.95 | 74.96 | 71.77 |
| Solid biofuels | 45.86 e | 64.00 | 52.53 | 64.42 | 67.68 | 68.26 |
| Biogases | - | 72.60 e | 47.22 | 46.44 | 50.03 | 46.17 |
| Biodiesels | - | - | - | - | - | - |
| Other liquid biofuels | - | - | - | - | - | - |

1. The capacity factor is defined as: the annual gross electricity generation divided by the reported net capacity times 365 (days/year) times 24 (hours/day).

2. In case a country has at least one mixed hydro plants, it is impossible to calculate capacity factor thus it is shown as 'not applicable'.

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Table 4. Gross electricity production from renewable and waste sources (GWh)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|--------------------------------------|--------------|--------------|---------------|---------------|---------------|---------------|--------------|---|
| Total electricity¹ | 26876 | 38652 | 101642 | 114756 | 101083 | 108845 | 91218 | 5.2 |
| Hydro | 26184 | 31807 | 45511 | 42970 | 31368 | 39865 | 20974 | -2.4 |
| <i>of which: pumped storage</i> | 714 | 3551 | 3207 | 3801 | 3228 | 3470 | 2288 | -2.6 |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar photovoltaic | 6 | 18 | 6425 | 8218 | 8266 | 8070 | 8512 | 43.7 |
| Solar thermal | - | - | 761 | 5455 | 5593 | 5579 | 5885 | - |
| Tide, wave, ocean | - | - | - | - | - | - | - | - |
| Wind | 14 | 4727 | 44271 | 52013 | 49325 | 48906 | 49094 | 14.8 |
| Industrial waste | 50 | 274 | .. | .. | .. | .. | - | - |
| Municipal waste renew. | 80 | 334 | 659 | 686 | 768 | 735 | 773 | 5.1 |
| Municipal waste non-renew. | 80 | 333 | 659 | 686 | 768 | 735 | 773 | 5.1 |
| Solid biofuels | 462 | 841 | 2508 | 3821 | 4014 | 4049 | 4280 | 10.0 |
| Biogases | - | 318 | 848 | 907 | 981 | 906 | 927 | 6.5 |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| of which: | | | | | | | | |
| Electricity only plants | 26271 | 37973 | 100324 | 113622 | 99764 | 107641 | .. | - |
| Hydro | 26184 | 31807 | 45511 | 42970 | 31368 | 39865 | .. | - |
| <i>of which: pumped storage</i> | 714 | 3551 | 3207 | 3801 | 3228 | 3470 | .. | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar photovoltaic | 6 | 18 | 6425 | 8218 | 8266 | 8070 | .. | - |
| Solar thermal | - | - | 761 | 5455 | 5593 | 5579 | .. | - |
| Tide, wave, ocean | - | - | - | - | - | - | - | - |
| Wind | 14 | 4727 | 44271 | 52013 | 49325 | 48906 | .. | - |
| Industrial waste | 50 | 274 | .. | .. | .. | .. | - | - |
| Municipal waste renew. | - | 334 | 659 | 686 | 672 | 641 | .. | - |
| Municipal waste non-renew. | - | 333 | 659 | 686 | 672 | 641 | .. | - |
| Solid biofuels | 17 | 176 | 1342 | 2856 | 3126 | 3213 | .. | - |
| Biogases | - | 304 | 696 | 738 | 742 | 726 | .. | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| CHP plants | 605 | 679 | 1318 | 1134 | 1319 | 1204 | .. | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | 80 | - | - | - | 96 | 94 | .. | - |
| Municipal waste non-renew. | 80 | - | - | - | 96 | 94 | .. | - |
| Solid biofuels | 445 | 665 | 1166 | 965 | 888 | 836 | .. | - |
| Biogases | - | 14 | 152 | 169 | 239 | 180 | .. | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |

1. **Total electricity** includes the electricity produced from industrial waste, non-renewable municipal waste and pumped storage. Electricity from renewable sources does *not* include the electricity produced from industrial waste, non-renewable municipal waste and pumped storage production.

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Table 5A. Heat production¹ from renewable and waste sources in the transformation sector (TJ)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|----------------------------|------|------|------|------|------|------|-------|--|
| Total heat | - | - | - | - | - | - | - | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | - | - | - | - | - |
| Solid biofuels | - | - | - | - | - | - | - | - |
| Biogases | - | - | - | - | - | - | - | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| <i>of which:</i> | | | | | | | | |
| CHP plants | - | - | - | - | - | - | - | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | - | - | - | - | - |
| Solid biofuels | - | - | - | - | - | - | - | - |
| Biogases | - | - | - | - | - | - | - | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| Heat only plants | - | - | - | - | - | - | - | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | - | - | - | - | - |
| Solid biofuels | - | - | - | - | - | - | - | - |
| Biogases | - | - | - | - | - | - | - | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |

1. Waste heat and heat production from heat pumps are not included and are reported separately in Table 5B.

Table 5B. Heat production from heat pumps and waste heat (TJ)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|----------------------------|------|------|------|------|------|------|-------|--|
| Total heat | - | - | - | - | - | - | - | - |
| Heat pumps ¹ | - | - | - | - | - | - | - | - |
| (-) Input to heat pumps | - | - | - | - | - | - | - | - |
| Other sources ² | - | - | - | - | - | - | - | - |

1. Installations producing heat for own use are not included.

2. Refers to production from hydrogen, purchased steam from industry, and waste heat.

Source: IEA/OECD *Electricity Statistics*.

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Table 6. Renewable and waste balance for 2016

| thousand tonnes of oil equivalent | Hydro ¹ | Wind | Tide wave ocean | Solar PV | Geo-thermal | Solar thermal | Industrial waste | Mun. waste renew. |
|------------------------------------|--------------------|--------------|-----------------|-------------|-------------|---------------|------------------|-------------------|
| Production | 3129 | 4205 | - | 694 | 19 | 2484 | .. | 235 |
| Imports | - | - | - | - | - | - | - | - |
| Exports | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| TPES | 3129 | 4205 | - | 694 | 19 | 2484 | - | 235 |
| Statistical differences | - | - | - | - | - | - | - | - |
| Main activity electricity plants | -3060 | -4204 | - | -691 | - | -2191 | .. | -25 |
| Autoproducer electricity plants | -69 | -1 | - | -3 | - | - | - | -169 |
| Main activity CHP plants | - | - | - | - | - | - | - | - |
| Autoproducer CHP plants | - | - | - | - | - | - | - | -35 |
| Main heat plants | - | - | - | - | - | - | - | - |
| Autoproducer heat plants | - | - | - | - | - | - | - | - |
| Charcoal production plants | - | - | - | - | - | - | - | - |
| Other transformation | - | - | - | - | - | - | - | - |
| Energy Industry own use | - | - | - | - | - | - | - | - |
| Losses | - | - | - | - | - | - | - | - |
| TFC | - | - | - | - | 19 | 293 | - | 6 |
| Industry | - | - | - | - | - | 3 | - | - |
| Iron and steel | - | - | - | - | - | - | - | - |
| Chemical and petrochemical | - | - | - | - | - | - | - | - |
| Non-ferrous metals | - | - | - | - | - | - | - | - |
| Non-metallc minerals | - | - | - | - | - | - | .. | - |
| Transport equipment | - | - | - | - | - | - | - | - |
| Machinery | - | - | - | - | - | - | - | - |
| Mining and quarrying | - | - | - | - | - | - | - | - |
| Food and tobacco | - | - | - | - | - | 1 | - | - |
| Paper, pulp and print | - | - | - | - | - | - | - | - |
| Wood and wood products | - | - | - | - | - | - | - | - |
| Construction | - | - | - | - | - | - | - | - |
| Textile and leather | - | - | - | - | - | - | - | - |
| Non-specified | - | - | - | - | - | - | - | - |
| Transport | - | - | - | - | - | - | - | - |
| Road | - | - | - | - | - | - | - | - |
| Other | - | - | - | - | - | - | - | - |
| Other | - | - | - | - | 19 | 291 | - | 6 |
| Residential | - | - | - | - | 11 | 234 | - | - |
| Commercial and public services | - | - | - | - | 4 | 55 | - | 6 |
| Agriculture/forestry | - | - | - | - | 4 | 2 | - | - |
| Fishing | - | - | - | - | - | - | - | - |
| Non-specified | - | - | - | - | - | - | - | - |
| Electricity generated - GWh | 36395 | 48906 | - | 8070 | - | 5579 | .. | 735 |
| <i>Electricity plants</i> | 36395 | 48906 | - | 8070 | - | 5579 | .. | 641 |
| <i>CHP plants</i> | - | - | - | - | - | - | - | 94 |
| Heat generated - TJ | - | - | - | - | - | - | - | - |
| <i>CHP plants</i> | - | - | - | - | - | - | - | - |
| <i>Heat plants</i> | - | - | - | - | - | - | - | - |

1. Hydro does not include pumped hydro.

Source: IEA/OECD *World Energy Balances*.

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Table 6. Renewable and waste balance for 2016 (continued)

| Mun. waste non-ren. | Wood/wood waste | Charcoal | Bio-gases | Bio-gasoline | Bio-diesel | Other liquid biofuels | Total renew. & waste sources ² | Share in total energy sources ³ |
|---------------------|-----------------|-----------|------------|--------------|------------|-----------------------|---|--|
| 235 | 5303 | - | 245 | 168 | 1202 | - | 17919 | 52.5% |
| - | - | - | - | 5 | 739 | - | 744 | 0.6% |
| - | - | - | - | -41 | -1097 | - | -1138 | 3.7% |
| - | - | - | - | 4 | 137 | - | 141 | x |
| 235 | 5303 | - | 245 | 135 | 981 | - | 17665 | 14.7% |
| - | - | - | - | 1 | - | - | 1 | x |
| -25 | -819 | - | -79 | - | - | - | -11094 | x |
| -169 | -209 | - | -89 | - | - | - | -709 | x |
| - | - | - | - | - | - | - | - | - |
| -35 | -163 | - | -25 | - | - | - | -258 | x |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | -132 | 26 | - | - | - | - | -106 | x |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| 6 | 3981 | 26 | 52 | 135 | 981 | - | 5499 | 6.7% |
| - | 1332 | - | 39 | - | 12 | - | 1386 | 7.6% |
| - | - | - | - | - | - | - | - | - |
| - | 5 | - | 1 | - | - | - | 6 | 0.2% |
| - | - | - | - | - | - | - | - | - |
| - | 205 | - | 3 | - | - | - | 208 | 6.4% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | 2 | - | 2 | 0.5% |
| - | 197 | - | 7 | - | 2 | - | 207 | 8.7% |
| - | 535 | - | 26 | - | - | - | 561 | 34.1% |
| - | 312 | - | - | - | - | - | 312 | 57.2% |
| - | 14 | - | - | - | 9 | - | 23 | 2.4% |
| - | 3 | - | - | - | - | - | 3 | 0.8% |
| - | 60 | - | 2 | - | - | - | 62 | 7.0% |
| - | - | - | - | 134 | 960 | - | 1094 | 3.6% |
| - | - | - | - | 134 | 955 | - | 1089 | 4.0% |
| - | - | - | - | - | 5 | - | 5 | 0.2% |
| 6 | 2650 | 26 | 13 | 1 | 8 | - | 3020 | 10.6% |
| - | 2495 | 26 | - | - | 1 | - | 2767 | 18.4% |
| 6 | 87 | - | 11 | 1 | 4 | - | 174 | 1.6% |
| - | 68 | - | 1 | - | - | - | 75 | 3.1% |
| - | - | - | - | 1 | 4 | - | 5 | 2.1% |
| - | - | - | 1 | - | - | - | 1 | 0.5% |
| 735 | 4048 | - | 906 | - | - | - | 105374 | 38.8% |
| 641 | 3212 | - | 726 | - | - | - | 104170 | 43.1% |
| 94 | 836 | - | 180 | - | - | - | 1204 | 4.0% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |

2. Total includes non-renewable waste.

3. Share of renewables on TFC excludes electricity and heat generated from renewable sources.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|--|--------|--------|-------|--------|--------|--------|--------|--|
| Geothermal (TJ) | | | | | | | | |
| Production | 154 | 225 | 670 | 789 | 789 | 789 | 791 | 8.2 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 154 | 225 | 670 | 789 | 789 | 789 | 791 | 8.2 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 154 | 225 | 670 | 789 | 789 | 789 | .. | 8.2 |
| <i>Industry</i> | - | - | 1 | 3 | 3 | 3 | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 154 | 225 | 669 | 786 | 786 | 786 | .. | 8.1 |
| Solar thermal (TJ) | | | | | | | | |
| Production | - | 1303 | 20198 | 100519 | 103551 | 104012 | 109239 | 31.5 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | 1303 | 20198 | 100519 | 103551 | 104012 | 109239 | 31.5 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | 12515 | 89685 | 91961 | 91729 | .. | - |
| Energy industry own use | - | - | 4 | 3 | 3 | 4 | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | 1303 | 7679 | 10831 | 11587 | 12279 | .. | 15.1 |
| <i>Industry</i> | - | 4 | 73 | 97 | 104 | 105 | .. | 22.7 |
| <i>Transport</i> | - | - | - | 3 | - | - | .. | - |
| <i>Other</i> | - | 1299 | 7606 | 10731 | 11483 | 12174 | .. | 15.0 |
| Industrial waste (TJ) | | | | | | | | |
| Production | 853 e | 3134 e | .. | .. | .. | .. | .. | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 853 e | 3134 e | .. | .. | .. | .. | .. | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | 353 e | 3134 e | .. | .. | .. | .. | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 500 e | .. | .. | .. | .. | .. | .. | .. |
| <i>Industry</i> | 500 e | .. | .. | .. | .. | .. | .. | .. |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Municipal waste - renewables (TJ) | | | | | | | | |
| Production | 1697 e | 4803 e | 7293 | 8549 | 10551 | 9849 | 10663 | 4.6 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 1697 e | 4803 e | 7293 | 8549 | 10551 | 9849 | 10663 | 4.6 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | 1663 e | 4803 e | 7293 | 8549 | 10450 | 9613 | .. | 4.4 |
| Energy industry own use | 34 e | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | 101 | 236 | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | 101 | 236 | .. | - |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics (continued)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|--|----------|----------|--------|--------|--------|--------|--------|---|
| Municipal waste - non-renewables (TJ) | | | | | | | | |
| Production | 1696 e | 4802 e | 7293 | 8549 | 10551 | 9849 | 10663 | 4.6 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 1696 e | 4802 e | 7293 | 8549 | 10551 | 9849 | 10663 | 4.6 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | 1662 e | 4802 e | 7293 | 8549 | 10450 | 9613 | .. | 4.4 |
| Energy industry own use | 34 e | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | 101 | 236 | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | 101 | 236 | .. | - |
| Solid Biofuel excluding charcoal (TJ) | | | | | | | | |
| Production | 165624 e | 151702 e | 195340 | 216066 | 220234 | 222046 | 222848 | 2.4 |
| Net imports ¹ | - | - | - | 4810 | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 165624 e | 151702 e | 195340 | 220876 | 220234 | 222046 | 222848 | 2.4 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | 2345 e | 11882 e | 32657 | 53607 | 55858 | 55349 | .. | 10.1 |
| Energy industry own use | - | 126 | 9789 | 10919 | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 163279 | 139694 | 152894 | 156350 | 164376 | 166697 | .. | 1.1 |
| <i>Industry</i> | 76453 | 53880 | 45877 | 45222 | 53916 | 55766 | .. | 0.2 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 86826 | 85814 | 107017 | 111128 | 110460 | 110931 | .. | 1.6 |
| Charcoal (kt) | | | | | | | | |
| Production | - | - | 36 | 36 | 36 | 36 | 36 | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | 36 | 36 | 36 | 36 | 36 | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | 36 | 36 | 36 | 36 | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | 36 | 36 | 36 | 36 | .. | - |
| Biogases (TJ) | | | | | | | | |
| Production | 425 | 5492 | 11600 | 14791 | 10954 | 10264 | 9174 | 4.0 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 425 | 5492 | 11600 | 14791 | 10954 | 10264 | 9174 | 4.0 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | 4442 | 8562 | 8737 | 8450 | 8094 | .. | 3.8 |
| Energy industry own use | - | - | 816 | 1825 | 30 | 6 | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 425 | 1050 | 2222 | 4229 | 2474 | 2164 | .. | 4.6 |
| <i>Industry</i> | 425 | 648 | 2025 | 2094 | 1937 | 1634 | .. | 6.0 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | 402 | 197 | 2135 | 537 | 530 | .. | 1.7 |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

SPAIN

Table 7. Aggregated renewables and waste statistics (continued)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|-----------------------------------|------|------|------|------|------|------|-------|---|
| Biogasoline (kt) | | | | | | | | |
| Production | - | .. | 420 | 384 | 391 | 260 | 331 | .. |
| Net imports ¹ | - | - | -65 | -133 | -138 | -57 | -112 | - |
| Stock changes | - | - | 6 | 43 | 44 | 6 | -3 | |
| Gross consumption | - | .. | 361 | 294 | 297 | 209 | 216 | .. |
| Statistical differences | - | .. | -1 | - | 1 | 1 | .. | |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | |
| Final energy consumption | - | - | 360 | 294 | 298 | 210 | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | 360 | 291 | 295 | 208 | .. | - |
| <i>Other</i> | - | - | - | 3 | 3 | 2 | .. | - |
| Biodiesel (kt) | | | | | | | | |
| Production | - | 80 e | 841 | 1212 | 1113 | 1360 | 1747 | 19.4 |
| Net imports ¹ | - | - | 516 | -218 | -348 | -405 | -595 | - |
| Stock changes | - | - | -14 | -112 | 129 | 155 | 148 | |
| Gross consumption | - | 80 e | 1343 | 882 | 894 | 1110 | 1300 | 17.9 |
| Statistical differences | - | - | 1 | - | - | - | .. | |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | |
| Final energy consumption | - | 80 | 1344 | 882 | 894 | 1110 | .. | 17.9 |
| <i>Industry</i> | - | - | - | 8 | 11 | 14 | .. | - |
| <i>Transport</i> | - | 80 | 1344 | 870 | 875 | 1087 | .. | 17.7 |
| <i>Other</i> | - | - | - | 4 | 8 | 9 | .. | - |
| Other liquid biofuels (kt) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Figure 1. Contribution of renewables in 1990

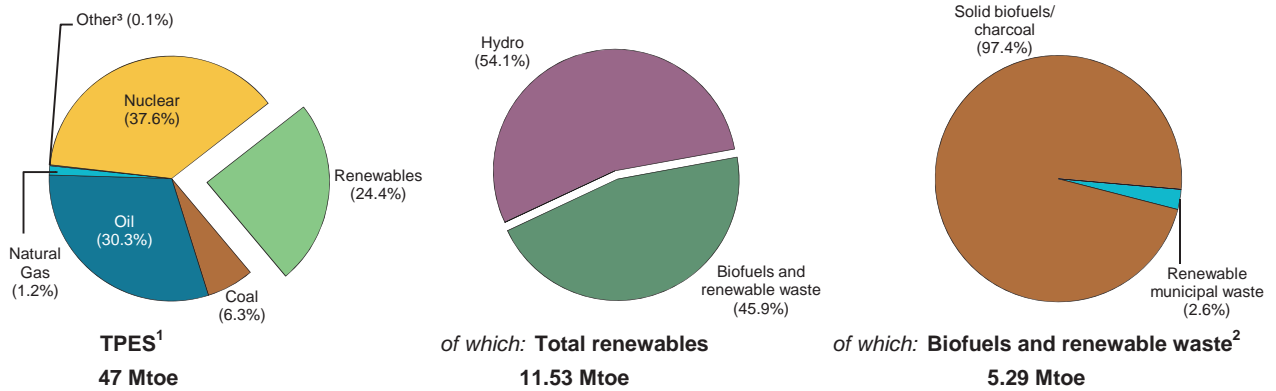


Figure 2. Contribution of renewables in 2017 provisional

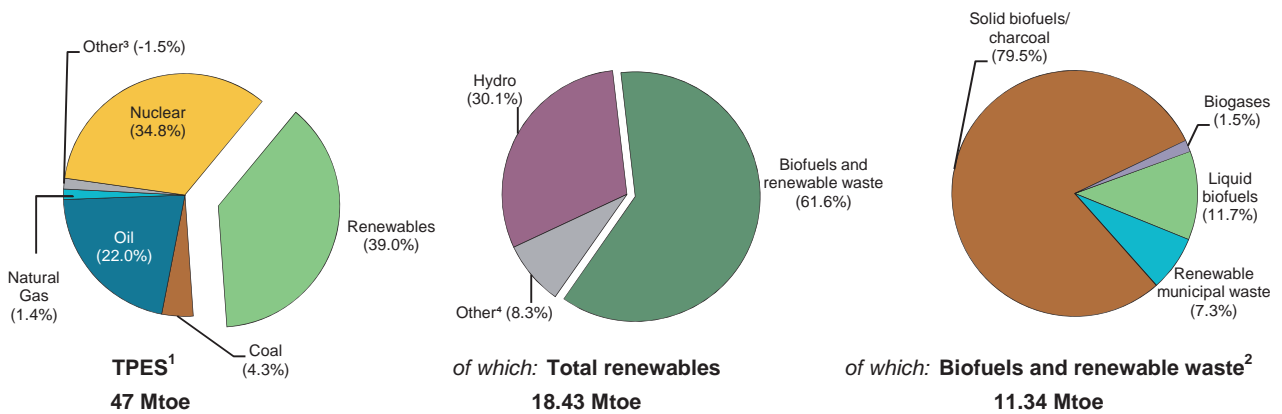
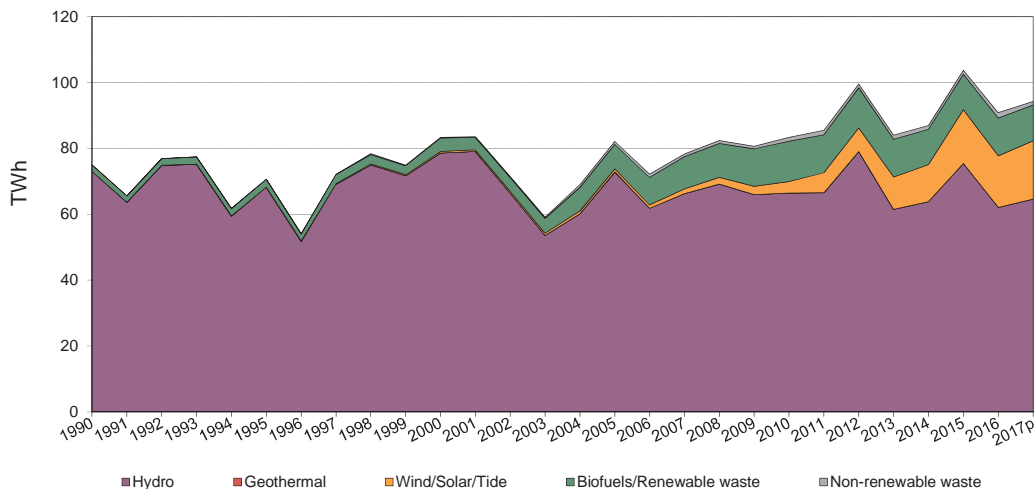


Figure 3. Electricity production by renewables and waste energy source



1. Total primary energy supply includes electricity trade.
 2. Biofuels and renewable waste include solid biofuels, liquid biofuels, biogases, and renewable municipal waste.
 3. Includes non-renewable municipal waste, industrial waste, peat, shale oil, electricity trade, and other sources of primary energy. (In the case of negative values, the net exports of electricity are greater than the other products in this category).
 4. Includes geothermal, solar, wind and tide.

Note: Totals may not sum due to rounding.
Source: IEA/OECD World Energy Balances.

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Table 1. Energy supply, GDP and population

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|---|--------|--------|--------|--------|--------|--------|--------|--|
| TPES (Mtoe) | 47.20 | 47.55 | 50.91 | 48.20 | 45.48 | 49.23 | 47.23 | -0.0 |
| of which: Renewables (Mtoe) ¹ | 11.53 | 14.74 | 17.00 | 17.30 | 19.09 | 18.28 | 18.43 | 1.3 |
| Renewables/TPES(%) | 24.4 | 31.0 | 33.4 | 35.9 | 42.0 | 37.1 | 39.0 | 1.4 |
| GDP (billion 2010 US dollars) | 321.07 | 396.53 | 488.38 | 519.34 | 542.83 | 560.39 | 573.21 | 2.2 |
| TPES/GDP ² | 0.15 | 0.12 | 0.10 | 0.09 | 0.08 | 0.09 | 0.08 | -2.2 |
| TPES/GDP (year 2010 = 100) | 141 | 115 | 100 | 89 | 80 | 84 | 79 | -2.2 |
| Population (millions) | 8.56 | 8.87 | 9.38 | 9.70 | 9.80 | 9.93 | 10.07 | 0.8 |
| TPES/population (toe per capita) | 5.51 | 5.36 | 5.43 | 4.97 | 4.64 | 4.96 | 4.69 | -0.8 |
| Electricity generation (TWh) ³ | 146.0 | 145.2 | 148.5 | 153.6 | 161.9 | 155.9 | 160.1 | 0.6 |
| of which: Renewables (TWh) ^{1,3} | 74.45 | 83.14 | 82.10 | 85.74 | 102.44 | 89.13 | 93.06 | 0.7 |
| Renew./Total Elec.(%) ^{1,4} | 51.0 | 57.2 | 55.3 | 55.8 | 63.3 | 57.2 | 58.1 | 0.1 |
| Road energy consumption (Mtoe) | 6.1 | 6.7 | 7.3 | 7.3 | 7.4 | 7.7 | .. | .. |
| of which: Liquid biofuels (Mtoe) | - | - | 0.40 | 0.90 | 1.06 | 1.32 | .. | .. |
| Liq. biofuels/road tr.(%) ⁵ | - | - | 5.5 | 12.2 | 14.4 | 17.1 | - | - |

1. Renewables do not include industrial waste, non-renewable municipal waste and pumped storage production.

2. In units of toe per thousand 2010 US dollars.

3. Electricity generation = gross production - amount of electricity produced in pumped storage plants.

4. Electricity share generated from renewables over the total electricity production.

5. Energy from liquid biofuels consumed in road transport over the total energy consumed in road transport.

Source: IEA/OECD *World Energy Balances* and OECD *Main Economic Indicators*.

Table 2. Net generating capacity of renewable and waste sources (MWe)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | Average annual percent change 00-16 |
|---|--------------|--------------|--------------|--------------|--------------|--------------|--|
| Total capacity | 17569 | 18319 | 22716 | 26055 | 27508 | 28656 | 2.8 |
| Hydro | 16331 | 16525 | 16732 | 15996 | 16329 | 16466 | -0.0 |
| Hydro <1MW | - | 178 | 143 | 171 | 182 | 177 | -0.0 |
| Hydro 1-10MW | - | 741 | 798 | 762 | 779 | 784 | 0.4 |
| Hydro 10+MW | - | 15587 | 15683 | 14964 | 15269 | 15406 | -0.1 |
| Mixed plants | 427 | 19 | 108 | 99 | 99 | 99 | 10.9 |
| Pure pumped storage | - | - | - | - | - | - | - |
| Geothermal | - | - | - | - | - | - | - |
| Solar photovoltaic | - | 3 | 11 | 60 | 104 | 153 | 27.9 |
| Solar thermal | - | - | - | - | - | - | - |
| Tide, wave, ocean | - | - | - | - | - | - | - |
| Wind | 8 | 209 | 2019 | 5097 | 5840 | 6434 | 23.9 |
| Industrial waste | - | - | 100 | 190 | 81 | 190 | - |
| Municipal waste | 30 | 74 | 654 | 459 | 876 | 1127 | 18.6 |
| Solid biofuels | 1200 | 1490 | 3178 | 3729 | 3700 | 3769 | 6.0 |
| Biogases | - | 18 | 22 | 2 | 2 | 2 | -12.8 |
| Liquid biofuels | - | - | - | 522 | 576 | 515 | - |
| Solar collectors surface (1000 m ²) | 90 | 207 | 510 | 475 | 478 | 475 | 5.3 |
| Cap. of solar collectors (MW _{th}) ¹ | 63 | 145 | 357 | 333 | 335 | 333 | 5.3 |

1. Converted at 0.7 kW_{th}/m² of solar collector area, as estimated by the IEA Solar Heating & Cooling Programme.

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Table 3. Capacity factors (%)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 |
|--|--------------|--------------|--------------|--------------|--------------|--------------|
| Total plants¹ | 48.76 | 51.98 | 41.91 | 38.11 | 43.06 | 36.19 |
| Hydro | 51.05 | 54.31 | 45.37 | 45.58 | 52.74 | 43.08 |
| <i>of which: <1MW</i> | - | 48.29 | 43.48 | 45.51 | 49.05 | 36.39 |
| <i>of which: 1-10MW</i> | - | 52.79 | 46.54 | 46.25 | 48.43 | 35.55 |
| <i>of which: 10+MW</i> | - | 54.49 | 45.57 | 45.77 | 53.25 | 43.73 |
| <i>of which: pure pumped storage²</i> | x | x | x | x | x | x |
| Geothermal | - | - | - | - | - | - |
| Solar photovoltaic | - | 5.40 | 8.92 | 8.94 | 10.65 | 10.67 |
| Solar thermal | - | - | - | - | - | - |
| Tide, wave and ocean | - | - | - | - | - | - |
| Wind | 8.56 | 24.96 | 19.80 | 25.16 | 31.80 | 27.46 |
| Industrial waste | - | - | 6.99 | 2.46 | 5.21 | 2.34 |
| Municipal waste | 39.19 | 36.87 | 49.91 | 67.40 | 37.99 | 32.75 |
| Solid biofuels | 18.09 e | 30.42 | 36.85 | 27.57 | 27.70 | 29.53 |
| Biogases | - | 20.29 | 18.89 | 79.91 | 62.79 | 63.23 |
| Biodiesels | - | - | - | - | - | - |
| Other liquid biofuels | - | - | - | 1.07 | 0.55 | 1.02 |

1. The capacity factor is defined as: the annual gross electricity generation divided by the reported net capacity times 365 (days/year) times 24 (hours/day).

2. In case a country has at least one mixed hydro plants, it is impossible to calculate capacity factor thus it is shown as 'not applicable'.

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Table 4. Gross electricity production from renewable and waste sources (GWh)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|--------------------------------------|--------------|--------------|--------------|--------------|---------------|--------------|--------------|---|
| Total electricity¹ | 75044 | 83419 | 83409 | 86974 | 103772 | 90838 | 94306 | 0.7 |
| Hydro | 73033 | 78619 | 66501 | 63872 | 75439 | 62137 | 64611 | -1.1 |
| <i>of which: pumped storage</i> | 530 | 35 | 103 | 108 | 127 | 119 | 102 | 6.5 |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar photovoltaic | - | 1 | 9 | 47 | 97 | 143 | 229 | 37.7 |
| Solar thermal | - | - | - | - | - | - | - | - |
| Tide, wave, ocean | - | - | - | - | - | - | - | - |
| Wind | 6 | 457 | 3502 | 11234 | 16268 | 15479 | 17508 | 23.9 |
| Industrial waste | - | 101 | 61 | 41 | 37 | 39 | 25 | -7.9 |
| Municipal waste renew. | 41 | 96 | 1716 | 1626 | 1749 | 1681 | 1213 | 16.1 |
| Municipal waste non-renew. | 62 | 143 | 1144 | 1084 | 1166 | 1552 | 1120 | 12.9 |
| Solid biofuels | 1902 | 3970 | 10260 | 9007 | 8977 | 9750 | 9586 | 5.3 |
| Biogases | - | 32 | 36 | 14 | 11 | 11 | 9 | -7.2 |
| Liquid biofuels | - | - | 180 | 49 | 28 | 46 | 5 | - |
| of which: | | | | | | | | |
| Electricity only plants | 73039 | 79077 | 70012 | 75153 | 91804 | 77759 | .. | - |
| Hydro | 73033 | 78619 | 66501 | 63872 | 75439 | 62137 | .. | - |
| <i>of which: pumped storage</i> | 530 | 35 | 103 | 108 | 127 | 119 | .. | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar photovoltaic | - | 1 | 9 | 47 | 97 | 143 | .. | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Tide, wave, ocean | - | - | - | - | - | - | - | - |
| Wind | 6 | 457 | 3502 | 11234 | 16268 | 15479 | .. | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | - | - | - | - | - |
| Solid biofuels | - | - | - | - | - | - | - | - |
| Biogases | - | - | - | - | - | - | - | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| CHP plants | 2005 | 4342 | 13397 | 11821 | 11968 | 13079 | .. | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | 101 | 61 | 41 | 37 | 39 | .. | - |
| Municipal waste renew. | 41 | 96 | 1716 | 1626 | 1749 | 1681 | .. | - |
| Municipal waste non-renew. | 62 | 143 | 1144 | 1084 | 1166 | 1552 | .. | - |
| Solid biofuels | 1902 | 3970 | 10260 | 9007 | 8977 | 9750 | .. | - |
| Biogases | - | 32 | 36 | 14 | 11 | 11 | .. | - |
| Liquid biofuels | - | - | 180 | 49 | 28 | 46 | .. | - |

1. **Total electricity** includes the electricity produced from industrial waste, non-renewable municipal waste and pumped storage. Electricity from renewable sources does *not* include the electricity produced from industrial waste, non-renewable municipal waste and pumped storage production.

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Table 5A. Heat production¹ from renewable and waste sources in the transformation sector (TJ)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|----------------------------|----------------|--------------|---------------|---------------|---------------|---------------|---------------|--|
| Total heat | 24534 e | 90539 | 150349 | 138671 | 143781 | 152540 | 143318 | 2.7 |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | 508 | 527 | 570 | 510 | 496 | - | - |
| Municipal waste renew. | 4979 | 6663 | 19905 | 24127 | 26499 | 23701 | 25288 | 8.2 |
| Municipal waste non-renew. | 7569 | 9996 | 13286 | 16086 | 17667 | 21877 | 23343 | 5.1 |
| Solid biofuels | 11986 e | 72330 | 109500 | 95369 | 97063 | 103690 | 92452 | 1.5 |
| Biogases | - | 1042 | 731 | 370 | 274 | 274 | 357 | -6.1 |
| Liquid biofuels | - | - | 6400 | 2149 | 1768 | 2502 | 1878 | - |
| <i>of which:</i> | | | | | | | | |
| CHP plants | 8518 e | 57787 | 103001 | 103975 | 108648 | 116102 | .. | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | 489 | 527 | 570 | 510 | 496 | .. | - |
| Municipal waste renew. | 1869 | 4388 | 15805 | 22362 | 24080 | 21344 | .. | - |
| Municipal waste non-renew. | 2804 | 6583 | 10536 | 14909 | 16054 | 19702 | .. | - |
| Solid biofuels | 3845 e | 45738 | 74500 | 65393 | 67591 | 73915 | .. | - |
| Biogases | - | 589 | 333 | 201 | 149 | 146 | .. | - |
| Liquid biofuels | - | - | 1300 | 540 | 264 | 499 | .. | - |
| Heat only plants | 16016 | 32752 | 47348 | 34696 | 35133 | 36438 | .. | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | 19 | - | - | - | - | - | - |
| Municipal waste renew. | 3110 | 2275 | 4100 | 1765 | 2419 | 2357 | .. | - |
| Municipal waste non-renew. | 4765 | 3413 | 2750 | 1177 | 1613 | 2175 | .. | - |
| Solid biofuels | 8141 e | 26592 | 35000 | 29976 | 29472 | 29775 | .. | - |
| Biogases | - | 453 | 398 | 169 | 125 | 128 | .. | - |
| Liquid biofuels | - | - | 5100 | 1609 | 1504 | 2003 | .. | - |

1. Waste heat and heat production from heat pumps are not included and are reported separately in Table 5B.

Table 5B. Heat production from heat pumps and waste heat (TJ)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|----------------------------|-----------|--------------|--------------|-------------|-------------|-------------|-------------|--|
| Total heat | .. | 14967 | 11327 | 9900 | 8543 | 6834 | 6420 | -4.9 |
| Heat pumps ¹ | .. | 21283 | 15539 | 14303 | 13975 | 12773 | 8294 | -5.4 |
| (-) Input to heat pumps | - | 6317 | 4212 | 4403 | 5432 | 5938 | 1874 | -6.9 |
| Other sources ² | - | - | - | - | - | - | - | - |

1. Installations producing heat for own use are not included.

2. Refers to production from hydrogen, purchased steam from industry, and waste heat.

Source: IEA/OECD *Electricity Statistics*.

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Table 6. Renewable and waste balance for 2016

| thousand tonnes of oil equivalent | Hydro ¹ | Wind | Tide wave ocean | Solar PV | Geo-thermal | Solar thermal | Industrial waste | Mun. waste renew. |
|------------------------------------|--------------------|--------------|-----------------|------------|-------------|---------------|------------------|-------------------|
| Production | 5333 | 1331 | - | 12 | - | 11 | 18 | 832 |
| Imports | - | - | - | - | - | - | - | - |
| Exports | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| TPES | 5333 | 1331 | - | 12 | - | 11 | 18 | 832 |
| Statistical differences | - | - | - | - | - | - | - | - |
| Main activity electricity plants | -5332 | -1331 | - | -12 | - | - | - | - |
| Autoproducer electricity plants | -1 | - | - | - | - | - | - | - |
| Main activity CHP plants | - | - | - | - | - | - | -18 | -767 |
| Autoproducer CHP plants | - | - | - | - | - | - | - | - |
| Main heat plants | - | - | - | - | - | - | - | -65 |
| Autoproducer heat plants | - | - | - | - | - | - | - | - |
| Charcoal production plants | - | - | - | - | - | - | - | - |
| Other transformation | - | - | - | - | - | - | - | - |
| Energy Industry own use | - | - | - | - | - | - | - | - |
| Losses | - | - | - | - | - | - | - | - |
| TFC | - | - | - | - | - | 11 | - | - |
| Industry | - | - | - | - | - | - | - | - |
| Iron and steel | - | - | - | - | - | - | - | - |
| Chemical and petrochemical | - | - | - | - | - | - | - | - |
| Non-ferrous metals | - | - | - | - | - | - | - | - |
| Non-metallc minerals | - | - | - | - | - | - | - | - |
| Transport equipment | - | - | - | - | - | - | - | - |
| Machinery | - | - | - | - | - | - | - | - |
| Mining and quarrying | - | - | - | - | - | - | - | - |
| Food and tobacco | - | - | - | - | - | - | - | - |
| Paper, pulp and print | - | - | - | - | - | - | - | - |
| Wood and wood products | - | - | - | - | - | - | - | - |
| Construction | - | - | - | - | - | - | - | - |
| Textile and leather | - | - | - | - | - | - | - | - |
| Non-specified | - | - | - | - | - | - | - | - |
| Transport | - | - | - | - | - | - | - | - |
| Road | - | - | - | - | - | - | - | - |
| Other | - | - | - | - | - | - | - | - |
| Other | - | - | - | - | - | 11 | - | - |
| Residential | - | - | - | - | - | 11 | - | - |
| Commercial and public services | - | - | - | - | - | - | - | - |
| Agriculture/forestry | - | - | - | - | - | - | - | - |
| Fishing | - | - | - | - | - | - | - | - |
| Non-specified | - | - | - | - | - | - | - | - |
| Electricity generated - GWh | 62018 | 15479 | - | 143 | - | - | 39 | 1681 |
| <i>Electricity plants</i> | 62018 | 15479 | - | 143 | - | - | - | - |
| <i>CHP plants</i> | - | - | - | - | - | - | 39 | 1681 |
| Heat generated - TJ | - | - | - | - | - | - | 496 | 23701 |
| <i>CHP plants</i> | - | - | - | - | - | - | 496 | 21344 |
| <i>Heat plants</i> | - | - | - | - | - | - | - | 2357 |

1. Hydro does not include pumped hydro.

Source: IEA/OECD *World Energy Balances*.

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Table 6. Renewable and waste balance for 2016 (continued)

| Mun. waste non-ren. | Wood/ wood waste | Charcoal | Bio-gases | Bio-gasoline | Bio-diesel | Other liquid biofuels | Total renew. & waste sources ² | Share in total energy sources ³ |
|---------------------|------------------|----------|------------|--------------|-------------|-----------------------|---|--|
| 768 | 9402 | - | 174 | 110 | 98 | 74 | 18163 | 52.1% |
| - | 113 | - | - | 123 | 929 | - | 1165 | 3.2% |
| - | -97 | - | - | -121 | -35 | - | -253 | 1.3% |
| - | - | - | - | - | -6 | - | -6 | x |
| 768 | 9419 | - | 174 | 112 | 986 | 74 | 19070 | 38.7% |
| - | - | - | - | -3 | 125 | - | 122 | x |
| - | - | - | - | - | - | - | -6675 | x |
| - | - | - | - | - | - | - | -1 | x |
| -708 | -2033 | - | -5 | - | - | -18 | -3549 | x |
| - | -1194 | - | - | - | - | -1 | -1195 | x |
| -60 | -816 | - | -4 | - | - | -55 | -1000 | x |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | -16 | - | - | - | -16 | x |
| - | - | - | - | - | - | - | - | - |
| - | 5376 | - | 149 | 109 | 1110 | - | 6755 | 20.3% |
| - | 4268 | - | 1 | - | - | - | 4269 | 39.2% |
| - | - | - | - | - | - | - | - | - |
| - | 10 | - | - | - | - | - | 10 | 1.6% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | 22 | - | - | - | - | - | 22 | 6.0% |
| - | 3828 | - | - | - | - | - | 3828 | 66.8% |
| - | 383 | - | - | - | - | - | 383 | 66.3% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | 1 | - | - | - | 1 | 4.0% |
| - | 25 | - | - | - | - | - | 25 | 3.3% |
| - | - | - | 99 | 109 | 1110 | - | 1318 | 16.1% |
| - | - | - | 99 | 109 | 1110 | - | 1318 | 17.1% |
| - | - | - | - | - | - | - | - | - |
| - | 1108 | - | 49 | - | - | - | 1168 | 9.7% |
| - | 912 | - | 49 | - | - | - | 972 | 13.0% |
| - | 66 | - | - | - | - | - | 66 | 1.5% |
| - | 130 | - | - | - | - | - | 130 | 39.5% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| 1552 | 9749 | - | 11 | - | - | 46 | 90718 | 58.2% |
| - | - | - | - | - | - | - | 77640 | 55.2% |
| 1552 | 9749 | - | 11 | - | - | 46 | 13078 | 86.5% |
| 21877 | 103690 | - | 274 | - | - | 2502 | 152540 | 78.9% |
| 19702 | 73915 | - | 146 | - | - | 499 | 116102 | 81.9% |
| 2175 | 29775 | - | 128 | - | - | 2003 | 36438 | 70.5% |

2. Total includes non-renewable waste.

3. Share of renewables on TFC excludes electricity and heat generated from renewable sources.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|--|--------|--------|-------|-------|-------|-------|-------|---|
| Geothermal (TJ) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Solar thermal (TJ) | | | | | | | | |
| Production | 133 | 223 | 432 | 468 | 472 | 468 | 464 | 4.7 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 133 | 223 | 432 | 468 | 472 | 468 | 464 | 4.7 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 133 | 223 | 432 | 468 | 472 | 468 | .. | 4.7 |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 133 | 223 | 432 | 468 | 472 | 468 | .. | 4.7 |
| Industrial waste (TJ) | | | | | | | | |
| Production | 209 | 1061 | 868 | 863 | 749 | 746 | 701 | -2.2 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 209 | 1061 | 868 | 863 | 749 | 746 | 701 | -2.2 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | 1061 | 868 | 863 | 749 | 746 | .. | -2.2 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 209 | - | - | - | - | - | .. | - |
| <i>Industry</i> | 209 | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Municipal waste - renewables (TJ) | | | | | | | | |
| Production | 5856 e | 8347 e | 31100 | 35911 | 38032 | 34835 | 34720 | 9.3 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 5856 e | 8347 e | 31100 | 35911 | 38032 | 34835 | 34720 | 9.3 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | 5856 | 8347 | 31100 | 35911 | 38032 | 34835 | .. | 9.3 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics (continued)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|--|--------|---------|--------|--------|--------|--------|--------|---|
| Municipal waste - non-renewables (TJ) | | | | | | | | |
| Production | 8784 e | 12522 e | 20700 | 23942 | 25355 | 32155 | 32049 | 6.1 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 8784 e | 12522 e | 20700 | 23942 | 25355 | 32155 | 32049 | 6.1 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | 8784 | 12522 | 20700 | 23942 | 25355 | 32155 | .. | 6.1 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Solid Biofuel excluding charcoal (TJ) | | | | | | | | |
| Production | 215730 | 322717 | 397731 | 368962 | 380225 | 393651 | 376161 | 1.2 |
| Net imports ¹ | - | - | - | 4631 | 1971 | 684 | 1283 | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 215730 | 322717 | 397731 | 373593 | 382196 | 394335 | 377444 | 1.3 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | 21839 | 101281 | 179550 | 156470 | 157338 | 169259 | .. | 3.3 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 193891 | 221436 | 218181 | 217123 | 224858 | 225076 | .. | 0.1 |
| <i>Industry</i> | 153614 | 181457 | 177143 | 171865 | 179234 | 178691 | .. | -0.1 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 40277 | 39979 | 41038 | 45258 | 45624 | 46385 | .. | 0.9 |
| Charcoal (kt) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Biogases (TJ) | | | | | | | | |
| Production | - | 1342 | 4654 | 6422 | 7009 | 7265 | 7265 | 11.1 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | 1342 | 4654 | 6422 | 7009 | 7265 | 7265 | 11.1 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | 1342 | 1012 | 500 | 358 | 368 | .. | -7.8 |
| Energy industry own use | - | - | - | 696 | 713 | 662 | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | 3642 | 5226 | 5938 | 6235 | .. | - |
| <i>Industry</i> | - | - | - | 22 | - | 36 | .. | - |
| <i>Transport</i> | - | - | 885 | 3498 | 4062 | 4140 | .. | - |
| <i>Other</i> | - | - | 2757 | 1706 | 1876 | 2059 | .. | - |

1. Net imports = total imports - total exports.

Source: IEA/OECD World Energy Balances.

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Table 7. Aggregated renewables and waste statistics (continued)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|-----------------------------------|------|------|------|------|------|------|-------|---|
| Biogasoline (kt) | | | | | | | | |
| Production | - | - | 149 | 136 | 147 | 171 | 188 | - |
| Net imports ¹ | - | - | 158 | 126 | 105 | 3 | -30 | - |
| Stock changes | - | - | -15 | -17 | -55 | - | -5 | - |
| Gross consumption | - | - | 292 | 245 | 197 | 174 | 153 | - |
| Statistical differences | - | - | 25 | 13 | 19 | -4 | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | 317 | 258 | 216 | 170 | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | 317 | 258 | 216 | 170 | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Biodiesel (kt) | | | | | | | | |
| Production | - | - | 124 | 157 | 139 | 109 | 66 | - |
| Net imports ¹ | - | - | 93 | 550 | 776 | 998 | 1247 | - |
| Stock changes | - | - | 3 | 50 | -1 | -7 | 10 | - |
| Gross consumption | - | - | 220 | 757 | 914 | 1100 | 1323 | - |
| Statistical differences | - | - | -22 | -34 | 7 | 139 | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | 198 | 723 | 921 | 1239 | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | 198 | 723 | 921 | 1239 | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Other liquid biofuels (kt) | | | | | | | | |
| Production | - | - | 240 | 72 | 55 | 81 | 46 | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | 240 | 72 | 55 | 81 | 46 | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | 240 | 72 | 55 | 81 | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Figure 1. Contribution of renewables in 1990

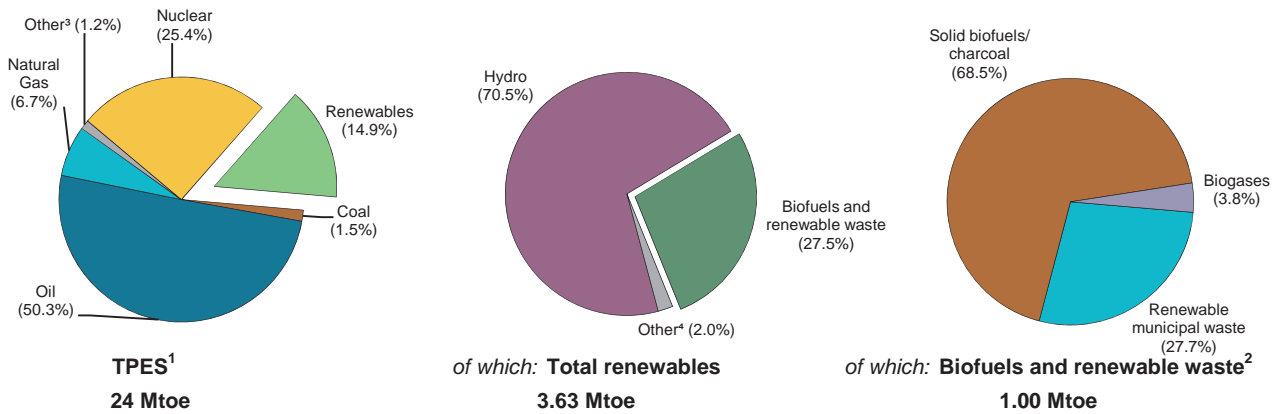


Figure 2. Contribution of renewables in 2017 provisional

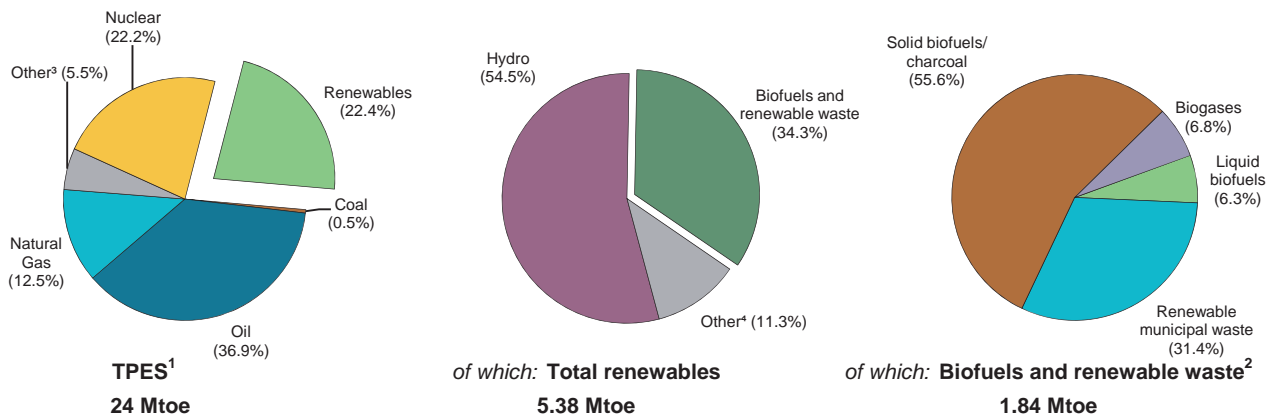
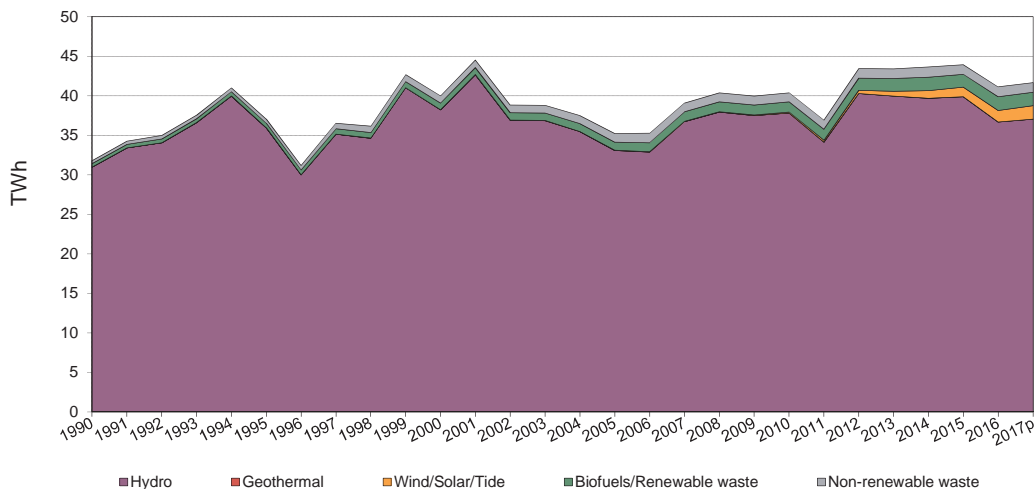


Figure 3. Electricity production by renewables and waste energy source



1. Total primary energy supply includes electricity trade.
 2. Biofuels and renewable waste include solid biofuels, liquid biofuels, biogases, and renewable municipal waste.
 3. Includes non-renewable municipal waste, industrial waste, peat, shale oil, electricity trade, and other sources of primary energy. (In the case of negative values, the net exports of electricity are greater than the other products in this category).
 4. Includes geothermal, solar, wind and tide.

Note: Totals may not sum due to rounding.
Source: IEA/OECD World Energy Balances.

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Table 1. Energy supply, GDP and population

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|---|--------|--------|--------|--------|--------|--------|--------|--|
| TPES (Mtoe) | 24.36 | 25.00 | 26.20 | 25.06 | 24.52 | 23.90 | 24.04 | -0.2 |
| of which: Renewables (Mtoe) ¹ | 3.63 | 4.43 | 4.98 | 5.28 | 5.46 | 5.33 | 5.38 | 1.1 |
| Renewables/TPES(%) | 14.9 | 17.7 | 19.0 | 21.1 | 22.3 | 22.3 | 22.4 | 1.4 |
| GDP (billion 2010 US dollars) | 432.10 | 487.15 | 583.78 | 625.70 | 633.38 | 642.09 | 648.80 | 1.7 |
| TPES/GDP ² | 0.06 | 0.05 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | -1.9 |
| TPES/GDP (year 2010 = 100) | 126 | 114 | 100 | 89 | 86 | 83 | 83 | -1.9 |
| Population (millions) | 6.80 | 7.25 | 7.86 | 8.19 | 8.28 | 8.37 | 8.45 | 0.9 |
| TPES/population (toe per capita) | 3.58 | 3.45 | 3.33 | 3.06 | 2.96 | 2.86 | 2.84 | -1.1 |
| Electricity generation (TWh) ³ | 55.0 | 66.1 | 66.1 | 70.1 | 66.1 | 61.1 | 60.0 | -0.6 |
| of which: Renewables (TWh) ^{1,3} | 30.24 | 37.69 | 37.47 | 40.67 | 41.11 | 37.81 | 37.51 | -0.0 |
| Renew./Total Elec.(%) ^{1,4} | 55.0 | 57.0 | 56.7 | 58.0 | 62.2 | 61.9 | 62.5 | 0.5 |
| Road energy consumption (Mtoe) | 4.8 | 5.5 | 5.7 | 5.6 | 5.3 | 5.3 | .. | .. |
| of which: Liquid biofuels (Mtoe) | - | - | 0.01 | 0.02 | 0.04 | 0.07 | .. | .. |
| Liq. biofuels/road tr.(%) ⁵ | - | - | 0.2 | 0.3 | 0.8 | 1.4 | - | - |

1. Renewables do not include industrial waste, non-renewable municipal waste and pumped storage production.

2. In units of toe per thousand 2010 US dollars.

3. Electricity generation = gross production - amount of electricity produced in pumped storage plants.

4. Electricity share generated from renewables over the total electricity production.

5. Energy from liquid biofuels consumed in road transport over the total energy consumed in road transport.

Source: IEA/OECD *World Energy Balances* and OECD *Main Economic Indicators*.

Table 2. Net generating capacity of renewable and waste sources (MWe)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | Average annual percent change 00-16 |
|---|--------------|--------------|--------------|--------------|--------------|--------------|--|
| Total capacity | 11818 | 13565 | 14280 | 15290 | 15720 | 16997 | 1.4 |
| Hydro | 11665 | 13239 | 13723 | 13743 | 13815 | 14806 | 0.7 |
| Hydro <1MW | 115 | 125 | 143 | 173 | 180 | 186 | 2.5 |
| Hydro 1-10MW | 559 | 583 | 664 | 692 | 698 | 730 | 1.4 |
| Hydro 10+MW | 9224 | 10775 | 11077 | 11039 | 11085 | 11301 | 0.3 |
| Mixed plants | 1455 | 1440 | 1383 | 1383 | 1383 | 2062 | 2.3 |
| Pure pumped storage | 312 | 316 | 456 | 456 | 469 | 527 | 3.2 |
| Geothermal | - | - | - | - | - | - | - |
| Solar photovoltaic | 2 | 16 | 125 | 1061 | 1394 | 1664 | 33.7 |
| Solar thermal | - | - | - | - | - | - | - |
| Tide, wave, ocean | - | - | - | - | - | - | - |
| Wind | - | 3 | 42 | 60 | 60 | 75 | 22.3 |
| Industrial waste | .. | .. | .. | .. | .. | .. | .. |
| Municipal waste | 148 | 274 | 358 | 394 | 422 | 423 | 2.8 |
| Solid biofuels | .. | .. | .. | .. | .. | .. | .. |
| Biogases | 3 | 33 | 32 | 32 | 29 | 29 | -0.8 |
| Liquid biofuels | - | - | - | - | - | - | - |
| Solar collectors surface (1000 m ²) | 97 | 445 | 1008 | 1485 | 1566 | 1620 | 8.4 |
| Cap. of solar collectors (MW _{th}) ¹ | 68 | 312 | 706 | 1040 | 1096 | 1134 | 8.4 |

1. Converted at 0.7 kW_{th}/m² of solar collector area, as estimated by the IEA Solar Heating & Cooling Programme.

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Table 3. Capacity factors (%)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 |
|--|--------------|--------------|--------------|--------------|--------------|--------------|
| Total plants¹ | 30.70 | 33.65 | 32.28 | 32.59 | 31.90 | 27.62 |
| Hydro | 30.32 | 32.96 | 31.46 | 32.98 | 32.95 | 28.29 |
| <i>of which: <1MW</i> | - | - | - | - | - | - |
| <i>of which: 1-10MW</i> | - | - | - | - | - | - |
| <i>of which: 10+MW</i> | 36.87 | 39.02 | 37.16 | 39.33 | 39.40 | 34.97 |
| <i>of which: pure pumped storage²</i> | x | x | x | x | x | x |
| Geothermal | - | - | - | - | - | - |
| Solar photovoltaic | 5.71 | 7.85 | 8.58 | 9.06 | 9.16 | 9.14 |
| Solar thermal | - | - | - | - | - | - |
| Tide, wave and ocean | - | - | - | - | - | - |
| Wind | - | 11.42 | 10.06 | 19.22 | 20.93 | 16.59 |
| Industrial waste | x | x | x | x | x | x |
| Municipal waste | 49.36 | 52.91 | 58.61 | 63.86 | 59.84 | 63.37 |
| Solid biofuels | x | x | x | x | x | x |
| Biogases | x | 51.63 | 74.56 | x | x | x |
| Biodiesels | - | - | - | - | - | - |
| Other liquid biofuels | - | - | - | - | - | - |

1. The capacity factor is defined as: the annual gross electricity generation divided by the reported net capacity times 365 (days/year) times 24 (hours/day).

2. In case a country has at least one mixed hydro plants, it is impossible to calculate capacity factor thus it is shown as 'not applicable'.

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Table 4. Gross electricity production from renewable and waste sources (GWh)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|--------------------------------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|---|
| Total electricity¹ | 31787 | 39990 | 40381 | 43647 | 43924 | 41122 | 41657 | 0.2 |
| Hydro | 30982 | 38230 | 37825 | 39701 | 39881 | 36689 | 37033 | -0.2 |
| <i>of which: pumped storage</i> | 1187 | 1396 | 1764 | 1665 | 1623 | 2065 | 2941 | 4.5 |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar photovoltaic | 1 | 11 | 94 | 842 | 1119 | 1333 | 1600 | 34.0 |
| Solar thermal | - | - | - | - | - | - | - | - |
| Tide, wave, ocean | - | - | - | - | - | - | - | - |
| Wind | - | 3 | 37 | 101 | 110 | 109 | 133 | 25.0 |
| Industrial waste | 44 | 268 | 227 | 210 | 84 | 74 | 72 | -7.4 |
| Municipal waste renew. | 320 | 635 | 919 | 1102 | 1106 | 1174 | 1135 | 3.5 |
| Municipal waste non-renew. | 320 | 635 | 919 | 1102 | 1106 | 1174 | 1135 | 3.5 |
| Solid biofuels | 40 | 59 | 151 | 298 | 214 | 248 | 239 | 8.6 |
| Biogases | 80 | 149 | 209 | 291 | 304 | 321 | 310 | 4.4 |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| <i>of which:</i> | | | | | | | | |
| Electricity only plants | 31209 | 38606 | 38076 | 40646 | 41112 | 38132 | .. | - |
| Hydro | 30982 | 38230 | 37825 | 39701 | 39881 | 36689 | .. | - |
| <i>of which: pumped storage</i> | 1187 | 1396 | 1764 | 1665 | 1623 | 2065 | .. | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar photovoltaic | 1 | 11 | 94 | 842 | 1119 | 1333 | .. | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Tide, wave, ocean | - | - | - | - | - | - | - | - |
| Wind | - | 3 | 37 | 101 | 110 | 109 | .. | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | 103 | 159 | 58 | - | - | - | - | - |
| Municipal waste non-renew. | 103 | 159 | 58 | - | - | - | - | - |
| Solid biofuels | - | - | - | - | - | - | - | - |
| Biogases | 20 | 44 | 4 | 2 | 2 | 1 | .. | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| CHP plants | 578 | 1384 | 2305 | 3001 | 2812 | 2990 | .. | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Industrial waste | 44 | 268 | 227 | 210 | 84 | 74 | .. | - |
| Municipal waste renew. | 217 | 476 | 861 | 1102 | 1106 | 1174 | .. | - |
| Municipal waste non-renew. | 217 | 476 | 861 | 1102 | 1106 | 1174 | .. | - |
| Solid biofuels | 40 | 59 | 151 | 298 | 214 | 248 | .. | - |
| Biogases | 60 | 105 | 205 | 289 | 302 | 320 | .. | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |

1. **Total electricity** includes the electricity produced from industrial waste, non-renewable municipal waste and pumped storage. Electricity from renewable sources does *not* include the electricity produced from industrial waste, non-renewable municipal waste and pumped storage production.

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Table 5A. Heat production¹ from renewable and waste sources in the transformation sector (TJ)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|----------------------------|-------------|-------------|--------------|--------------|--------------|--------------|--------------|--|
| Total heat | 5559 | 8658 | 13396 | 13705 | 14976 | 16167 | 16162 | 3.7 |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | 106 | 1225 | 1006 | 1048 | 490 | 376 | 376 | -6.7 |
| Municipal waste renew. | 2723 | 3659 | 5543 | 5486 | 6106 | 6639 | 6637 | 3.6 |
| Municipal waste non-renew. | 2723 | 3659 | 5543 | 5486 | 6106 | 6639 | 6637 | 3.6 |
| Solid biofuels | 7 | 65 | 1302 | 1685 | 2274 | 2513 | 2512 | 24.0 |
| Biogases | - | 50 | 2 | - | - | - | - | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| <i>of which:</i> | | | | | | | | |
| CHP plants | 5377 | 8308 | 13394 | 13705 | 14976 | 16167 | .. | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | 106 | 1225 | 1006 | 1048 | 490 | 376 | .. | - |
| Municipal waste renew. | 2632 | 3509 | 5543 | 5486 | 6106 | 6639 | .. | - |
| Municipal waste non-renew. | 2632 | 3509 | 5543 | 5486 | 6106 | 6639 | .. | - |
| Solid biofuels | 7 | 65 | 1302 | 1685 | 2274 | 2513 | .. | - |
| Biogases | - | - | - | - | - | - | - | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| Heat only plants | 182 | 350 | 2 | - | - | - | - | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | 91 | 150 | - | - | - | - | - | - |
| Municipal waste non-renew. | 91 | 150 | - | - | - | - | - | - |
| Solid biofuels | - | - | - | - | - | - | - | - |
| Biogases | - | 50 | 2 | - | - | - | - | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |

1. Waste heat and heat production from heat pumps are not included and are reported separately in Table 5B.

Table 5B. Heat production from heat pumps and waste heat (TJ)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|----------------------------|----------|-----------|-----------|-----------|-----------|-----------|-----------|--|
| Total heat | - | 51 | 94 | 36 | 62 | 68 | 59 | 0.8 |
| Heat pumps ¹ | - | 73 | 141 | 68 | 91 | 100 | 102 | 2.0 |
| (-) Input to heat pumps | - | 22 | 47 | 32 | 29 | 32 | 43 | 4.2 |
| Other sources ² | - | - | - | - | - | - | - | - |

1. Installations producing heat for own use are not included.

2. Refers to production from hydrogen, purchased steam from industry, and waste heat.

Source: IEA/OECD *Electricity Statistics*.

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Table 6. Renewable and waste balance for 2016

| thousand tonnes of oil equivalent | Hydro ¹ | Wind | Tide wave ocean | Solar PV | Geo-thermal | Solar thermal | Industrial waste | Mun. waste renew. |
|------------------------------------|--------------------|------------|-----------------|-------------|-------------|---------------|------------------|-------------------|
| Production | 2977 | 9 | - | 115 | 380 | 59 | 258 | 575 |
| Imports | - | - | - | - | - | - | - | - |
| Exports | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| TPES | 2977 | 9 | - | 115 | 380 | 59 | 258 | 575 |
| Statistical differences | - | - | - | - | - | - | - | - |
| Main activity electricity plants | -2750 | -9 | - | - | - | - | - | - |
| Autoproducer electricity plants | -227 | - | - | -115 | - | - | - | - |
| Main activity CHP plants | - | - | - | - | - | - | - | - |
| Autoproducer CHP plants | - | - | - | - | - | - | -20 | -532 |
| Main heat plants | - | - | - | - | - | - | - | - |
| Autoproducer heat plants | - | - | - | - | - | - | - | - |
| Charcoal production plants | - | - | - | - | - | - | - | - |
| Other transformation | - | - | - | - | - | - | - | - |
| Energy Industry own use | - | - | - | - | - | - | - | - |
| Losses | - | - | - | - | - | - | - | - |
| TFC | - | - | - | - | 380 | 59 | 238 | 43 |
| Industry | - | - | - | - | 27 | 2 | 235 | - |
| Iron and steel | - | - | - | - | - | - | - | - |
| Chemical and petrochemical | - | - | - | - | - | - | 93 | - |
| Non-ferrous metals | - | - | - | - | - | - | - | - |
| Non-metallc minerals | - | - | - | - | - | - | 124 | - |
| Transport equipment | - | - | - | - | - | - | - | - |
| Machinery | - | - | - | - | - | - | - | - |
| Mining and quarrying | - | - | - | - | - | - | - | - |
| Food and tobacco | - | - | - | - | - | - | 3 | - |
| Paper, pulp and print | - | - | - | - | - | - | 13 | - |
| Wood and wood products | - | - | - | - | - | - | - | - |
| Construction | - | - | - | - | - | - | - | - |
| Textile and leather | - | - | - | - | - | - | - | - |
| Non-specified | - | - | - | - | 27 | 2 | 3 | - |
| Transport | - | - | - | - | - | - | - | - |
| Road | - | - | - | - | - | - | - | - |
| Other | - | - | - | - | - | - | - | - |
| Other | - | - | - | - | 353 | 57 | 3 | 43 |
| Residential | - | - | - | - | 306 | 48 | - | - |
| Commercial and public services | - | - | - | - | 45 | 9 | 3 | 43 |
| Agriculture/forestry | - | - | - | - | 2 | - | - | - |
| Fishing | - | - | - | - | - | - | - | - |
| Non-specified | - | - | - | - | - | - | - | - |
| Electricity generated - GWh | 34624 | 109 | - | 1333 | - | - | 74 | 1174 |
| <i>Electricity plants</i> | 34624 | 109 | - | 1333 | - | - | - | - |
| <i>CHP plants</i> | - | - | - | - | - | - | 74 | 1174 |
| Heat generated - TJ | - | - | - | - | - | - | 376 | 6639 |
| <i>CHP plants</i> | - | - | - | - | - | - | 376 | 6639 |
| <i>Heat plants</i> | - | - | - | - | - | - | - | - |

1. Hydro does not include pumped hydro.

Source: IEA/OECD *World Energy Balances*.

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Table 6. Renewable and waste balance for 2016 (continued)

| Mun. waste non-ren. | Wood/wood waste | Charcoal | Bio-gases | Bio-gasoline | Bio-diesel | Other liquid biofuels | Total renew. & waste sources ² | Share in total energy sources ³ |
|---------------------|-----------------|----------|------------|--------------|------------|-----------------------|---|--|
| 575 | 988 | - | 117 | - | 5 | - | 6058 | 52.2% |
| - | 41 | - | - | 25 | 51 | - | 117 | 0.7% |
| - | -2 | - | - | -5 | - | - | -7 | 0.2% |
| - | - | - | - | -1 | -2 | - | -3 | x |
| 575 | 1026 | - | 117 | 19 | 54 | - | 6164 | 25.8% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | -2759 | x |
| - | - | - | - | - | - | - | -342 | x |
| - | -101 | - | - | - | - | - | -101 | x |
| -532 | -32 | - | -51 | - | - | - | -1167 | x |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | -24 | - | - | - | -24 | x |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| 43 | 894 | - | 42 | 19 | 54 | - | 1772 | 9.2% |
| - | 236 | - | 11 | - | - | - | 511 | 14.1% |
| - | 3 | - | - | - | - | - | 3 | 1.4% |
| - | - | - | - | - | - | - | 93 | 12.9% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | 124 | 26.3% |
| - | - | - | - | - | - | - | - | - |
| - | 4 | - | - | - | - | - | 4 | 0.7% |
| - | - | - | - | - | - | - | - | - |
| - | 1 | - | - | - | - | - | 4 | 0.9% |
| - | 33 | - | - | - | - | - | 46 | 14.0% |
| - | - | - | - | - | - | - | - | - |
| - | 71 | - | - | - | - | - | 71 | 38.1% |
| - | 2 | - | - | - | - | - | 2 | 4.7% |
| - | 122 | - | 11 | - | - | - | 165 | 31.4% |
| - | - | - | - | 19 | 54 | - | 73 | 1.3% |
| - | - | - | - | 19 | 54 | - | 73 | 1.4% |
| - | - | - | - | - | - | - | - | - |
| 43 | 657 | - | 31 | - | - | - | 1187 | 12.5% |
| - | 473 | - | - | - | - | - | 827 | 14.4% |
| 43 | 169 | - | 26 | - | - | - | 338 | 9.9% |
| - | 15 | - | 4 | - | - | - | 21 | 18.4% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| 1174 | 248 | - | 321 | - | - | - | 39057 | 63.9% |
| - | - | - | 1 | - | - | - | 36067 | 63.0% |
| 1174 | 248 | - | 320 | - | - | - | 2990 | 76.9% |
| 6639 | 2513 | - | - | - | - | - | 16167 | 73.7% |
| 6639 | 2513 | - | - | - | - | - | 16167 | 86.2% |
| - | - | - | - | - | - | - | - | - |

2. Total includes non-renewable waste.

3. Share of renewables on TFC excludes electricity and heat generated from renewable sources.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|--|-------|-------|-------|-------|-------|-------|-------|---|
| Geothermal (TJ) | | | | | | | | |
| Production | 2871 | 4312 | 10848 | 12616 | 14398 | 15929 | 16632 | 8.5 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 2871 | 4312 | 10848 | 12616 | 14398 | 15929 | 16632 | 8.5 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 2871 | 4312 | 10848 | 12616 | 14398 | 15929 | .. | 8.5 |
| <i>Industry</i> | 206 | 309 | 784 | 912 | 1041 | 1151 | .. | 8.6 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 2665 | 4003 | 10064 | 11704 | 13357 | 14778 | .. | 8.5 |
| Solar thermal (TJ) | | | | | | | | |
| Production | 106 | 555 | 1451 | 2212 | 2359 | 2450 | 2530 | 9.7 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 106 | 555 | 1451 | 2212 | 2359 | 2450 | 2530 | 9.7 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 106 | 555 | 1451 | 2212 | 2359 | 2450 | .. | 9.7 |
| <i>Industry</i> | 3 | 14 | 42 | 67 | 72 | 75 | .. | 11.1 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 103 | 541 | 1409 | 2145 | 2287 | 2375 | .. | 9.7 |
| Industrial waste (TJ) | | | | | | | | |
| Production | 8680 | 10440 | 10050 | 11864 | 10234 | 10790 | 11237 | 0.2 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 8680 | 10440 | 10050 | 11864 | 10234 | 10790 | 11237 | 0.2 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | 345 | 2465 | 2017 | 2002 | 881 | 834 | .. | -6.5 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 8335 | 7975 | 8033 | 9862 | 9353 | 9956 | .. | 1.4 |
| <i>Industry</i> | 8335 | 7975 | 8033 | 9862 | 9353 | 9835 | .. | 1.3 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | 121 | .. | - |
| Municipal waste - renewables (TJ) | | | | | | | | |
| Production | 11589 | 17560 | 22305 | 22525 | 23215 | 24075 | 24225 | 2.0 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 11589 | 17560 | 22305 | 22525 | 23215 | 24075 | 24225 | 2.0 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | 11589 | 15788 | 19175 | 20646 | 21416 | 22282 | .. | 2.2 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | 1772 | 3130 | 1879 | 1799 | 1793 | .. | 0.1 |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | 1772 | 3130 | 1879 | 1799 | 1793 | .. | 0.1 |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics (continued)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|--|-------|-------|-------|-------|-------|-------|-------|---|
| Municipal waste - non-renewables (TJ) | | | | | | | | |
| Production | 11589 | 17560 | 22305 | 22525 | 23215 | 24075 | 24225 | 2.0 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 11589 | 17560 | 22305 | 22525 | 23215 | 24075 | 24225 | 2.0 |
| Statistical differences | - | - | - | - | - | - | .. | .. |
| Transformation processes | 11589 | 15788 | 19175 | 20646 | 21416 | 22282 | .. | 2.2 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | .. |
| Final energy consumption | - | 1772 | 3130 | 1879 | 1799 | 1793 | .. | 0.1 |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | 1772 | 3130 | 1879 | 1799 | 1793 | .. | 0.1 |
| Solid Biofuel excluding charcoal (TJ) | | | | | | | | |
| Production | 28370 | 28030 | 39410 | 37020 | 38060 | 41350 | 40820 | 2.5 |
| Net imports ¹ | 270 | - | 590 | 1480 | 1990 | 1620 | 2100 | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 28640 | 28030 | 40000 | 38500 | 40050 | 42970 | 42920 | 2.7 |
| Statistical differences | - | - | - | - | - | - | .. | .. |
| Transformation processes | 186 | 347 | 3576 | 6041 | 4944 | 5550 | .. | 18.9 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | .. |
| Final energy consumption | 28454 | 27683 | 36424 | 32459 | 35106 | 37420 | .. | 1.9 |
| <i>Industry</i> | - | 9428 | 9405 | 8584 | 9284 | 9896 | .. | 0.3 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 28454 | 18255 | 27019 | 23875 | 25822 | 27524 | .. | 2.6 |
| Charcoal (kt) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | .. |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | .. |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Biogases (TJ) | | | | | | | | |
| Production | 1603 | 2460 | 3143 | 4354 | 4585 | 4898 | 5235 | 4.4 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 1603 | 2460 | 3143 | 4354 | 4585 | 4898 | 5235 | 4.4 |
| Statistical differences | - | - | - | - | - | - | .. | .. |
| Transformation processes | 486 | 1055 | 1524 | 2588 | 2840 | 3146 | .. | 7.1 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | .. |
| Final energy consumption | 1117 | 1405 | 1619 | 1766 | 1745 | 1752 | .. | 1.4 |
| <i>Industry</i> | 40 | 148 | 320 | 458 | 452 | 473 | .. | 7.5 |
| <i>Transport</i> | - | 7 | 4 | - | - | - | .. | - |
| <i>Other</i> | 1077 | 1250 | 1295 | 1308 | 1293 | 1279 | .. | 0.1 |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics (continued)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|-----------------------------------|------|------|------|------|------|------|-------|---|
| Biogasoline (kt) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | 3 | 6 | 23 | 31 | 42 | - |
| Stock changes | - | - | -2 | -1 | - | -1 | -4 | |
| Gross consumption | - | - | 1 | 5 | 23 | 30 | 38 | - |
| Statistical differences | - | - | 1 | 2 | -1 | - | .. | |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | 2 | 7 | 22 | 30 | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | 2 | 7 | 22 | 30 | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Biodiesel (kt) | | | | | | | | |
| Production | - | - | 7 | 5 | 6 | 7 | 8 | - |
| Net imports ¹ | - | - | 3 | 13 | 33 | 66 | 112 | - |
| Stock changes | - | - | - | - | - | -2 | - | |
| Gross consumption | - | - | 10 | 18 | 39 | 71 | 120 | - |
| Statistical differences | - | - | - | - | - | - | .. | |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | 10 | 18 | 39 | 71 | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | 10 | 18 | 39 | 71 | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Other liquid biofuels (kt) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Figure 1. Contribution of renewables in 1990

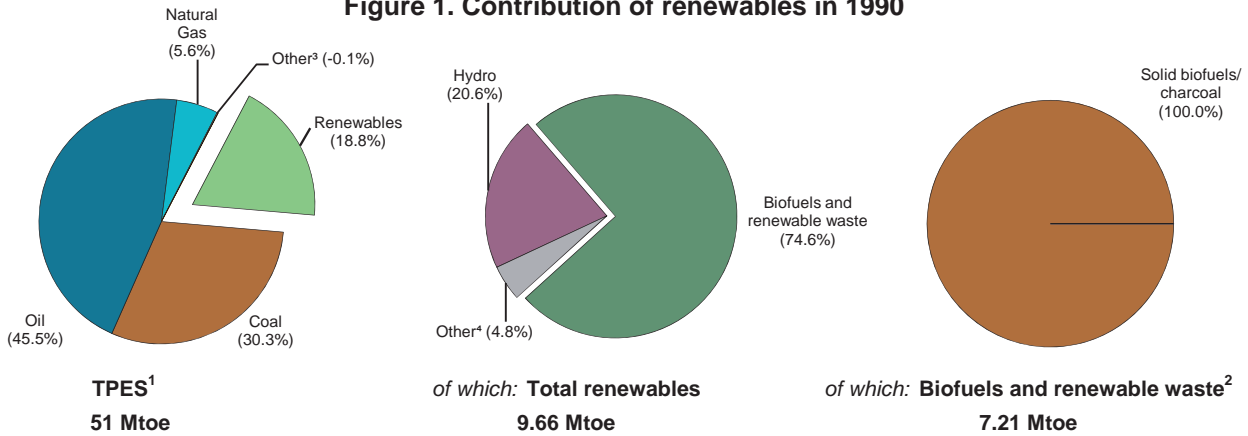


Figure 2. Contribution of renewables in 2017 provisional

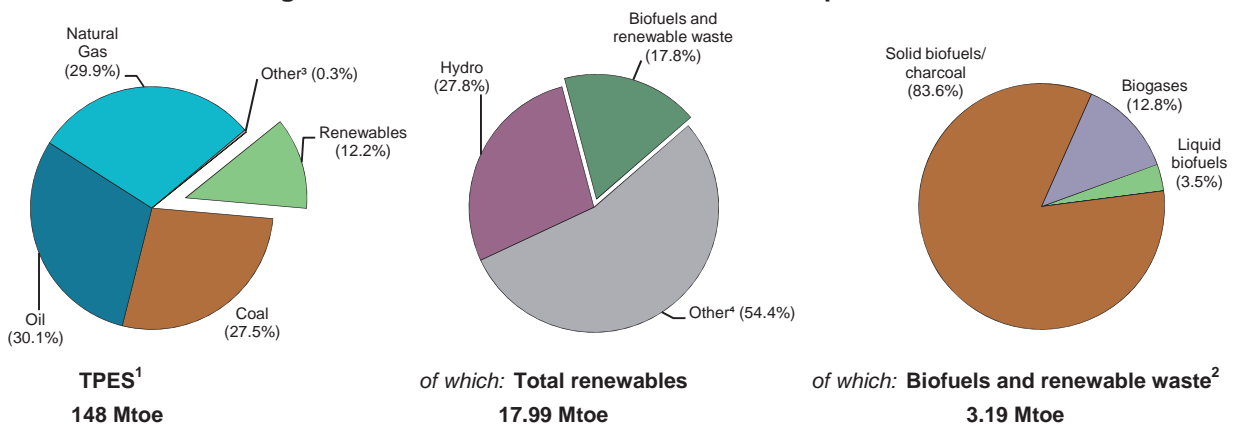
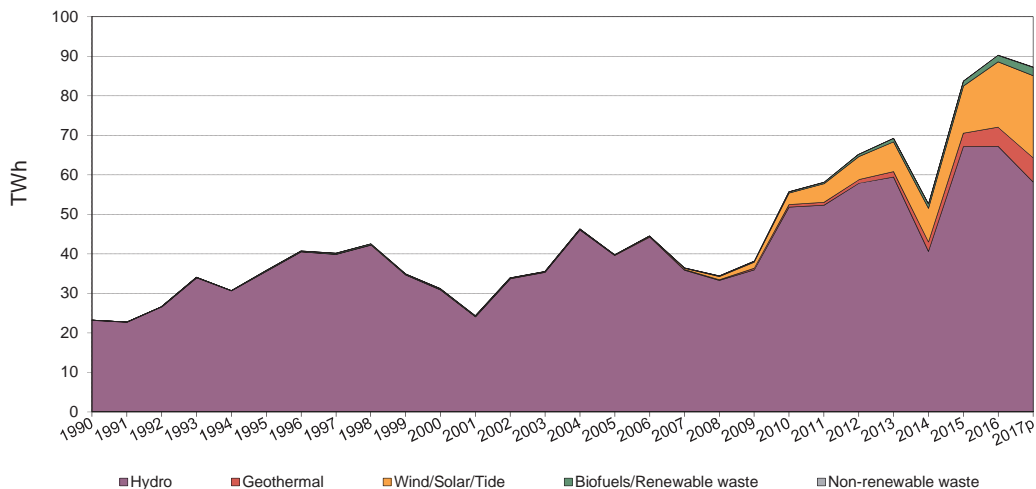


Figure 3. Electricity production by renewables and waste energy source



1. Total primary energy supply includes electricity trade.
2. Biofuels and renewable waste include solid biofuels, liquid biofuels, biogases, and renewable municipal waste.
3. Includes non-renewable municipal waste, industrial waste, peat, shale oil, electricity trade, and other sources of primary energy. (In the case of negative values, the net exports of electricity are greater than the other products in this category).
4. Includes geothermal, solar, wind and tide.

Note: Totals may not sum due to rounding.
Source: IEA/OECD World Energy Balances.

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Table 1. Energy supply, GDP and population

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|---|--------|--------|--------|---------|---------|---------|---------|-------------------------------------|
| TPES (Mtoe) | 51.44 | 76.29 | 105.72 | 119.10 | 128.80 | 136.72 | 147.74 | 4.0 |
| of which: Renewables (Mtoe) ¹ | 9.66 | 10.10 | 11.63 | 12.06 | 15.65 | 17.14 | 17.99 | 3.5 |
| Renewables/TPES(%) | 18.8 | 13.2 | 11.0 | 10.1 | 12.1 | 12.5 | 12.2 | -0.5 |
| GDP (billion 2010 US dollars) | 363.95 | 520.93 | 771.88 | 1025.43 | 1087.84 | 1122.48 | 1205.75 | 5.1 |
| TPES/GDP ² | 0.14 | 0.15 | 0.14 | 0.12 | 0.12 | 0.12 | 0.12 | -1.0 |
| TPES/GDP (year 2010 = 100) | 103 | 107 | 100 | 85 | 86 | 89 | 89 | -1.0 |
| Population (millions) | 55.12 | 64.25 | 73.00 | 76.62 | 77.44 | 78.25 | 79.04 | 1.2 |
| TPES/population (toe per capita) | 0.93 | 1.19 | 1.45 | 1.55 | 1.66 | 1.75 | 1.87 | 2.7 |
| Electricity generation (TWh) ³ | 57.5 | 124.9 | 211.2 | 252.0 | 261.8 | 274.4 | 297.3 | 5.2 |
| of which: Renewables (TWh) ^{1,3} | 23.23 | 31.15 | 55.71 | 52.63 | 83.66 | 90.25 | 87.24 | 6.2 |
| Renew./Total Elec.(%) ^{1,4} | 40.4 | 24.9 | 26.4 | 20.9 | 32.0 | 32.9 | 29.3 | 1.0 |
| Road energy consumption (Mtoe) | 8.4 | 10.5 | 13.3 | 18.5 | 22.3 | 24.3 | .. | .. |
| of which: Liquid biofuels (Mtoe) | - | - | 0.01 | 0.14 | 0.11 | 0.11 | .. | .. |
| Liq. biofuels/road tr.(%) ⁵ | - | - | 0.0 | 0.8 | 0.5 | 0.4 | - | - |

1. Renewables do not include industrial waste, non-renewable municipal waste and pumped storage production.

2. In units of toe per thousand 2010 US dollars.

3. Electricity generation = gross production - amount of electricity produced in pumped storage plants.

4. Electricity share generated from renewables over the total electricity production.

5. Energy from liquid biofuels consumed in road transport over the total energy consumed in road transport.

Source: IEA/OECD World Energy Balances and OECD Main Economic Indicators.

Table 2. Net generating capacity of renewable and waste sources (MWe)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | Average annual percent change 00-16 |
|---|-------------|--------------|--------------|--------------|--------------|--------------|-------------------------------------|
| Total capacity | 6782 | 11293 | 17368 | 27945 | 31521 | 34451 | 7.2 |
| Hydro | 6764 | 11175 | 15831 | 23643 | 25868 | 26681 | 5.6 |
| Hydro <1MW | 12 | 16 | 17 | 19 | 20 | 20 | 1.4 |
| Hydro 1-10MW | 72 | 136 | 436 | 1098 | 1180 | 1341 | 15.4 |
| Hydro 10+MW | 6680 | 11023 | 15378 | 22526 | 24668 | 25320 | 5.3 |
| Mixed plants | - | - | - | - | - | - | - |
| Pure pumped storage | - | - | - | - | - | - | - |
| Geothermal | 18 | 18 | 94 | 405 | 624 | 821 | 27.0 |
| Solar photovoltaic | - | - | - | 40 | 249 | 833 | - |
| Solar thermal | - | - | - | - | - | - | - |
| Tide, wave, ocean | - | - | - | - | - | - | - |
| Wind | - | 19 | 1320 | 3630 | 4503 | 5751 | 42.9 |
| Industrial waste | - | 5 | 5 | 6 | 6 | 6 | 1.1 |
| Municipal waste | - | - | - | - | - | - | - |
| Solid biofuels | - | 72 | 47 | 10 | 12 | 55 | -1.7 |
| Biogases | - | 4 | 71 | 204 | 252 | 297 | 30.9 |
| Liquid biofuels | - | - | - | 7 | 7 | 7 | - |
| Solar collectors surface (1000 m ²) | .. | 7700 | 12350 | 19490 | 19690 | 20080 | 6.2 |
| Cap. of solar collectors (MW _{th}) ¹ | .. | 5390 | 8645 | 13643 | 13783 | 14056 | 6.2 |

1. Converted at 0.7 kW_{th}/m² of solar collector area, as estimated by the IEA Solar Heating & Cooling Programme.

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Table 3. Capacity factors (%)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 |
|--|--------------|--------------|--------------|--------------|--------------|--------------|
| Total plants¹ | 39.10 | 31.50 | 36.63 | 21.50 | 30.31 | 29.91 |
| Hydro | 39.07 | 31.54 | 37.35 | 19.62 | 29.63 | 28.76 |
| <i>of which: <1MW</i> | - | 22.12 | 38.18 | 26.72 | 37.27 | 39.74 |
| <i>of which: 1-10MW</i> | 1.59 | 26.27 | 31.52 | 21.77 | 33.83 | 27.06 |
| <i>of which: 10+MW</i> | 39.54 | 31.62 | 37.51 | 19.51 | 29.42 | 28.85 |
| <i>of which: pure pumped storage²</i> | - | - | - | - | - | - |
| Geothermal | 50.74 | 48.20 | 81.15 | 66.63 | 62.66 | 67.00 |
| Solar photovoltaic | - | - | - | 4.96 | 8.90 | 14.30 |
| Solar thermal | - | - | - | - | - | - |
| Tide, wave and ocean | - | - | - | - | - | - |
| Wind | - | 19.83 | 25.22 | 26.79 | 29.54 | 30.80 |
| Industrial waste | - | 17.63 | 30.71 | 22.60 | 41.27 | 45.28 |
| Municipal waste | - | - | - | - | - | - |
| Solid biofuels | - | 22.99 | 8.87 | 39.04 | 29.79 | 15.39 |
| Biogases | - | 59.93 | 47.66 | 58.53 | 54.74 | 59.93 |
| Biodiesels | - | - | - | - | - | - |
| Other liquid biofuels | - | - | - | 3.91 | 2.30 | 2.20 |

1. The capacity factor is defined as: the annual gross electricity generation divided by the reported net capacity times 365 (days/year) times 24 (hours/day).

2. In case a country has at least one mixed hydro plants, it is impossible to calculate capacity factor thus it is shown as 'not applicable'.

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Table 4. Gross electricity production from renewable and waste sources (GWh)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|--------------------------------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|---|
| Total electricity¹ | 23228 | 31162 | 55725 | 52641 | 83680 | 90267 | 87264 | 6.2 |
| Hydro | 23148 | 30879 | 51796 | 40645 | 67145 | 67230 | 58219 | 3.8 |
| <i>of which: pumped storage</i> | - | - | - | - | - | - | - | - |
| Geothermal | 80 | 76 | 668 | 2364 | 3425 | 4819 | 6128 | 29.5 |
| Solar photovoltaic | - | - | - | 17 | 194 | 1043 | 2889 | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Tide, wave, ocean | - | - | - | - | - | - | - | - |
| Wind | - | 33 | 2916 | 8520 | 11653 | 15517 | 17904 | 44.8 |
| Industrial waste | - | 8 | 13 | 12 | 22 | 24 | 28 | 7.6 |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | - | - | - | - | - |
| Solid biofuels | - | 145 | 36 | 34 | 32 | 74 | 313 | 4.6 |
| Biogases | - | 21 | 296 | 1047 | 1208 | 1559 | 1781 | 29.8 |
| Liquid biofuels | - | - | - | 2 | 1 | 1 | 2 | - |
| of which: | | | | | | | | |
| Electricity only plants | 23228 | 31070 | 55686 | 52257 | 83178 | 89715 | .. | - |
| Hydro | 23148 | 30879 | 51796 | 40645 | 67145 | 67230 | .. | - |
| <i>of which: pumped storage</i> | - | - | - | - | - | - | - | - |
| Geothermal | 80 | 76 | 668 | 2364 | 3425 | 4819 | .. | - |
| Solar photovoltaic | - | - | - | 17 | 194 | 1043 | .. | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Tide, wave, ocean | - | - | - | - | - | - | - | - |
| Wind | - | 33 | 2916 | 8520 | 11653 | 15517 | .. | - |
| Industrial waste | - | 8 | 13 | 12 | 16 | 16 | .. | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | - | - | - | - | - |
| Solid biofuels | - | 53 | 14 | 11 | 14 | 47 | .. | - |
| Biogases | - | 21 | 279 | 686 | 730 | 1042 | .. | - |
| Liquid biofuels | - | - | - | 2 | 1 | 1 | .. | - |
| CHP plants | - | 92 | 39 | 384 | 502 | 552 | .. | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | - | - | 6 | 8 | .. | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | - | - | - | - | - |
| Solid biofuels | - | 92 | 22 | 23 | 18 | 27 | .. | - |
| Biogases | - | - | 17 | 361 | 478 | 517 | .. | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |

1. **Total electricity** includes the electricity produced from industrial waste, non-renewable municipal waste and pumped storage. Electricity from renewable sources does *not* include the electricity produced from industrial waste, non-renewable municipal waste and pumped storage production.

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Table 5A. Heat production¹ from renewable and waste sources in the transformation sector (TJ)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|----------------------------|------|------|------|------|------|------|-------|--|
| Total heat | - | - | 213 | 1438 | 2514 | 3410 | 4230 | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | - | - | 859 | 1381 | 1488 | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | - | - | - | - | - |
| Solid biofuels | - | - | - | - | 29 | 35 | 42 | - |
| Biogases | - | - | 213 | 1438 | 1626 | 1994 | 2700 | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| <i>of which:</i> | | | | | | | | |
| CHP plants | - | - | 213 | 1438 | 2514 | 3410 | .. | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | - | - | 859 | 1381 | .. | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | - | - | - | - | - |
| Solid biofuels | - | - | - | - | 29 | 35 | .. | - |
| Biogases | - | - | 213 | 1438 | 1626 | 1994 | .. | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| Heat only plants | - | - | - | - | - | - | - | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | - | - | - | - | - |
| Solid biofuels | - | - | - | - | - | - | - | - |
| Biogases | - | - | - | - | - | - | - | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |

1. Waste heat and heat production from heat pumps are not included and are reported separately in Table 5B.

Table 5B. Heat production from heat pumps and waste heat (TJ)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|----------------------------|------|------|------|------|------|-------|-------|--|
| Total heat | - | 613 | 1480 | 4317 | 6598 | 14060 | 16520 | 21.4 |
| Heat pumps ¹ | - | - | - | - | - | - | - | - |
| (-) Input to heat pumps | - | - | - | - | - | - | - | - |
| Other sources ² | - | 613 | 1480 | 4317 | 6598 | 14060 | 16520 | 21.4 |

1. Installations producing heat for own use are not included.

2. Refers to production from hydrogen, purchased steam from industry, and waste heat.

Source: IEA/OECD *Electricity Statistics*.

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Table 6. Renewable and waste balance for 2016

| thousand tonnes of oil equivalent | Hydro ¹ | Wind | Tide wave ocean | Solar PV | Geo-thermal | Solar thermal | Industrial waste | Mun. waste renew. |
|------------------------------------|--------------------|--------------|-----------------|-------------|-------------|---------------|------------------|-------------------|
| Production | 5781 | 1334 | - | 90 | 6033 | 827 | 49 | - |
| Imports | - | - | - | - | - | - | - | - |
| Exports | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| TPES | 5781 | 1334 | - | 90 | 6033 | 827 | 49 | - |
| Statistical differences | - | - | - | - | - | - | - | - |
| Main activity electricity plants | -5708 | -1332 | - | -52 | -4143 | - | - | - |
| Autoproducer electricity plants | -73 | -2 | - | -38 | - | - | -5 | - |
| Main activity CHP plants | - | - | - | - | - | - | -44 | - |
| Autoproducer CHP plants | - | - | - | - | - | - | - | - |
| Main heat plants | - | - | - | - | - | - | - | - |
| Autoproducer heat plants | - | - | - | - | - | - | - | - |
| Charcoal production plants | - | - | - | - | - | - | - | - |
| Other transformation | - | - | - | - | - | - | - | - |
| Energy Industry own use | - | - | - | - | - | - | - | - |
| Losses | - | - | - | - | - | - | - | - |
| TFC | - | - | - | - | 1890 | 827 | - | - |
| Industry | - | - | - | - | - | 288 | - | - |
| Iron and steel | - | - | - | - | - | - | - | - |
| Chemical and petrochemical | - | - | - | - | - | - | - | - |
| Non-ferrous metals | - | - | - | - | - | - | - | - |
| Non-metallc minerals | - | - | - | - | - | - | - | - |
| Transport equipment | - | - | - | - | - | - | - | - |
| Machinery | - | - | - | - | - | - | - | - |
| Mining and quarrying | - | - | - | - | - | - | - | - |
| Food and tobacco | - | - | - | - | - | - | - | - |
| Paper, pulp and print | - | - | - | - | - | - | - | - |
| Wood and wood products | - | - | - | - | - | - | - | - |
| Construction | - | - | - | - | - | - | - | - |
| Textile and leather | - | - | - | - | - | - | - | - |
| Non-specified | - | - | - | - | - | 288 | - | - |
| Transport | - | - | - | - | - | - | - | - |
| Road | - | - | - | - | - | - | - | - |
| Other | - | - | - | - | - | - | - | - |
| Other | - | - | - | - | 1890 | 539 | - | - |
| Residential | - | - | - | - | 1310 | 539 | - | - |
| Commercial and public services | - | - | - | - | - | - | - | - |
| Agriculture/forestry | - | - | - | - | 580 | - | - | - |
| Fishing | - | - | - | - | - | - | - | - |
| Non-specified | - | - | - | - | - | - | - | - |
| Electricity generated - GWh | 67231 | 15517 | - | 1043 | 4819 | - | 24 | - |
| <i>Electricity plants</i> | 67231 | 15517 | - | 1043 | 4819 | - | 16 | - |
| <i>CHP plants</i> | - | - | - | - | - | - | 8 | - |
| Heat generated - TJ | - | - | - | - | - | - | 1381 | - |
| <i>CHP plants</i> | - | - | - | - | - | - | 1381 | - |
| <i>Heat plants</i> | - | - | - | - | - | - | - | - |

1. Hydro does not include pumped hydro.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|--|-------|-------|-------|--------|--------|--------|--------|--|
| Geothermal (TJ) | | | | | | | | |
| Production | 18137 | 28623 | 82317 | 147528 | 202416 | 252589 | 299738 | 14.6 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 18137 | 28623 | 82317 | 147528 | 202416 | 252589 | 299738 | 14.6 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | 2880 | 2736 | 24060 | 85103 | 123286 | 173459 | .. | 29.6 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 15257 | 25887 | 58257 | 62425 | 79130 | 79130 | .. | 7.2 |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 15257 | 25887 | 58257 | 62425 | 79130 | 79130 | .. | 7.2 |
| Solar thermal (TJ) | | | | | | | | |
| Production | 1172 | 10967 | 18087 | 33620 | 34647 | 34625 | 35295 | 7.4 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 1172 | 10967 | 18087 | 33620 | 34647 | 34625 | 35295 | 7.4 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 1172 | 10967 | 18087 | 33620 | 34647 | 34625 | .. | 7.4 |
| <i>Industry</i> | 335 | 4060 | 5426 | 11723 | 11848 | 12058 | .. | 7.0 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 837 | 6907 | 12661 | 21897 | 22799 | 22567 | .. | 7.7 |
| Industrial waste (TJ) | | | | | | | | |
| Production | - | 94 | 162 | 144 | 1362 | 2067 | 2778 | 21.3 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | 94 | 162 | 144 | 1362 | 2067 | 2778 | 21.3 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | 94 | 162 | 144 | 1362 | 2067 | .. | 21.3 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Municipal waste - renewables (TJ) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics (continued)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|--|--------|----------|--------|--------|--------|--------|--------|---|
| Municipal waste - non-renewables (TJ) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Solid Biofuel excluding charcoal (TJ) | | | | | | | | |
| Production | 301722 | 271875 e | 186289 | 131008 | 117954 | 109382 | 111829 | -5.5 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 301722 | 271875 e | 186289 | 131008 | 117954 | 109382 | 111829 | -5.5 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | 1585 | 603 | 589 | 556 | 986 | .. | -2.9 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 301722 | 270290 | 185686 | 130419 | 117398 | 108396 | .. | -5.6 |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 301722 | 270290 | 185686 | 130419 | 117398 | 108396 | .. | -5.6 |
| Charcoal (kt) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Biogases (TJ) | | | | | | | | |
| Production | - | 209 | 2846 | 9653 | 11119 | 14721 | 17130 | 30.5 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | 209 | 2846 | 9653 | 11119 | 14721 | 17130 | 30.5 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | 209 | 2846 | 9653 | 11119 | 14721 | .. | 30.5 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics (continued)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|-----------------------------------|------|------|------|------|------|------|-------|---|
| Biogasoline (kt) | | | | | | | | |
| Production | - | - | - | 55 | 67 | 72 | 78 | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | 55 | 67 | 72 | 78 | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | 55 | 67 | 72 | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | 55 | 67 | 72 | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Biodiesel (kt) | | | | | | | | |
| Production | - | - | 7 | 36 | 69 | 63 | 67 | - |
| Net imports ¹ | - | - | - | 80 | - | - | - | - |
| Stock changes | - | - | - | - | - | 1 | - | - |
| Gross consumption | - | - | 7 | 116 | 69 | 64 | 67 | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | 7 | 116 | 69 | 64 | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | 7 | 116 | 69 | 64 | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Other liquid biofuels (kt) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Figure 1. Contribution of renewables in 1990

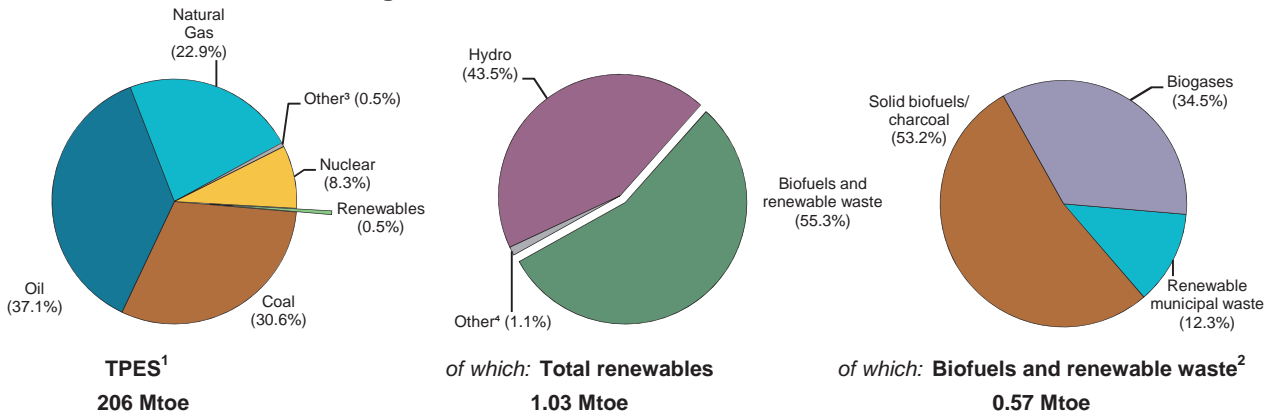


Figure 2. Contribution of renewables in 2017 provisional

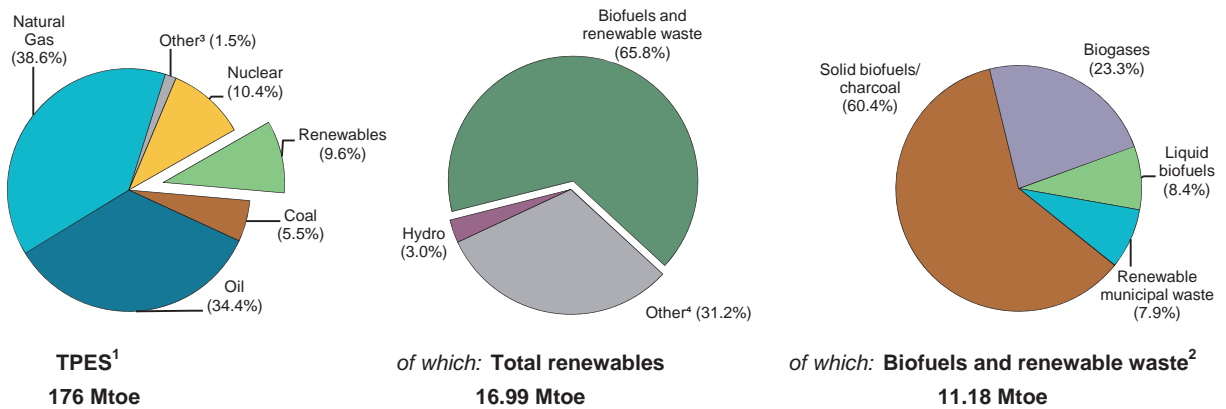
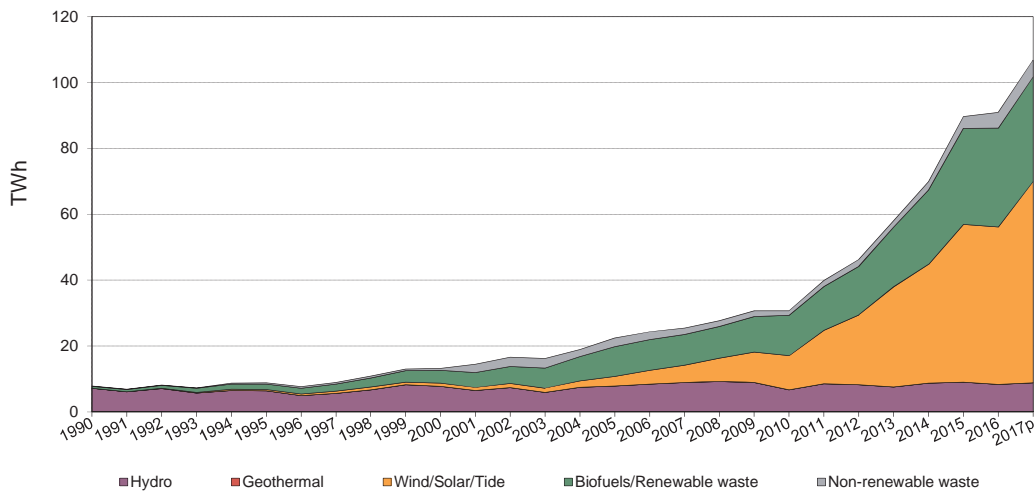


Figure 3. Electricity production by renewables and waste energy source



1. Total primary energy supply includes electricity trade.
 2. Biofuels and renewable waste include solid biofuels, liquid biofuels, biogases, and renewable municipal waste.
 3. Includes non-renewable municipal waste, industrial waste, peat, shale oil, electricity trade, and other sources of primary energy. (In the case of negative values, the net exports of electricity are greater than the other products in this category).
 4. Includes geothermal, solar, wind and tide.

Note: Totals may not sum due to rounding.
Source: IEA/OECD World Energy Balances.

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Table 1. Energy supply, GDP and population

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|---|---------|---------|---------|---------|---------|---------|---------|-------------------------------------|
| TPES (Mtoe) | 205.94 | 222.99 | 203.67 | 179.97 | 181.61 | 178.89 | 176.18 | -1.4 |
| of which: Renewables (Mtoe) ¹ | 1.03 | 2.26 | 7.35 | 12.35 | 14.76 | 15.36 | 16.99 | 12.6 |
| Renewables/TPES(%) | 0.5 | 1.0 | 3.6 | 6.9 | 8.1 | 8.6 | 9.6 | 14.2 |
| GDP (billion 2010 US dollars) | 1642.51 | 2095.21 | 2441.17 | 2643.24 | 2705.25 | 2757.62 | 2806.90 | 1.7 |
| TPES/GDP ² | 0.13 | 0.11 | 0.08 | 0.07 | 0.07 | 0.06 | 0.06 | -3.1 |
| TPES/GDP (year 2010 = 100) | 150 | 128 | 100 | 82 | 80 | 78 | 75 | -3.1 |
| Population (millions) | 57.24 | 58.89 | 62.76 | 64.60 | 65.11 | 65.65 | 66.05 | 0.7 |
| TPES/population (toe per capita) | 3.60 | 3.79 | 3.25 | 2.79 | 2.79 | 2.73 | 2.67 | -2.0 |
| Electricity generation (TWh) ³ | 317.8 | 374.4 | 378.9 | 335.2 | 336.2 | 336.4 | 333.0 | -0.7 |
| of which: Renewables (TWh) ^{1,3} | 5.81 | 9.97 | 26.18 | 64.52 | 83.41 | 83.23 | 98.86 | 14.4 |
| Renew./Total Elec.(%) ^{1,4} | 1.8 | 2.7 | 6.9 | 19.2 | 24.8 | 24.7 | 29.7 | 15.2 |
| Road energy consumption (Mtoe) | 36.4 | 38.9 | 37.7 | 37.3 | 37.8 | 38.7 | .. | .. |
| of which: Liquid biofuels (Mtoe) | - | - | 1.15 | 1.17 | 0.93 | 0.95 | .. | .. |
| Liq. biofuels/road tr.(%) ⁵ | - | - | 3.1 | 3.1 | 2.5 | 2.4 | - | - |

1. Renewables do not include industrial waste, non-renewable municipal waste and pumped storage production.

2. In units of toe per thousand 2010 US dollars.

3. Electricity generation = gross production - amount of electricity produced in pumped storage plants.

4. Electricity share generated from renewables over the total electricity production.

5. Energy from liquid biofuels consumed in road transport over the total energy consumed in road transport.

Source: IEA/OECD *World Energy Balances* and OECD *Main Economic Indicators*.

Table 2. Net generating capacity of renewable and waste sources (MWe)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | Average annual percent change 00-16 |
|---|-------------|-------------|--------------|--------------|--------------|--------------|-------------------------------------|
| Total capacity | 4028 | 5473 | 12277 | 27679 | 33659 | 38457 | 13.0 |
| Hydro | 3897 | 4273 | 4391 | 4474 | 4521 | 4579 | 0.4 |
| Hydro <1MW | - | 26 | 75 | 141 | 188 | 246 | 15.1 |
| Hydro 1-10MW | 26 | 40 | 181 | 180 | 180 | 180 | 9.9 |
| Hydro 10+MW | 1084 | 1419 | 1391 | 1409 | 1409 | 1409 | -0.0 |
| Mixed plants | 300 | 300 | 300 | 300 | 300 | 300 | - |
| Pure pumped storage | 2487 | 2488 | 2444 | 2444 | 2444 | 2444 | -0.1 |
| Geothermal | - | - | - | - | - | - | - |
| Solar photovoltaic | - | 2 | 95 | 5528 | 9535 | 11899 | 72.1 |
| Solar thermal | - | - | - | - | - | - | - |
| Tide, wave, ocean | - | 1 | 4 | 9 | 9 | 13 | 17.4 |
| Wind | 10 | 412 | 5421 | 13074 | 14316 | 16217 | 25.8 |
| Industrial waste | - | - | - | - | - | - | - |
| Municipal waste | 31 | 184 | 413 | 680 | 925 | 1017 | 11.3 |
| Solid biofuels | - | 133 | 709 | 2383 | 2738 | 2993 | 21.5 |
| Biogases | 90 | 468 | 1244 | 1531 | 1615 | 1739 | 8.5 |
| Liquid biofuels | - | - | - | - | - | - | - |
| Solar collectors surface (1000 m ²) | 205 | 396 | 1038 | 1352 | 1383 | 1400 | 8.2 |
| Cap. of solar collectors (MW _{th}) ¹ | 144 | 277 | 727 | 946 | 968 | 980 | 8.2 |

1. Converted at 0.7 kW_{th}/m² of solar collector area, as estimated by the IEA Solar Heating & Cooling Programme.

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Table 3. Capacity factors (%)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 |
|--|--------------|--------------|--------------|--------------|--------------|--------------|
| Total plants¹ | 22.32 | 27.50 | 28.58 | 28.83 | 30.42 | 27.01 |
| Hydro | 21.06 | 20.78 | 17.53 | 22.38 | 22.82 | 20.83 |
| <i>of which: <1MW</i> | - | 9.22 | 29.01 | 34.17 | 34.67 | 31.38 |
| <i>of which: 1-10MW</i> | - | 55.08 | 28.93 | 44.48 | 46.15 | 38.59 |
| <i>of which: 10+MW</i> | 54.83 | 39.19 | 24.14 | 38.60 | 40.51 | 33.30 |
| <i>of which: pure pumped storage²</i> | x | x | x | x | x | x |
| Geothermal | - | - | - | - | - | - |
| Solar photovoltaic | - | 5.71 | 4.84 | 8.37 | 9.03 | 10.00 |
| Solar thermal | - | - | - | - | - | - |
| Tide, wave and ocean | - | - | 5.38 | 2.82 | 2.54 | 0.01 |
| Wind | 10.27 | 26.24 | 21.66 | 27.91 | 32.15 | 26.30 |
| Industrial waste | - | - | - | - | - | - |
| Municipal waste | 82.12 | 84.31 | 69.52 | 63.80 | 63.81 | 61.54 |
| Solid biofuels | - | 46.43 | 75.27 | 66.22 | 80.96 | 74.74 |
| Biogases | 57.71 | 62.32 | 55.60 | 51.43 | 51.16 | 50.59 |
| Biodiesels | - | - | - | - | - | - |
| Other liquid biofuels | - | - | - | - | - | - |

1. The capacity factor is defined as: the annual gross electricity generation divided by the reported net capacity times 365 (days/year) times 24 (hours/day).

2. In case a country has at least one mixed hydro plants, it is impossible to calculate capacity factor thus it is shown as 'not applicable'.

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Table 4. Gross electricity production from renewable and waste sources (GWh)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|--------------------------------------|-------------|--------------|--------------|--------------|--------------|--------------|---------------|---|
| Total electricity¹ | 7876 | 13183 | 30742 | 69895 | 89698 | 90991 | 106822 | 13.1 |
| Hydro | 7189 | 7780 | 6741 | 8771 | 9038 | 8354 | 8815 | 0.7 |
| <i>of which: pumped storage</i> | 1982 | 2694 | 3150 | 2883 | 2739 | 2959 | 2872 | 0.4 |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar photovoltaic | - | 1 | 40 | 4054 | 7546 | 10421 | 11479 | 73.3 |
| Solar thermal | - | - | - | - | - | - | - | - |
| Tide, wave, ocean | - | - | 2 | 2 | 2 | - | 4 | - |
| Wind | 9 | 947 | 10286 | 31959 | 40317 | 37367 | 49605 | 26.2 |
| Industrial waste | - | - | 423 | 588 | 968 | 2064 | 1610 | - |
| Municipal waste renew. | 140 | 840 | 1529 | 1900 | 2585 | 2740 | 3482 | 8.7 |
| Municipal waste non-renew. | 83 | 519 | 987 | 1901 | 2586 | 2742 | 3485 | 11.9 |
| Solid biofuels | - | 541 | 4675 | 13823 | 19418 | 19597 | 20616 | 23.9 |
| Biogases | 455 | 2555 | 6059 | 6897 | 7238 | 7706 | 7726 | 6.7 |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| of which: | | | | | | | | |
| Electricity only plants | 7560 | 12761 | 29158 | 67591 | 87655 | 88703 | .. | - |
| Hydro | 7189 | 7780 | 6741 | 8771 | 9038 | 8354 | .. | - |
| <i>of which: pumped storage</i> | 1982 | 2694 | 3150 | 2883 | 2739 | 2959 | .. | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar photovoltaic | - | 1 | 40 | 4054 | 7546 | 10421 | .. | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Tide, wave, ocean | - | - | 2 | 2 | 2 | - | - | - |
| Wind | 9 | 947 | 10286 | 31959 | 40317 | 37367 | .. | - |
| Industrial waste | - | - | 109 | 384 | 613 | 1522 | .. | - |
| Municipal waste renew. | 140 | 804 | 1106 | 1186 | 2096 | 2226 | .. | - |
| Municipal waste non-renew. | 83 | 500 | 714 | 1187 | 2097 | 2228 | .. | - |
| Solid biofuels | - | 541 | 4675 | 13823 | 19418 | 19597 | .. | - |
| Biogases | 139 | 2188 | 5485 | 6225 | 6528 | 6988 | .. | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| CHP plants | 316 | 422 | 1584 | 2304 | 2043 | 2288 | .. | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | 314 | 204 | 355 | 542 | .. | - |
| Municipal waste renew. | - | 36 | 423 | 714 | 489 | 514 | .. | - |
| Municipal waste non-renew. | - | 19 | 273 | 714 | 489 | 514 | .. | - |
| Solid biofuels | - | - | - | - | - | - | - | - |
| Biogases | 316 | 367 | 574 | 672 | 710 | 718 | .. | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |

1. **Total electricity** includes the electricity produced from industrial waste, non-renewable municipal waste and pumped storage. Electricity from renewable sources does *not* include the electricity produced from industrial waste, non-renewable municipal waste and pumped storage production.

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Table 5A. Heat production¹ from renewable and waste sources in the transformation sector (TJ)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|----------------------------|------|------|------------|-------------|-------------|-------------|-------------|--|
| Total heat | - | - | 928 | 1128 | 1370 | 1327 | 1327 | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | - | - | 80 | 491 | 518 | 524 | 524 | - |
| Municipal waste non-renew. | - | - | 809 | 526 | 671 | 697 | 697 | - |
| Solid biofuels | - | - | 39 | 111 | 181 | 106 | 106 | - |
| Biogases | - | - | - | - | - | - | - | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| <i>of which:</i> | | | | | | | | |
| CHP plants | - | - | - | - | - | - | - | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | - | - | - | - | - | - | - | - |
| Municipal waste non-renew. | - | - | - | - | - | - | - | - |
| Solid biofuels | - | - | - | - | - | - | - | - |
| Biogases | - | - | - | - | - | - | - | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| Heat only plants | - | - | 928 | 1128 | 1370 | 1327 | .. | - |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | - | - | - | - | - | - | - |
| Municipal waste renew. | - | - | 80 | 491 | 518 | 524 | .. | - |
| Municipal waste non-renew. | - | - | 809 | 526 | 671 | 697 | .. | - |
| Solid biofuels | - | - | 39 | 111 | 181 | 106 | .. | - |
| Biogases | - | - | - | - | - | - | - | - |
| Liquid biofuels | - | - | - | - | - | - | - | - |

1. Waste heat and heat production from heat pumps are not included and are reported separately in Table 5B.

Table 5B. Heat production from heat pumps and waste heat (TJ)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|----------------------------|------|------|------|------|------|------|-------|--|
| Total heat | - | - | - | - | - | - | - | - |
| Heat pumps ¹ | - | - | - | - | - | - | - | - |
| (-) Input to heat pumps | - | - | - | - | - | - | - | - |
| Other sources ² | - | - | - | - | - | - | - | - |

1. Installations producing heat for own use are not included.

2. Refers to production from hydrogen, purchased steam from industry, and waste heat.

Source: IEA/OECD *Electricity Statistics*.

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Table 6. Renewable and waste balance for 2016

| thousand tonnes of oil equivalent | Hydro ¹ | Wind | Tide wave ocean | Solar PV | Geo-thermal | Solar thermal | Industrial waste | Mun. waste renew. |
|------------------------------------|--------------------|--------------|-----------------|--------------|-------------|---------------|------------------|-------------------|
| Production | 464 | 3213 | - | 896 | 1 | 51 | 404 | 820 |
| Imports | - | - | - | - | - | - | - | - |
| Exports | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| TPES | 464 | 3213 | - | 896 | 1 | 51 | 404 | 820 |
| Statistical differences | - | - | - | - | - | - | - | - |
| Main activity electricity plants | -340 | -2641 | - | -175 | - | - | - | -279 |
| Autoproducer electricity plants | -124 | -572 | - | -721 | - | - | -285 | -377 |
| Main activity CHP plants | - | - | - | - | - | - | - | - |
| Autoproducer CHP plants | - | - | - | - | - | - | -119 | -132 |
| Main heat plants | - | - | - | - | - | - | - | - |
| Autoproducer heat plants | - | - | - | - | - | - | - | -21 |
| Charcoal production plants | - | - | - | - | - | - | - | - |
| Other transformation | - | - | - | - | - | - | - | - |
| Energy Industry own use | - | - | - | - | - | - | - | - |
| Losses | - | - | - | - | - | - | - | - |
| TFC | - | - | - | - | 1 | 51 | - | 12 |
| Industry | - | - | - | - | - | - | - | 11 |
| Iron and steel | - | - | - | - | - | - | - | - |
| Chemical and petrochemical | - | - | - | - | - | - | - | - |
| Non-ferrous metals | - | - | - | - | - | - | - | - |
| Non-metallurgical minerals | - | - | - | - | - | - | - | - |
| Transport equipment | - | - | - | - | - | - | - | - |
| Machinery | - | - | - | - | - | - | - | 1 |
| Mining and quarrying | - | - | - | - | - | - | - | - |
| Food and tobacco | - | - | - | - | - | - | - | - |
| Paper, pulp and print | - | - | - | - | - | - | - | - |
| Wood and wood products | - | - | - | - | - | - | - | - |
| Construction | - | - | - | - | - | - | - | - |
| Textile and leather | - | - | - | - | - | - | - | - |
| Non-specified | - | - | - | - | - | - | - | 11 |
| Transport | - | - | - | - | - | - | - | - |
| Road | - | - | - | - | - | - | - | - |
| Other | - | - | - | - | - | - | - | - |
| Other | - | - | - | - | 1 | 51 | - | - |
| Residential | - | - | - | - | - | 32 | - | - |
| Commercial and public services | - | - | - | - | 1 | 19 | - | - |
| Agriculture/forestry | - | - | - | - | - | - | - | - |
| Fishing | - | - | - | - | - | - | - | - |
| Non-specified | - | - | - | - | - | - | - | - |
| Electricity generated - GWh | 5395 | 37367 | - | 10421 | - | - | 2064 | 2740 |
| <i>Electricity plants</i> | 5395 | 37367 | - | 10421 | - | - | 1522 | 2226 |
| <i>CHP plants</i> | - | - | - | - | - | - | 542 | 514 |
| Heat generated - TJ | - | - | - | - | - | - | - | 524 |
| <i>CHP plants</i> | - | - | - | - | - | - | - | - |
| <i>Heat plants</i> | - | - | - | - | - | - | - | 524 |

1. Hydro does not include pumped hydro.

Source: IEA/OECD *World Energy Balances*.

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Table 6. Renewable and waste balance for 2016 (continued)

| Mun. waste non-ren. | Wood/wood waste | Charcoal | Bio-gases | Bio-gasoline | Bio-diesel | Other liquid biofuels | Total renew. & waste sources ² | Share in total energy sources ³ |
|---------------------|-----------------|----------|-------------|--------------|------------|-----------------------|---|--|
| 942 | 3840 | - | 2601 | 238 | 304 | - | 13774 | 11.5% |
| - | 2644 | - | - | 263 | 299 | - | 3206 | 2.3% |
| - | -114 | - | - | -111 | -76 | - | -301 | 0.4% |
| - | - | - | - | -3 | 32 | - | 29 | x |
| 942 | 6370 | - | 2601 | 386 | 559 | - | 16707 | 9.3% |
| - | - | - | - | - | 1 | - | 1 | x |
| -279 | -2925 | - | - | - | - | - | -6639 | x |
| -383 | -580 | - | -2022 | - | - | - | -5064 | x |
| - | - | - | - | - | - | - | - | - |
| -132 | - | - | -212 | - | - | - | -595 | x |
| - | - | - | - | - | - | - | - | - |
| -27 | -4 | - | - | - | - | - | -52 | x |
| - | - | - | - | - | - | - | - | - |
| - | - | - | -139 | - | - | - | -139 | x |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| 121 | 2861 | - | 228 | 386 | 560 | - | 4220 | 3.3% |
| 85 | 964 | - | 86 | - | - | - | 1146 | 5.1% |
| - | - | - | - | - | - | - | - | - |
| - | 22 | - | - | - | - | - | 22 | 0.7% |
| - | - | - | - | - | - | - | - | - |
| - | 145 | - | 13 | - | - | - | 158 | 7.0% |
| - | - | - | - | - | - | - | - | - |
| 1 | - | - | - | - | - | - | 2 | 0.1% |
| - | - | - | - | - | - | - | - | - |
| - | 31 | - | 6 | - | - | - | 37 | 1.4% |
| - | 412 | - | 2 | - | - | - | 414 | 19.9% |
| - | 96 | - | - | - | - | - | 96 | 45.3% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| 85 | 256 | - | 64 | - | - | - | 416 | 6.7% |
| - | - | - | - | 386 | 560 | - | 946 | 2.3% |
| - | - | - | - | 386 | 560 | - | 946 | 2.5% |
| - | - | - | - | - | - | - | - | - |
| 35 | 1897 | - | 143 | - | - | - | 2127 | 3.8% |
| - | 1641 | - | - | - | - | - | 1673 | 4.4% |
| 35 | 164 | - | - | - | - | - | 219 | 1.3% |
| - | 92 | - | 142 | - | - | - | 234 | 23.5% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| 2742 | 19597 | - | 7706 | - | - | - | 88032 | 26.2% |
| 2228 | 19597 | - | 6988 | - | - | - | 85744 | 27.1% |
| 514 | - | - | 718 | - | - | - | 2288 | 11.8% |
| 697 | 106 | - | - | - | - | - | 1327 | 2.3% |
| - | - | - | - | - | - | - | - | - |
| 697 | 106 | - | - | - | - | - | 1327 | 2.3% |

2. Total includes non-renewable waste.

3. Share of renewables on TFC excludes electricity and heat generated from renewable sources.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|--|-------|-------|-------|-------|-------|-------|-------|---|
| Geothermal (TJ) | | | | | | | | |
| Production | 33 | 33 | 33 | 33 | 33 | 33 | 33 | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 33 | 33 | 33 | 33 | 33 | 33 | 33 | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 33 | 33 | 33 | 33 | 33 | 33 | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 33 | 33 | 33 | 33 | 33 | 33 | .. | - |
| Solar thermal (TJ) | | | | | | | | |
| Production | 428 | 469 | 1591 | 2075 | 2122 | 2145 | 2146 | 10.0 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 428 | 469 | 1591 | 2075 | 2122 | 2145 | 2146 | 10.0 |
| Statistical differences | - | - | - | - | - | 1 | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 428 | 469 | 1591 | 2075 | 2122 | 2146 | .. | 10.0 |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 428 | 469 | 1591 | 2075 | 2122 | 2146 | .. | 10.0 |
| Industrial waste (TJ) | | | | | | | | |
| Production | 676 | 1472 | 2437 | 8556 | 9348 | 16912 | 16102 | 16.5 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 676 | 1472 | 2437 | 8556 | 9348 | 16912 | 16102 | 16.5 |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | 2437 | 8556 | 9348 | 16912 | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 676 e | 1472 | - | - | - | - | .. | - |
| <i>Industry</i> | 398 | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 278 | 1472 | - | - | - | - | .. | - |
| Municipal waste - renewables (TJ) | | | | | | | | |
| Production | 2933 | 11055 | 18785 | 21590 | 28067 | 34347 | 37191 | 7.3 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 2933 | 11055 | 18785 | 21590 | 28067 | 34347 | 37191 | 7.3 |
| Statistical differences | - | - | - | 1 | -1 | -1 | .. | - |
| Transformation processes | 2033 | 10266 | 17973 | 20930 | 27559 | 33858 | .. | 7.7 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 900 | 789 | 812 | 661 | 507 | 488 | .. | -3.0 |
| <i>Industry</i> | - | 92 | 68 | 36 | 507 | 478 | .. | 10.8 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 900 | 697 | 744 | 625 | - | 10 | .. | -23.3 |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics (continued)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|--|-------|-------|--------|--------|--------|--------|--------|---|
| Municipal waste - non-renewables (TJ) | | | | | | | | |
| Production | 1747 | 6441 | 16848 | 27250 | 32808 | 39445 | 39881 | 12.0 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 1747 | 6441 | 16848 | 27250 | 32808 | 39445 | 39881 | 12.0 |
| Statistical differences | - | - | - | -23 | -31 | -1 | .. | .. |
| Transformation processes | 1211 | 6028 | 13093 | 21235 | 28053 | 34392 | .. | 11.5 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | .. |
| Final energy consumption | 536 | 413 | 3755 | 5992 | 4724 | 5052 | .. | 16.9 |
| <i>Industry</i> | - | 54 | 1986 | 3785 | 3248 | 3566 | .. | 29.9 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 536 | 359 | 1769 | 2207 | 1476 | 1486 | .. | 9.3 |
| Solid Biofuel excluding charcoal (TJ) | | | | | | | | |
| Production | 12685 | 27588 | 81961 | 132173 | 160568 | 160773 | 182842 | 11.6 |
| Net imports ¹ | - | - | 29316 | 72009 | 95197 | 105932 | 100006 | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 12685 | 27588 | 111277 | 204182 | 255765 | 266705 | 282848 | 15.2 |
| Statistical differences | - | - | - | -1 | - | - | .. | .. |
| Transformation processes | - | 6742 | 47054 | 112641 | 146836 | 146901 | .. | 21.2 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | .. |
| Final energy consumption | 12685 | 20846 | 64223 | 91540 | 108929 | 119804 | .. | 11.5 |
| <i>Industry</i> | 2386 | 11137 | 13473 | 17004 | 32865 | 40364 | .. | 8.4 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 10299 | 9709 | 50750 | 74536 | 76064 | 79440 | .. | 14.0 |
| Charcoal (kt) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | .. |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | .. |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Biogases (TJ) | | | | | | | | |
| Production | 8222 | 33912 | 77640 | 89383 | 97835 | 108893 | 108797 | 7.6 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 8222 | 33912 | 77640 | 89383 | 97835 | 108893 | 108797 | 7.6 |
| Statistical differences | - | - | - | - | -1 | 1 | .. | .. |
| Transformation processes | 5622 | 31575 | 74769 | 84792 | 91195 | 99341 | .. | 7.4 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | .. |
| Final energy consumption | 2600 | 2337 | 2871 | 4591 | 6639 | 9553 | .. | 9.2 |
| <i>Industry</i> | 1281 | 528 | 528 | 528 | 3556 | 3586 | .. | 12.7 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 1319 | 1809 | 2343 | 4063 | 3083 | 5967 | .. | 7.7 |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics (continued)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|-----------------------------------|------|------|------|------|------|------|-------|---|
| Biogasoline (kt) | | | | | | | | |
| Production | - | - | 223 | 410 | 264 | 372 | 512 | - |
| Net imports ¹ | - | - | 278 | 249 | 376 | 236 | 85 | - |
| Stock changes | - | - | - | -13 | -9 | -5 | 1 | |
| Gross consumption | - | - | 501 | 646 | 631 | 603 | 598 | - |
| Statistical differences | - | - | - | - | - | - | .. | |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | |
| Final energy consumption | - | - | 501 | 646 | 631 | 603 | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | 501 | 646 | 631 | 603 | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Biodiesel (kt) | | | | | | | | |
| Production | - | - | 155 | 143 | 149 | 342 | 467 | - |
| Net imports ¹ | - | - | 779 | 746 | 427 | 251 | 153 | - |
| Stock changes | - | - | - | -39 | 20 | 36 | - | |
| Gross consumption | - | - | 934 | 850 | 596 | 629 | 620 | - |
| Statistical differences | - | - | - | -1 | -1 | 1 | .. | |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | |
| Final energy consumption | - | - | 934 | 849 | 595 | 630 | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | 934 | 849 | 595 | 630 | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Other liquid biofuels (kt) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Figure 1. Contribution of renewables in 1990

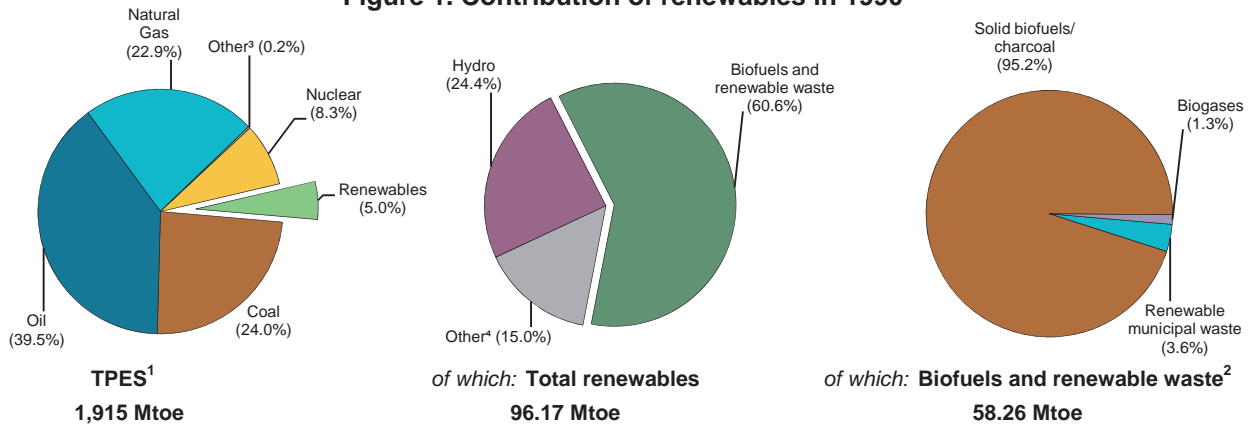


Figure 2. Contribution of renewables in 2017 provisional

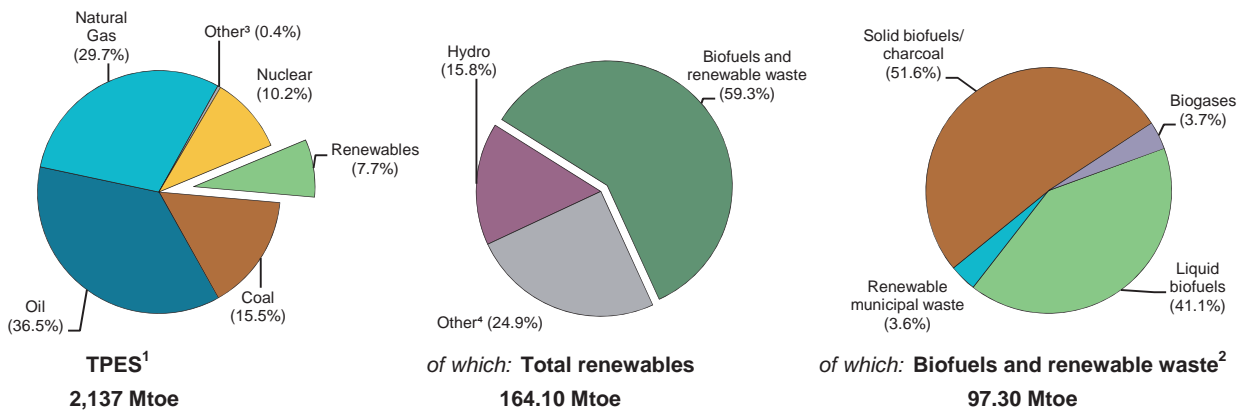
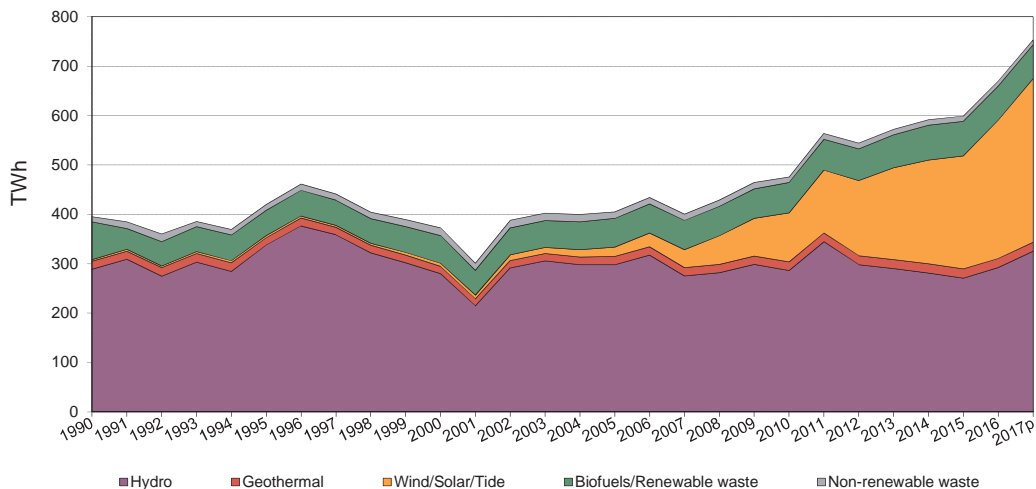


Figure 3. Electricity production by renewables and waste energy source



1. Total primary energy supply includes electricity trade.
2. Biofuels and renewable waste include solid biofuels, liquid biofuels, biogases, and renewable municipal waste.
3. Includes non-renewable municipal waste, industrial waste, peat, shale oil, electricity trade, and other sources of primary energy. (In the case of negative values, the net exports of electricity are greater than the other products in this category).
4. Includes geothermal, solar, wind and tide.

Note: Totals may not sum due to rounding.
Source: IEA/OECD *World Energy Balances*.

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Table 1. Energy supply, GDP and population

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|---|---------|----------|----------|----------|----------|----------|----------|--|
| TPES (Mtoe) | 1915.02 | 2273.78 | 2216.89 | 2210.70 | 2187.66 | 2166.62 | 2136.79 | -0.4 |
| of which: Renewables (Mtoe) ¹ | 96.17 | 101.97 | 125.88 | 152.53 | 150.58 | 156.23 | 164.10 | 2.8 |
| Renewables/TPES(%) | 5.0 | 4.5 | 5.7 | 6.9 | 6.9 | 7.2 | 7.7 | 3.2 |
| GDP (billion 2010 US dollars) | 9064.41 | 12713.06 | 14964.37 | 16208.86 | 16672.69 | 16920.33 | 17304.98 | 1.8 |
| TPES/GDP ² | 0.21 | 0.18 | 0.15 | 0.14 | 0.13 | 0.13 | 0.12 | -2.2 |
| TPES/GDP (year 2010 = 100) | 143 | 121 | 100 | 92 | 89 | 86 | 83 | -2.2 |
| Population (millions) | 250.18 | 282.40 | 309.80 | 318.89 | 321.17 | 323.39 | 325.70 | 0.8 |
| TPES/population (toe per capita) | 7.65 | 8.05 | 7.16 | 6.93 | 6.81 | 6.70 | 6.56 | -1.2 |
| Electricity generation (TWh) ³ | 3202.8 | 4025.9 | 4354.4 | 4320.3 | 4297.0 | 4299.6 | 4234.4 | 0.3 |
| of which: Renewables (TWh) ^{1,3} | 369.24 | 330.36 | 440.68 | 560.66 | 568.44 | 637.08 | 720.40 | 4.7 |
| Renew./Total Elec.(%) ^{1,4} | 11.5 | 8.2 | 10.1 | 13.0 | 13.2 | 14.8 | 17.0 | 4.4 |
| Road energy consumption (Mtoe) | 391.4 | 490.7 | 517.4 | 506.8 | 525.0 | 529.5 | .. | .. |
| of which: Liquid biofuels (Mtoe) | - | 3.19 | 23.28 | 34.49 | 35.58 | 38.30 | .. | .. |
| Liq. biofuels/road tr.(%) ⁵ | - | 0.6 | 4.5 | 6.8 | 6.8 | 7.2 | - | - |

1. Renewables do not include industrial waste, non-renewable municipal waste and pumped storage production.

2. In units of toe per thousand 2010 US dollars.

3. Electricity generation = gross production - amount of electricity produced in pumped storage plants.

4. Electricity share generated from renewables over the total electricity production.

5. Energy from liquid biofuels consumed in road transport over the total energy consumed in road transport.

Source: IEA/OECD *World Energy Balances* and OECD *Main Economic Indicators*.

Table 2. Net generating capacity of renewable and waste sources (MWe)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | Average annual percent change 00-16 |
|---|-----------------|---------------|---------------|---------------|---------------|---------------|--|
| Total capacity | 108105 e | 114920 | 157859 | 200678 | 215082 | 235368 | 4.6 |
| Hydro | 92360 | 98881 | 101024 | 102162 | 102239 | 102692 | 0.2 |
| Hydro <1MW | - | 630 | 38 | 32 | 33 | 33 | -16.8 |
| Hydro 1-10MW | - | 5602 | 2790 | 2920 | 2907 | 2921 | -4.0 |
| Hydro 10+MW | - | 73127 | 67376 | 68095 | 68095 | 68333 | -0.4 |
| Mixed plants | - | - | 12308 | 12339 | 12339 | 12378 | - |
| Pure pumped storage | - | 19522 | 18511 | 18776 | 18866 | 19027 | -0.2 |
| Geothermal | 2669 | 2793 | 2405 | 2514 | 2542 | 2517 | -0.6 |
| Solar photovoltaic | .. | 176 e | 2909 e | 15984 e | 21684 e | 32958 e | 38.7 |
| Solar thermal | 339 | 419 | 473 | 1667 | 1758 | 1758 | 9.4 |
| Tide, wave, ocean | - | - | - | - | - | - | - |
| Wind | 1911 | 2377 | 39135 | 64232 | 72573 | 81287 | 24.7 |
| Industrial waste | 538 e | 638 | 513 | 585 | 193 | 129 | -9.5 |
| Municipal waste | 2001 e | 2627 | 2220 | 2230 | 2248 | 2248 | -1.0 |
| Solid biofuels | 7958 e | 6129 | 7361 | 8755 | 9320 | 9249 | 2.6 |
| Biogases | 329 e | 880 | 1636 | 2394 | 2370 | 2375 | 6.4 |
| Liquid biofuels | - | - | 183 | 155 | 155 | 155 | - |
| Solar collectors surface (1000 m ²) | 18530 | 19395 | 25566 e | 29840 e | 30827 e | 30827 e | 2.9 |
| Cap. of solar collectors (MW _{th}) ¹ | 12971 | 13577 | 17896 e | 20888 e | 21579 e | 21579 e | 2.9 |

1. Converted at 0.7 kW_{th}/m² of solar collector area, as estimated by the IEA Solar Heating & Cooling Programme.

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Table 3. Capacity factors (%)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 |
|--|----------------|----------------|----------------|----------------|----------------|----------------|
| Total plants¹ | 41.72 e | 37.02 e | 34.39 e | 33.66 e | 31.79 e | 32.48 e |
| Hydro | 35.71 | 32.32 | 32.36 | 31.46 | 30.27 | 32.47 |
| <i>of which: <1MW</i> | - | 43.38 | 91.85 | 81.28 | 72.12 | 88.44 |
| <i>of which: 1-10MW</i> | - | 24.52 | 49.80 | 43.25 | 40.76 | 43.27 |
| <i>of which: 10+MW</i> | - | 37.27 | 42.32 | 41.94 | 40.31 | 43.16 |
| <i>of which: pure pumped storage²</i> | - | 15.66 | x | x | x | x |
| Geothermal | 68.48 | 59.76 | 83.43 | 84.96 | 84.10 | 84.28 |
| Solar photovoltaic | x | 11.84 e | 12.02 e | 16.48 e | 16.89 e | 16.15 e |
| Solar thermal | 22.33 | 14.33 | 21.20 | 18.41 | 23.01 | 24.03 |
| Tide, wave and ocean | - | - | - | - | - | - |
| Wind | 18.32 | 27.13 | 27.75 | 32.68 | 30.36 | 32.23 |
| Industrial waste | 99.94 e | x | 78.92 | 55.03 | x | x |
| Municipal waste | 60.55 e | 72.69 | 85.47 | 84.93 | 83.91 | 84.87 |
| Solid biofuels | 98.33 e | 79.32 | 65.97 | 63.32 | 58.48 | 57.78 |
| Biogases | 86.54 e | 67.84 | 68.42 | 64.78 | 65.86 | 64.73 |
| Biodiesels | - | - | - | - | - | - |
| Other liquid biofuels | - | - | 5.89 | 15.29 | 16.45 | 15.41 |

1. The capacity factor is defined as: the annual gross electricity generation divided by the reported net capacity times 365 (days/year) times 24 (hours/day).

2. In case a country has at least one mixed hydro plants, it is impossible to calculate capacity factor thus it is shown as 'not applicable'.

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Table 4. Gross electricity production from renewable and waste sources (GWh)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|---------------------------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|------------------|---|
| Total electricity¹ | 395066 | 372679 | 475605 | 591662 | 598949 | 669649 | 752793 | 4.2 |
| Hydro | 288960 | 279986 | 286333 | 281527 | 271129 | 292113 | 325129 | 0.9 |
| <i>of which: pumped storage</i> | <i>15808</i> | <i>26782</i> | <i>24067</i> | <i>20054</i> | <i>20111</i> | <i>22443</i> | <i>22752</i> | <i>-1.0</i> |
| Geothermal | 16012 | 14621 | 17577 | 18710 | 18727 | 18584 | 18142 | 1.3 |
| Solar photovoltaic | 3 | 183 | 3063 | 23076 | 32091 | 46633 | 68447 | 41.7 |
| Solar thermal | 663 | 526 | 879 | 2688 | 3544 | 3701 | 5432 | 14.7 |
| Tide, wave, ocean | - | - | - | - | - | - | - | - |
| Wind | 3066 | 5650 | 95148 | 183892 | 192992 | 229471 | 257195 | 25.2 |
| Industrial waste | 4710 | 7170 | 3547 | 2821 | 2303 | 1940 | 1777 | -7.9 |
| Municipal waste renew. | 5306 | 8364 | 9308 | 8461 | 8427 | 8524 | 8181 | -0.1 |
| Municipal waste non-renew. | 5307 | 8363 | 7315 | 8130 | 8096 | 8190 | 7860 | -0.4 |
| Solid biofuels | 68545 | 42586 | 42536 | 48563 | 47743 | 46817 | 47897 | 0.7 |
| Biogases | 2494 | 5230 | 9805 | 13586 | 13674 | 13466 | 12509 | 5.3 |
| Liquid biofuels | - | - | 94 | 208 | 223 | 210 | 224 | - |
| <i>of which:</i> | | | | | | | | |
| <i>Electricity only plants</i> | <i>333179</i> | <i>330831</i> | <i>438453</i> | <i>553001</i> | <i>560902</i> | <i>631713</i> | <i>..</i> | <i>-</i> |
| Hydro | 288960 | 279986 | 286333 | 281527 | 271129 | 292113 | .. | - |
| <i>of which: pumped storage</i> | <i>15808</i> | <i>26782</i> | <i>24067</i> | <i>20054</i> | <i>20111</i> | <i>22443</i> | <i>..</i> | <i>-</i> |
| Geothermal | 16012 | 14621 | 17577 | 18710 | 18727 | 18584 | .. | - |
| Solar photovoltaic | 3 | 183 | 3063 | 23076 | 32091 | 46633 | .. | - |
| Solar thermal | 663 | 526 | 879 | 2688 | 3544 | 3701 | .. | - |
| Tide, wave, ocean | - | - | - | - | - | - | - | - |
| Wind | 3066 | 5650 | 95148 | 183892 | 192992 | 229471 | .. | - |
| Industrial waste | 749 | 923 | 822 | 788 | 736 | 545 | .. | - |
| Municipal waste renew. | 4846 | 7263 | 8343 | 7576 | 7528 | 7651 | .. | - |
| Municipal waste non-renew. | 4847 | 7262 | 6556 | 7279 | 7233 | 7351 | .. | - |
| Solid biofuels | 11539 | 10512 | 11173 | 15285 | 14652 | 13667 | .. | - |
| Biogases | 2494 | 3905 | 8550 | 12130 | 12206 | 11952 | .. | - |
| Liquid biofuels | - | - | 9 | 50 | 64 | 45 | .. | - |
| <i>CHP plants</i> | <i>61887</i> | <i>41848</i> | <i>37152</i> | <i>38661</i> | <i>38047</i> | <i>37936</i> | <i>..</i> | <i>-</i> |
| Geothermal | - | - | - | - | - | - | - | - |
| Industrial waste | 3961 | 6247 | 2725 | 2033 | 1567 | 1395 | .. | - |
| Municipal waste renew. | 460 | 1101 | 965 | 885 | 899 | 873 | .. | - |
| Municipal waste non-renew. | 460 | 1101 | 759 | 851 | 863 | 839 | .. | - |
| Solid biofuels | 57006 | 32074 | 31363 | 33278 | 33091 | 33150 | .. | - |
| Biogases | - | 1325 | 1255 | 1456 | 1468 | 1514 | .. | - |
| Liquid biofuels | - | - | 85 | 158 | 159 | 165 | .. | - |

1. **Total electricity** includes the electricity produced from industrial waste, non-renewable municipal waste and pumped storage. Electricity from renewable sources does *not* include the electricity produced from industrial waste, non-renewable municipal waste and pumped storage production.

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Table 5A. Heat production¹ from renewable and waste sources in the transformation sector (TJ)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|----------------------------|------|-------|-------|-------|-------|-------|-------|--|
| Total heat | - | 27118 | 44006 | 46552 | 43835 | 58263 | 59352 | 4.7 |
| Geothermal | - | - | - | - | - | - | - | - |
| Solar thermal | - | - | - | - | - | - | - | - |
| Industrial waste | - | 187 | 3807 | 4938 | 4300 | 6815 | 6050 | 22.7 |
| Municipal waste renew. | - | 7626 | 6363 | 5423 | 5481 | 7256 | 6831 | -0.6 |
| Municipal waste non-renew. | - | 7625 | 4999 | 5210 | 5266 | 6971 | 6563 | -0.9 |
| Solid biofuels | - | 9489 | 26954 | 29987 | 27400 | 34314 | 36517 | 8.3 |
| Biogases | - | 2191 | 1883 | 994 | 1388 | 2907 | 3391 | 2.6 |
| Liquid biofuels | - | - | - | - | - | - | - | - |
| <i>of which:</i> | | | | | | | | |
| CHP plants | .. | 27118 | 44006 | 46552 | 43835 | 58263 | .. | - |
| Geothermal | .. | - | - | - | - | - | - | - |
| Solar thermal | .. | - | - | - | - | - | - | - |
| Industrial waste | .. | 187 | 3807 | 4938 | 4300 | 6815 | .. | - |
| Municipal waste renew. | .. | 7626 | 6363 | 5423 | 5481 | 7256 | .. | - |
| Municipal waste non-renew. | .. | 7625 | 4999 | 5210 | 5266 | 6971 | .. | - |
| Solid biofuels | .. | 9489 | 26954 | 29987 | 27400 | 34314 | .. | - |
| Biogases | .. | 2191 | 1883 | 994 | 1388 | 2907 | .. | - |
| Liquid biofuels | .. | - | - | - | - | - | - | - |
| Heat only plants | .. | - | - | - | - | - | - | - |
| Geothermal | .. | - | - | - | - | - | - | - |
| Solar thermal | .. | - | - | - | - | - | - | - |
| Industrial waste | .. | - | - | - | - | - | - | - |
| Municipal waste renew. | .. | - | - | - | - | - | - | - |
| Municipal waste non-renew. | .. | - | - | - | - | - | - | - |
| Solid biofuels | .. | - | - | - | - | - | - | - |
| Biogases | .. | - | - | - | - | - | - | - |
| Liquid biofuels | .. | - | - | - | - | - | - | - |

1. Waste heat and heat production from heat pumps are not included and are reported separately in Table 5B.

Table 5B. Heat production from heat pumps and waste heat (TJ)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-17 |
|----------------------------|------|------|------|------|------|------|-------|--|
| Total heat | - | - | - | - | - | - | - | - |
| Heat pumps ¹ | - | - | - | - | - | - | - | - |
| (-) Input to heat pumps | - | - | - | - | - | - | - | - |
| Other sources ² | - | - | - | - | - | - | - | - |

1. Installations producing heat for own use are not included.

2. Refers to production from hydrogen, purchased steam from industry, and waste heat.

Source: IEA/OECD *Electricity Statistics*.

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Table 6. Renewable and waste balance for 2016

| thousand tonnes of oil equivalent | Hydro ¹ | Wind | Tide wave ocean | Solar PV | Geo-thermal | Solar thermal | Industrial waste | Mun. waste renew. |
|------------------------------------|--------------------|---------------|-----------------|----------------|--------------|---------------|------------------|-------------------|
| Production | 23187 | 19731 | - | 4010 e | 9160 e | 2718 | 1076 | 3692 |
| Imports | - | - | - | - | - | - | - | - |
| Exports | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| TPES | 23187 | 19731 | - | 4010 e | 9160 | 2718 | 1076 | 3692 |
| Statistical differences | - | - | - | - | - | - | - | - |
| Main activity electricity plants | -23057 | -19713 | - | -2828 | -8877 e | -748 | -152 | -2652 |
| Autoproducer electricity plants | -130 | -18 | - | -1181 e | - | - | -130 | -392 |
| Main activity CHP plants | - | - | - | - | - | - | -238 | -276 |
| Autoproducer CHP plants | - | - | - | - | - | - | -124 | -99 |
| Main heat plants | - | - | - | - | - | - | - | - |
| Autoproducer heat plants | - | - | - | - | - | - | - | - |
| Charcoal production plants | - | - | - | - | - | - | - | - |
| Other transformation | - | - | - | - | - | - | - | - |
| Energy Industry own use | - | - | - | - | - | - | - | - |
| Losses | - | - | - | - | - | - | - | - |
| TFC | - | - | - | - | 283 | 1970 | 432 | 272 |
| Industry | - | - | - | - | - | - | 432 | 41 |
| Iron and steel | - | - | - | - | - | - | - | - |
| Chemical and petrochemical | - | - | - | - | - | - | 197 | - |
| Non-ferrous metals | - | - | - | - | - | - | - | - |
| Non-metallc minerals | - | - | - | - | - | - | 2 | - |
| Transport equipment | - | - | - | - | - | - | - | - |
| Machinery | - | - | - | - | - | - | - | - |
| Mining and quarrying | - | - | - | - | - | - | - | - |
| Food and tobacco | - | - | - | - | - | - | 7 | - |
| Paper, pulp and print | - | - | - | - | - | - | 226 | - |
| Wood and wood products | - | - | - | - | - | - | - | - |
| Construction | - | - | - | - | - | - | - | - |
| Textile and leather | - | - | - | - | - | - | - | - |
| Non-specified | - | - | - | - | - | - | - | 41 |
| Transport | - | - | - | - | - | - | - | - |
| Road | - | - | - | - | - | - | - | - |
| Other | - | - | - | - | - | - | - | - |
| Other | - | - | - | - | 283 | 1970 | - | 231 |
| Residential | - | - | - | - | 283 | 247 | - | - |
| Commercial and public services | - | - | - | - | - | 1723 | - | 231 |
| Agriculture/forestry | - | - | - | - | - | - | - | - |
| Fishing | - | - | - | - | - | - | - | - |
| Non-specified | - | - | - | - | - | - | - | - |
| Electricity generated - GWh | 269670 | 229471 | - | 46633 e | 18584 | 3701 | 1940 | 8524 |
| <i>Electricity plants</i> | 269670 | 229471 | - | 46633 e | 18584 | 3701 | 545 | 7651 |
| <i>CHP plants</i> | - | - | - | - | - | - | 1395 | 873 |
| Heat generated - TJ | - | - | - | - | - | - | 6815 | 7256 |
| <i>CHP plants</i> | - | - | - | - | - | - | 6815 | 7256 |
| <i>Heat plants</i> | - | - | - | - | - | - | - | - |

1. Hydro does not include pumped hydro.

Source: IEA/OECD *World Energy Balances*.

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Table 6. Renewable and waste balance for 2016 (continued)

| Mun. waste non-ren. | Wood/ wood waste | Charcoal | Bio-gases | Bio-gasoline | Bio-diesel | Other liquid biofuels | Total renew. & waste sources ² | Share in total energy sources ³ |
|---------------------|------------------|----------|--------------|--------------|-------------|-----------------------|---|--|
| 3547 | 49925 | - | 3699 | 34604 | 5260 | 305 | 160914 | 8.4% |
| - | - | - | - | 83 | 3126 | - | 3209 | 0.5% |
| - | - | - | - | -2675 | -295 | - | -2970 | 0.9% |
| - | - | - | - | 179 | -480 | - | -301 | x |
| 3547 | 49925 | - | 3699 | 32190 | 7611 | 305 | 160851 | 7.4% |
| - | - | - | - | - | -1 | -1 | -2 | x |
| -2548 | -4637 | - | -3013 | - | -28 | -8 | -68261 | x |
| -376 | -28 | - | -243 | - | - | - | -2498 | x |
| -265 | -1317 | - | -173 | - | -1 | - | -2270 | x |
| -95 | -4146 | - | -167 | - | - | -29 | -4660 | x |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | -139 | - | -139 | x |
| - | - | - | - | - | - | - | - | - |
| 262 | 39798 | - | 103 | 32190 | 7442 | 267 | 83019 | 5.5% |
| 40 | 28621 | - | 19 | - | 311 | 267 | 29731 | 11.3% |
| - | - | - | - | - | 2 | - | 2 | 0.0% |
| - | 51 | - | 6 | - | 42 | - | 296 | 0.5% |
| - | - | - | - | - | 1 | - | 1 | 0.0% |
| - | 408 | - | - | - | 15 | 2 | 427 | 2.3% |
| - | - | - | 1 | - | 2 | - | 3 | 0.0% |
| - | - | - | - | - | 10 | - | 10 | 0.1% |
| - | - | - | - | - | 55 | - | 55 | 0.7% |
| - | 530 | - | 3 | - | 9 | - | 549 | 1.8% |
| - | 26305 | - | 6 | - | 2 | 265 | 26804 | 59.0% |
| - | 1233 | - | - | - | 11 | - | 1244 | 25.9% |
| - | - | - | - | - | 152 | - | 152 | 1.1% |
| - | - | - | - | - | - | - | - | - |
| 40 | 94 | - | 4 | - | 9 | - | 188 | 0.8% |
| - | - | - | - | 32190 | 6464 | - | 38654 | 6.2% |
| - | - | - | - | 32190 | 6113 | - | 38303 | 7.2% |
| - | - | - | - | - | 351 | - | 351 | 0.4% |
| 222 | 11176 | - | 84 | - | 667 | - | 14633 | 3.0% |
| - | 8938 | - | - | - | 225 | - | 9693 | 3.9% |
| 222 | 1308 | - | 83 | - | 212 | - | 3779 | 1.8% |
| - | 930 | - | 1 | - | 231 | - | 1162 | 5.7% |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| 8190 | 46817 | - | 13466 | - | - | 210 | 647206 | 15.1% |
| 7351 | 13667 | - | 11952 | - | - | 45 | 609270 | 15.3% |
| 839 | 33150 | - | 1514 | - | - | 165 | 37936 | 12.0% |
| 6971 | 34314 | - | 2907 | - | - | - | 58263 | 11.5% |
| 6971 | 34314 | - | 2907 | - | - | - | 58263 | 11.5% |
| - | - | - | - | - | - | - | - | - |

2. Total includes non-renewable waste.

3. Share of renewables on TFC excludes electricity and heat generated from renewable sources.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|--|---------|---------|----------|----------|----------|----------|----------|--|
| Geothermal (TJ) | | | | | | | | |
| Production | 590501 | 548091 | 353529 e | 375852 e | 376496 e | 383501 e | 373948 | -2.2 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 590501 | 548091 | 353529 e | 375852 e | 376496 e | 383501 e | 373948 | -2.2 |
| Statistical differences | - | - | - | - | - | -1 | .. | .. |
| Transformation processes | 576432 | 526356 | 342777 e | 364883 e | 365216 e | 371672 e | .. | -2.2 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 14069 | 21735 | 10752 | 10969 | 11280 | 11828 | .. | -3.7 |
| <i>Industry</i> | - | 4642 | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 14069 | 17093 | 10752 | 10969 | 11280 | 11828 | .. | -2.3 |
| Solar thermal (TJ) | | | | | | | | |
| Production | 2387 | 65871 e | 87203 | 116043 | 125981 | 113790 | 161845 e | 3.5 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 2387 | 65871 e | 87203 | 116043 | 125981 | 113790 | 161845 e | 3.5 |
| Statistical differences | 4846 | - | 1 | - | - | - | .. | .. |
| Transformation processes | 7233 | 5569 | 7719 | 23271 | 30141 | 31310 | .. | 11.4 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | 60302 | 79485 | 92772 | 95840 | 82480 | .. | 2.0 |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | 60302 | 79485 | 92772 | 95840 | 82480 | .. | 2.0 |
| Industrial waste (TJ) | | | | | | | | |
| Production | 80721 e | 172192 | 80589 | 58520 | 50686 | 45038 | 33588 | -8.0 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 80721 e | 172192 | 80589 | 58520 | 50686 | 45038 | 33588 | -8.0 |
| Statistical differences | - | - | -1 | - | - | - | .. | .. |
| Transformation processes | 80721 e | 69406 | 41741 | 38567 | 33475 | 26960 | .. | -5.7 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | 102786 | 38847 | 19953 | 17211 | 18078 | .. | -10.3 |
| <i>Industry</i> | - | 102131 | 38709 | 19953 | 17211 | 18078 | .. | -10.3 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | 655 | 138 | - | - | - | .. | - |
| Municipal waste - renewables (TJ) | | | | | | | | |
| Production | 86915 e | 171490 | 162810 | 150537 | 150084 | 154571 | 145865 | -0.6 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 86915 e | 171490 | 162810 | 150537 | 150084 | 154571 | 145865 | -0.6 |
| Statistical differences | - | - | -1 | - | 1 | - | .. | .. |
| Transformation processes | 86915 e | 128715 | 151312 | 139870 | 138631 | 143163 | .. | 0.7 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | 42775 | 11497 | 10667 | 11454 | 11408 | .. | -7.9 |
| <i>Industry</i> | - | 23850 | 1140 | 1601 | 1679 | 1721 | .. | -15.2 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | 18925 | 10357 | 9066 | 9775 | 9687 | .. | -4.1 |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics (continued)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|--|-----------|---------|---------|---------|---------|---------|---------|---|
| Municipal waste - non-renewables (TJ) | | | | | | | | |
| Production | 86914 | 171489 | 127922 | 144633 | 144198 | 148509 | 140144 | -0.9 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 86914 | 171489 | 127922 | 144633 | 144198 | 148509 | 140144 | -0.9 |
| Statistical differences | - | - | 1 | - | - | - | .. | - |
| Transformation processes | 86914 | 128714 | 118889 | 134384 | 133193 | 137548 | .. | 0.4 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | 42775 | 9034 | 10249 | 11005 | 10961 | .. | -8.2 |
| <i>Industry</i> | - | 23850 | 896 | 1538 | 1614 | 1654 | .. | -15.4 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | 18925 | 8138 | 8711 | 9391 | 9307 | .. | -4.3 |
| Solid Biofuel excluding charcoal (TJ) | | | | | | | | |
| Production | 2321772 e | 2303809 | 2202485 | 2369657 | 2192710 | 2090260 | 2104018 | -0.6 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 2321772 e | 2303809 | 2202485 | 2369657 | 2192710 | 2090260 | 2104018 | -0.6 |
| Statistical differences | - | - | -2 | 1 | 1 | 2 | .. | - |
| Transformation processes | 1375699 e | 502381 | 397912 | 484876 | 461763 | 424019 | .. | -1.1 |
| Energy industry own use | - | - | - | 90 | 90 | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | 946073 | 1801428 | 1804571 | 1884692 | 1730858 | 1666243 | .. | -0.5 |
| <i>Industry</i> | 379180 | 1294091 | 1153758 | 1192040 | 1187436 | 1198317 | .. | -0.5 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | 566893 | 507337 | 650813 | 692652 | 543422 | 467926 | .. | -0.5 |
| Charcoal (kt) | | | | | | | | |
| Production | - | - | - | - | - | - | - | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | - | - | - | - | - | - |
| Statistical differences | - | - | - | - | - | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | - | - | - | - | .. | - |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Biogases (TJ) | | | | | | | | |
| Production | 30674 e | 123966 | 116208 | 183110 | 177841 | 154864 | 149286 | 1.4 |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | 30674 e | 123966 | 116208 | 183110 | 177841 | 154864 | 149286 | 1.4 |
| Statistical differences | - | - | -1 | 1 | - | -1 | .. | - |
| Transformation processes | 30674 e | 63322 | 114408 | 162387 | 159616 | 150566 | .. | 5.6 |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | 60644 | 1799 | 20724 | 18225 | 4297 | .. | -15.2 |
| <i>Industry</i> | - | 57399 | 301 | 19162 | 16435 | 792 | .. | -23.5 |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | 3245 | 1498 | 1562 | 1790 | 3505 | .. | 0.5 |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

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Table 7. Aggregated renewables and waste statistics (continued)

| | 1990 | 2000 | 2010 | 2014 | 2015 | 2016 | 2017p | Average annual percent change 00-16 |
|-----------------------------------|------|------|-------|-------|-------|-------|-------|---|
| Biogasoline (kt) | | | | | | | | |
| Production | - | 4498 | 39071 | 42036 | 43461 | 45245 | 46610 | 15.5 |
| Net imports ¹ | - | 15 | -1140 | -2221 | -2169 | -3390 | -3861 | - |
| Stock changes | - | 79 | -166 | -291 | -356 | 234 | -415 | - |
| Gross consumption | - | 4592 | 37765 | 39524 | 40936 | 42089 | 42334 | 14.9 |
| Statistical differences | - | 365 | -2551 | - | 2 | - | .. | - |
| Transformation processes | - | - | - | - | - | - | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | 4957 | 35214 | 39524 | 40938 | 42089 | .. | 14.3 |
| <i>Industry</i> | - | - | - | - | - | - | .. | - |
| <i>Transport</i> | - | 4957 | 35214 | 39524 | 40938 | 42089 | .. | 14.3 |
| <i>Other</i> | - | - | - | - | - | - | .. | - |
| Biodiesel (kt) | | | | | | | | |
| Production | - | 21 | 841 e | 4259 | 4207 | 5221 | 5311 | 41.2 |
| Net imports ¹ | - | - | 27 | 778 | 1627 | 2810 | 1632 | - |
| Stock changes | - | - | 9 e | 126 | -235 | -476 | 437 | - |
| Gross consumption | - | 21 | 877 e | 5051 | 5436 | 7555 | 7380 | 44.5 |
| Statistical differences | - | - | -1 e | - | -1 | -1 | .. | - |
| Transformation processes | - | - | - | 44 | 38 | 29 | .. | - |
| Energy industry own use | - | - | - | 100 | 134 | 138 | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | 21 | 876 e | 4907 | 5263 | 7387 | .. | 44.3 |
| <i>Industry</i> | - | - | - | 206 | 292 | 309 | .. | - |
| <i>Transport</i> | - | 21 | 876 e | 4200 | 4324 | 6416 | .. | 43.0 |
| <i>Other</i> | - | - | - | 501 | 647 | 662 | .. | - |
| Other liquid biofuels (kt) | | | | | | | | |
| Production | - | - | 194 | 525 | 563 | 592 | 363 | - |
| Net imports ¹ | - | - | - | - | - | - | - | - |
| Stock changes | - | - | - | - | - | - | - | - |
| Gross consumption | - | - | 194 | 525 | 563 | 592 | 363 | - |
| Statistical differences | - | - | - | 1 | 1 | -1 | .. | - |
| Transformation processes | - | - | 29 | 116 | 124 | 73 | .. | - |
| Energy industry own use | - | - | - | - | - | - | .. | - |
| Losses | - | - | - | - | - | - | .. | - |
| Final energy consumption | - | - | 165 | 410 | 440 | 518 | .. | - |
| <i>Industry</i> | - | - | 165 | 410 | 440 | 518 | .. | - |
| <i>Transport</i> | - | - | - | - | - | - | .. | - |
| <i>Other</i> | - | - | - | - | - | - | .. | - |

1. Net imports = total imports - total exports.

Source: IEA/OECD *World Energy Balances*.

COUNTRY NOTES

General notes

This report is focused on the data from 1990 onwards, due to the limited availability of data prior to 1990.

Where no breakdown of municipal waste between renewable and non-renewable components is reported, the IEA Secretariat estimates equal shares of renewable and non-renewable components.

Australia

Source

Department of Industry, Canberra.

General notes

- All data refer to the fiscal year (e.g. July 2015 to June 2016 for 2016).
- Increases in indigenous production of **solid biofuels** since 2014 are related to incentives under the Renewable Energy Target legislation, which went into effect in 2001, and aims to increase the share of electricity generation from renewable sources. More information is available here: <http://www.cleanenergyregulator.gov.au/RET>
- The data for **biogasoline** and **biodiesel** are not available before 2003 and 2004 respectively.
- There are breaks in the time series for many data between 2002 and 2003 due to the adoption of the National Greenhouse and Energy Reporting (NGER) data as the main energy consumption data source for the Australian Energy Statistics.
- In 2002, the Australian administration started to use a new survey methodology and reclassified the types of plants between main activity producers and autoproducers.

- From 1996, a different industry consumption breakdown for **biofuels and waste** is available and leads to breaks in time series.

Supply

- Indigenous production of **biodiesel** decreased substantially in 2016 because one of major **biodiesel** producers ceased production in January 2016. The trend continues with 2017p data, when, according to Bioenergy Australia, low oil prices and higher feedstock prices created a difficult market for the remaining biodiesel producers.
- Indigenous production of **biogasoline (ethanol)** has decreased since the Ethanol Production Grants Programme ended on 30 June 2015. On 1 July 2015, the fuel excise on domestically produced ethanol was reduced to zero and will be increased by 2.5 cents per litre until it reaches 12.5 cents per litre. More information is available here: <http://biomassproducer.com.au/markets/bioenergy-markets-in-australia/ethanol/#.Wwf7Le6FOUk>. Additionally, 2017p data was also affected by low oil prices.
- **Biogas** production data at sewage treatment works are not available.
- The production data of electricity from **wind** are available from 1994.

Transformation

- In the 2018 edition, new methodologies were introduced by the Australian administration for reporting electricity production from solar sources. First, the methodology for reporting electricity production from **solar PV** and **solar thermal** was changed between 2009 and 2010, resulting in a break in time series. Prior to 2010, the ratio of electricity production from **solar thermal** to total solar was assumed to be the same each year. After

2010, **solar PV** autoproducer electricity production is the residual after the main activity **solar PV** and **solar thermal** are deducted from total solar production. There is an additional break in time series between 2013 and 2014 for **solar** production when a new methodology for determining large-scale **solar PV** production was introduced for main activity **solar PV** plants.

- Electricity production from **solar PV** starts in 1992 and from **solar thermal** in 2003.
- Prior to 1995, electricity production from **biogases** is included in natural gas.

Consumption

- In the 2018 edition, **solid biofuels** were revised back to 2010 by the Australian administration, expanding the scope from the revisions in the 2016 and 2017 editions to indigenous production and consumption sectors which weren't previously revised. This results in a break in time series between 2009 and 2010.
- In the 2017 edition of this publication, there has been a revision to the time series of **solid biofuels** consumption in "Paper, pulp and printing" sector. This time series has been revised back to 2010 resulting in break in time series between 2009 and 2010.
- In the 2016 edition of this publication, the Australian administration revised **primary solid biofuels** back to 2010 which impact mostly final consumption in Food and Tobacco. This created breaks in time series.
- The consumption data of **biogases** in industry is not available before 2003.

Austria

Source

Bundesanstalt Statistik Österreich, Vienna.

General notes

- Starting with the 2016 edition, widespread data revisions were received due to enhanced reporting for 2005 onwards as a consequence of the Austrian Energy Efficiency Act (Bundes-Energieeffizienzgesetz). For some time series, these revisions were extrapolated back to 1990. As a consequence, there may be breaks between 2004 and 2005, and 1989 and 1990.
- Data for **solar photovoltaic** and **wind** are available from 1993.

Transformation

- Electricity plants data may include some CHP plants operating in electricity only mode.
- Fluctuating efficiencies from year to year for **solid biofuel** and **industrial waste** plants are related to operational decisions which are governed by a formula described in the *Standard documentation Meta information on Energy balances for Austria and the Laender of Austria* published in June 2016 on the Statistics Austria website.
- In the 2018 edition, electricity production from **municipal waste** main activity electricity plants was revised from 2003-2009. Additionally, electricity production from **municipal waste** main activity CHP plants was revised in 2014.
- A large autoproducer electricity plant was reclassified as an autoproducer CHP plant and therefore creates a break in time series for **municipal waste** in 2011.
- Due to a change in the survey methodology, the heat produced in small plants (capacity inferior to 1 MW) is not reported starting in 2002.
- Prior to 2002, data for **biogases** only include plants of 1 MW or larger.
- Electricity generation from **geothermal** started in 2002.

Consumption

- In the 2016 edition, improvement in the iron and steel industry data have allowed more precision in the consumption, among other for **industrial wastes** in blast furnaces.
- In the 2016 edition, the consumption of **solid biofuels** in the residential sector was revised down from 2005 data.

Belgium

Source

Observatoire de l'Energie, Brussels.

General notes

- Renewable **municipal wastes** include a share of renewable **industrial wastes**.
- No information on **wood pellets** and **animal waste** is available prior to 2012.
- Data for **biodiesels** and **biogasoline** are available starting in 2009.

Supply

- Data on pure **biogasoline** and **biodiesels** trade are not available for 2009 and 2010.

Transformation

- In 2015, part of the law regulating the blending of biodiesel with diesel was temporarily suspended but in 2016, this law was reinstated.
- No information is available on heat production in main activity CHP plants for **industrial waste** in 2007.
- In 2003, combustion of **municipal waste** for electricity and heat generation purposes increased significantly. However, because a large portion of the heat produced is not used (sold), plant efficiencies dropped significantly between 2002 and 2003.
- In 2000, most autoproducer electricity plants using **combustible fuels** were reclassified as autoproducer CHP plants; the heat production from these plants was used for internal industrial processes and not sold to third parties until 2005.
- For 1998 and 1999, electricity production at CHP plants with annual heat output below 0.5 TJ is reported with electricity only plants.

Consumption

- Consumption of **bioethanol** increased in 2017 due to legislation which went into effect on 1 January 2017 which increased the blending obligation for gasoline products.
- **Industrial waste** consumption in the chemical sector started in 2013.
- **Other liquid biofuels** consumed in power plants reported before 2011 can include **biodiesel**.
- New data on consumption cause breaks in time series for **primary solid biofuels** between 2011 and 2012.

Canada

Source

Natural Resources Canada, Ottawa.

General notes

- The split of **municipal waste** reported assumes 65% renewable and 35% non-renewable.
- Starting in 2009, a new data source has been used by Canadian administration for electricity production

from **solar**, **wind**, and **tide**. This new source covers production from **solar** and **wind** only from plants with capacity higher than 500 kW.

- The IEA Secretariat has estimated the data for **biogases**, **industrial and municipal waste** from 1990 to 2004, **biogasoline (ethanol)** from 1998 to 2004 based on information supplied by Natural Resources Canada.

Supply

- Canadian **biodiesel** production increased significantly in 2014 because a large producer came online at the end of 2013. In 2016 again, there was big increase in production of **biodiesel** due to a large plant coming online in Alberta. This is also the reason for the increase in export, as Canada exports most of its **biodiesel** to the US.
- There were no exports of **biogasoline** since 2013.

Transformation

- In the 2018 edition, revisions were made to electricity production from **wind** back to 2013.
- In the 2017 edition of this publication, electrical capacity of **other liquid biofuels** have been reported without any relevant inputs or outputs due to the lack of data.
- In the 2016 edition of this publication, there was a reclassification from autoproducer to main activity producer for plants fuelled by **biogases** and **municipal waste**.
- In the 2016 edition of this publication, the electrical capacity of **solid biofuels** revised back to 2005, which makes break in time series between 2004 and 2005.
- Only gross maximum electrical capacity is available.
- Production capacity figures for **biodiesel** and **biogasoline** are not available.

Consumption

- The **solid biofuels** consumption for the residential sector in 2015 is equal to 2014 data because firewood data lag one year behind.

Chile

Source

Energía Abierta, Comisión Nacional de Energía, Ministerio de Energía, Santiago.

General notes

- The Chilean administration applied a new revised methodology for *final consumption* of **primary solid biofuels**. This may lead to breaks in time series between 2013 and 2014.
- **Charcoal** production and consumption have been estimated by the IEA Secretariat until 2013. From 2014 data, only **solid biofuels** input to **charcoal** production plant is estimated.
- The split of electricity generation by main activity and autoproducer by fuel was estimated by the Chilean administration for the period 1990 to 2003.
- From 1990, consumption in paper and pulp includes forestry and consumption in agriculture is included in non-specified industry.

Supply

- Production of **landfill gas** ceased in 2001 as landfill sites stopped producing adequate gas to continue collection.
- **Solar thermal heat** production has been estimated by the IEA Secretariat using data published by Chilean ministry of energy.

Transformation

- Electricity production from **geothermal** started at Cerro Pabellón in 2017.
- **Biofuels** are co-fired with other fuels for electricity production. For plants where multiple fuels are used for electricity production, capacities are reported under the dominant fuel.
- Regarding electricity generation from **solar PV** and **wind**, Chilean administration applied a new methodology for 2014 and this resulted in breaks in time series between 2013 and 2014. The revision for the previous years is pending.
- A new survey on primary **solid biofuels** causes breaks in production and input to autoproducer CHP between 2011 and 2012.
- Data for heat production in CHP and heat plants are not available.
- The split of **hydro** generation by plant size is available from 1996 for main activity and from 2000 for autoproducers.

Consumption

- **Solar thermal** consumption data are not available so all consumption data are allocated to the non-specified (other) sector.

Czech Republic

Source

Ministry of Industry and Trade, Prague.

General notes

- The restructuring of the Czech electricity market leads to breaks in the time series in all sectors between 1998 and 1999.
- Data for **municipal waste** and **solid biofuels** are not available prior to 1990 and **liquid biofuels** data are not available prior to 1992.

Transformation

- Starting in 2016, a main activity producer CHP incineration plant fired by **municipal waste** was in test operation at Chotikov.
- In 2012, a main activity producer electricity plant using **solid biofuels** started to produce heat and was reclassified as main activity CHP plant.
- Data on **biogases** used in main activity producer CHP and autoproducer heat plants start in 1997.
- Industrial waste use in main activity producer electricity plants is included with solid biofuels from 1996.

Consumption

- Starting in 2016, an increased excise duty was imposed on **biofuels**, causing a decline in consumption.
- In the 2017 edition, due to a new survey in households made by the Czech Statistical Office in 2015 (ENERGO 2015), **solid biofuels** consumption in residential sector has been considerably revised upwards since 1990.
- Hospital waste previously reported as **municipal waste** is reported under **industrial waste** since 2008.
- New survey systems cause breaks in final consumption in 1999 and in 2002. Breaks in both supply and consumption of biofuels and waste occur again in 2003.
- Data for direct use of **solar** energy are available from 2003.

Denmark

Source

Danish Energy Agency, Copenhagen.

General note

- In the 2014 edition, total heat production was revised back to 1994, due to the availability of new data for heat production from **liquid biofuels**.

Supply

- Indigenous production data of **municipal wastes** and **solid biofuels** were estimated by the Danish administration for 2017p based on consumption in the transformation sector. Imports of **municipal wastes** and **solid biofuels** for 2017p are estimated by the Danish administration using the indigenous production growth rates.
- In the 2015 edition, the Danish administration revised the **geothermal heat** production from 1990 to 2009.
- From 2012, **biodiesel** production was confidential and gathered with imports.

Transformation

- From 2012, **biogasoline** trade designated to be blended with motor gasoline is included under **biodiesels**, for confidentiality reasons.
- **Biodiesels** and **biogasoline** consumption for electricity and heat production are reported under **other liquid biofuels**, for confidentiality reasons.
- Data for **other liquid biofuels** main activity heat plants are available from 1994.
- Due to the high number of heating companies burning **wood chips** that are equipped with boilers with flue-gas condensation, the **solid biofuels** heat plants show a high efficiency.
- **Fish oil** used in main activity producer heat plants is included with **solid biofuels**.
- For some years heat plants for **biogases** show efficiencies larger than 100%, on a net calorific value basis, due to the use of condensing boilers that recover the latent heat of vaporisation.
- Based on the reported production from **solar thermal** collectors and installed surface of these, a decline in specific production [kWh/m²] is observed. The main reason of this is that the sources of the production data and installed surface are different each other. The production data origins from the “energy-producer-survey” that most certainly misses some of the newly established installations. Danish administration expects that this divergence will probably become smaller again in the next cycle.

Consumption

- In the 2017 edition of this publication, Danish administration used the 2014 figures of **municipal waste** consumption in industrial sector for the 2015 figures. These figures will be revised in the 2018 edition.
- In the 2016 edition, the Danish statistics revised energy consumption in industry sectors causing some breaks in **solid biofuels** consumption between 2010 and 2011.

Estonia

Source

Statistics Estonia, Tallinn.

General notes

- Data for Estonia are available starting in 1990. Prior to that, they are included in the Former Soviet Union in World Energy Statistics.
- Data for **biogases** include **landfill gas** starting in 2005.

Transformation

- For plants where multiple fuels are used for electricity production, capacities are reported under the dominant fuel.
- In the 2018 edition, the surge in main activity heat from **solid biofuels** was related to reclassification from autoproducer heat plants, where previously autoproducer own use heat and associated fuel inputs are not reported, and the fuel consumption appears in the main economic activity of the autoproducer.

Finland

Source

Statistics Finland, Helsinki.

General notes

- A new survey system and a reclassification of the data lead to breaks in the time series between 1999 and 2000 for most products and sectors. The new survey system is more detailed and has better product coverage, especially in electricity, CHP and heat production, as well as in industry.

- Prior to 2004, **industrial waste** also included other energy forms such as **hydrogen**, **heat from chemical processes**, **natural gas** and **blast furnace gas**.
- Data for **biogases** and **industrial waste** are available from 1996.

Supply

- Due to confidentiality reasons, the **biodiesel** production includes trade figures and stock changes starting with 2015 data. Regarding **biogasoline**, import covers production, exports and stock changes.

Transformation

- The capacities of co-firing plants are reported under the dominant fuel.
- The amount of **biodiesel** used for blending with diesel fell greatly in 2016 after record levels for the past two years. Annual variation in the consumption of biofuels is possible and caused by Finland's biofuel legislation, which gives distributors the possibility to fulfil the bio obligation flexibly in advance.
- In the 2016 edition, the allocation of **solar photovoltaic** between main activity and autoproducer plants was revised.
- In 2014, the new consumption of **other liquid biofuels** in main activity electricity plant corresponds to biopyrolysis oil made from wood chips.
- The increase in heat production from **municipal waste** in 2014 is due to the opening of a new plant.
- Heat output from autoproducer CHP plants is available starting in 1996 and from autoproducer heat plants starting in 2000.
- Before 1999, all electricity production from autoproducers running on **fuelwood** is allocated to CHP plants.
- Prior to 1992, outputs from the use of combustible renewables and waste to generate electricity and/or heat were included in peat. Therefore, the IEA Secretariat estimated the breakdown of outputs from **municipal waste** and **solid biofuels** based on reported inputs.

France

Source

SDES, Ministry of Ecology, Sustainable Development and Energy, Paris.

General notes

- In the 2018 edition, following an analysis of **biogases** in the energy sector by the French administration, there are revisions in **biogas** indigenous production, inputs to the transformation sector, heat production and final consumption back to 2005. Electricity production from **biogases** is revised back to 2011. This causes breaks in time series between 2004 and 2005 as well as 2010 and 2011.
- Indigenous production, transformation and final consumption of **industrial waste** are reported from 2013. In the 2018 edition, indigenous production and transformation of **industrial waste** were added from 2007 - 2012. It follows that there is a break in time series between 2012 and 2013.
- In the 2018 edition, **solid biofuels'** indigenous production and inputs to main activity and autoproducer heat plants have been revised back to 2007. Electricity production has been revised back to 2013. This causes breaks in time series between 2006 and 2007 as well as 2012 and 2013.
- In the 2018 edition, indigenous production and inputs to main activity heat plants have been revised back to 2007 for **municipal waste**. Electricity production has been revised back to 2011. This causes breaks in time series between 2006 and 2007 as well as 2010 and 2011. Prior to 2007, production and consumption of **industrial waste** were included in **municipal waste**.
- In 2014, a new survey on **solid biofuels** and **biogases** causes breaks in time series between 2013 and 2014. **Biogas** was previously reported under **Solid biofuels**.
- Prior to 2005, all the **geothermal** heat consumption was reported as direct use. From 2005 data, some quantities are reported as output of heat plants, resulting in breaks in time series for production, transformation and consumption.

Transformation

- Electricity plants data may include some CHP plants operating in electricity only mode. And heat plants data may include some CHP plants operating in heat only mode.
- In the 2018 edition, electricity production from **hydro** was revised back to the year 2000, in some cases only amounting to plant reclassification.
- Data for heat produced from combustible fuels in heat only plants are available starting from 2012.

- Electricity production from **geothermal** started in 2011 and stopped in 2012 due to the maintenance of the only plant.
- From 2011, all **photovoltaic** plants with capacity above 100kWp are considered as main activity producers, while all plants with capacity below that value are considered autoproducers.
- Plants using **municipal waste** were reclassified as autoproducer CHP plants from 1995, which leads to a break in time series. Breaks in time series in 2005 for **municipal waste** and **solid biofuels** are caused by sectoral reclassifications.
- Data on electricity production from **wind** is available from 1990.

Consumption

- From 2012, the energy consumption is more detailed due to a new national survey.
- Production and consumption of **industrial waste** are reported from 2013. Prior to that, they were included in **municipal waste**.
- A revision of the **solid biofuels** and **biogases** time series created breaks in the direct use time series between 2004 and 2005.
- The breakdown of the final energy consumption of **biogases** was estimated by the French administration from 1970 to 2003.

Germany

Source

Federal Ministry for Economic Affairs and Energy, Berlin.

General notes

- A revision of the time series for **solid biofuels**, including trade, and **other liquid biofuels** is planned for autumn 2018.
- Changes in the reporting system lead to breaks in time series between 1996 and 1997, 2002 and 2003, 2006 and 2007 and between 2010 and 2011.
- In 2011, numerous changes to methodology and classifications have caused many breaks in time series.
- Starting in 2008, **municipal waste** and **industrial waste** data were collected separately. This leads to breaks in the time series between 2007 and 2008.

- Data from 2007 incorporates a new methodology for reporting heat. From 2007 onwards all heat production in autoproducers is considered as non-sold (i.e. for self-use). Therefore, inputs of combustible renewables and waste for heat production are no longer reported in the transformation sector and appear in final energy consumption, broken down by sector, in 2007. More information on district heat also became available in 2007, resulting in increased inputs to main activity heat plants starting in 2007. These issues combined to cause breaks in the transformation and final consumption time series between 2006 and 2007.
- Data on **geothermal** heat production and direct consumption were revised by the German administration and are only available starting in 2003.
- GDP figures prior to 1991 are based on conversions made by the German Institute for Economic Research (Deutsches Institut für Wirtschaftsforschung) and the former Statistical Office of the GDR (Statistisches Amt der DDR).

Supply

- Trade data for **biogasoline** are available from 2004 and for **biodiesels** from 2003.

Transformation

- **Industrial wastes** are co-fired with other fuels for electricity production. For plants where multiple fuels are used for electricity production, capacities are reported under the dominant fuel.
- Due to a reclassification of **wind** energy and **solar photovoltaic** in the official data of the German Federal Statistical Office since 2011, the production is now only reported under main activity producer plants.
- Prior to 2003 electricity production in electricity plants includes production from CHP plants and heat production in CHP plants includes production from heat plants.
- In some instances, electricity generation from **hydro-electricity**, **solar** and **wind** in autoproducer electricity plants are confidential or non-available and therefore are included in main activity producer electricity plants.

Consumption

- For **solid biofuels** consumption in the commercial and public services sector, new data were derived

in cooperation with the Federal Research Institute for Rural Areas, Forestry and Fisheries by applying a different calculation approach based on the total demand for material and energy use of the resource wood in Germany. This had resulted in breaks in time series between 2013 and 2014.

Greece

Source

Ministry for Environment and Energy, Athens.

General notes

- New information on **solid biofuels** is available from 1996 and leads to breaks between 1995 and 1996.
- Data for **biofuels and waste** input and output to transformation are available from 1992.
- Data for **biogases** are available from 1990 and data for **industrial waste** from 1992.

Supply

- No heat production of **solar heat** is reported although it exists.
- Indigenous production of **solid biofuels** is estimated by the IEA Secretariat for 2015 and 2016 based on consumption.

Transformation

- The big increase in delivery of **industrial wastes** to autoproducer CHP plant in 2010 is mainly due to the opening of a new plant.
- Inputs of **solid biofuels** to **charcoal** production are estimated for 2007 to 2010 by the IEA Secretariat assuming an efficiency of 40%.
- **Industrial waste** used in autoproducer CHP plants decreased substantially in 2006 because a plant closed.

Consumption

- **Solid biofuels** consumption in commercial/public services is included in residential until 2011.
- The consumption of **solid biofuels** in the paper, pulp and printing industry is not available from 2003 to 2012.
- Direct use of **geothermal heat** in residential is available starting in 2004.

Hungary

Source

Hungarian Energy and Public Utility Regulatory Authority, Budapest.

General notes

- Data for **biogases** are available from 2000; for **industrial waste** from 2003; for **biodiesel** production from 2007.
- Data for **wind** and **solar thermal** are available from 2001.
- The Hungarian administration reclassified some of their plants between 1996 and 2000, which caused some breaks in the time series.

Supply

- A 2012 change in **biogasoline** reporting methodology results in break in time series between 2011 and 2012.

Transformation

- In 2014, some CHP plants running on **Industrial waste** and **solid biofuels** produced only heat and were reclassified to heat plants.
- From 2014 data, more data suppliers were involved in the process, causing new autoproducer time series to appear for **geothermal** and **industrial waste** plants.
- Data on electricity and heat production from **solid biofuels** in autoproducer CHP plants are available from 1995.
- **Geothermal heat** production from main activity producer heat plants is also available from 1995.

Consumption

- In the 2018 edition, the Hungarian authority has revised **solid biofuels** consumption in other sectors back to 2005 based on the new survey from Hungarian Central Statistical Office (HCSO). This resulted in break in series between 2004 and 2005.
- A new reporting methodology for the direct use of **geothermal** energy was applied from 2014 resulting in break in time series between 2013 and 2014.
- Data for direct use of **geothermal heat** are available from 1990.

Iceland

Source

National Energy Authority, Reykjavik.

General notes

- Energy industry own use of electricity refers mainly to the use of electricity by the **geothermal** industry to pump **geothermal** water from underground sources.
- In the 2018 edition, supply and consumption of **solid biofuels** has been reported for the first time, with 2013 as the first year of data availability.
- In the 2015 edition, the Icelandic administration revised **geothermal heat** production and heat consumption back to 1990. This affects mainly the **geothermal** direct use, the **geothermal heat** production and the final consumption of heat. Prior to 1990, all heat for space heating was reported in residential.

Supply

- The increase in **hydroelectric** and **geothermal** electricity production and capacity between 2007 and 2008 is due to the expansion of the aluminium industry.

Transformation

- Gross heat production from **geothermal** sources increased by 30% from 2015 to 2016. This is due to more accurate reporting from Reykjavik Energy about the temperature of delivered and returned water, rather than physical increases in supply or generation. Revisions to historical data may be forthcoming in future editions
- From 2013 data, the Hellisheidi **geothermal** power plant, previously reported under main activity electricity plant, was categorised as main activity CHP plant.
- The use of **municipal waste** to produce heat is available from 1993 and stops in 2010.
- In 2002, the increase of heat produced by **geothermal** was due to the installation of a third unit at the Nesjavellir CHP power plant.
- In 1998, 60 MW of generating capacity was installed in the **geothermal** CHP plant at Nesjavellir. Since the plant was inoperable for four months, production of **geothermal heat** is almost same with 1997. The extra electricity capacity caused electricity production from **geothermal** to almost double over the same period.

- Electricity production from **geothermal** sources in main activity producer CHP plants is available from 1992.

Consumption

- **Biodiesel** consumption data for 2014 are estimated by Icelandic administration based on 2013.
- Revisions in the direct use of **geothermal heat** from 2013 create breaks in time series between 2012 and 2013.
- **Biogases** used for transport purposes were reported for the first time in 2007.
- The **geothermal** consumption on industrial sector is reported under non-specified industry, as the Icelandic administration decided not to estimate the allocation amongst the sub-sectors of industry.

Ireland

Sources

- Department of Communications, Energy and Natural Resources, Dublin.
- Sustainable Energy Authority of Ireland, Cork.

General notes

- Data for **municipal waste** are available from 2009.
- Data for **solid biofuels** and **biogases** are available from 1990.
- The **solid biofuels** capacity only refers to CHP. The electricity generated by **solid biofuels** from main activity producer electricity plants, refers to a 118 MW co-firing plant using milled peat and biomass. As the primary fuel is peat, this capacity is reported under peat.

Supply

- Due to increased demand from a second waste to energy electricity plant which began operation in 2017, indigenous production of **municipal waste** increased sharply starting with 2017p data.
- Prior to 2011, production and trade of **biogasoline** and **biodiesels** cannot be distinguished due to confidentiality issues.

Transformation

- Starting in 2016, the increase of electricity production of **solid biofuels** is a result of a decarbonisation programme and comes from a plant which is co-firing peat and biomass.

- In 2012 and 2013, the renewable fraction of tyre-derived fuel (12%) used by a cement plant was reported by the administration under **renewable municipal waste**; the non-renewable fraction (88%) was reported under **industrial waste**.
- In 2012, a new main activity electricity plant burning **municipal waste** (the Meath plant) started operation
- There is no **Pumped Hydro** capacity reported in 2010 and 2011 due to the fact that Ireland's pumped storage station, Turlough Hill, was taken offline for an overhaul late in 2010 and did not come back online until February 2012.
- Electricity production from **wind** begins in 1992 and from **biogases** in 1996.

Consumption

- The Biofuels Obligation Scheme places an obligation on suppliers of mineral oil to ensure that 8.695% (by volume) of the **gas/diesel oil** they place on the market in Ireland is produced from renewable sources, e.g. **bioethanol** and **biodiesel**. The obligation was increased from the 1st January, 2017, previously it was 6.383%.
- Despite the Biofuels Obligation Scheme, **bioethanol** consumption decreased in 2017 because there was a reduction in overall motor gasoline use and fuel tourism.
- Increases in **biodiesel** consumption in 2017 are related to the Biofuels Obligation Scheme and increases in road freight, which is heavily dependent on **diesel oil**.
- The consumption of pure **biodiesel** in the industry sector and in the road transport refers to one site, which is no longer in operation since 2014.
- Data for direct use of **solar thermal** heat are available from 1990.

Israel

Source

Israel Central Bureau of Statistics, Jerusalem.

General notes

- The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli administration. The use of such data by the OECD and/or the IEA is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

- In the 2018 edition, data on imports and consumption of **charcoal** were estimated since 1992 using data from the Forestry Production and Trade database from the Food and Agriculture Organization of the United Nations.
- In the 2017 edition, **solar thermal** production and direct consumption were revised and are now estimated by the IEA Secretariat from 2012 onwards, using data published in the IEA-Solar Heating and Cooling Programme Annual Report. These estimations may create breaks in time series between 2011 and 2012.
- Data on the breakdown of **hydroelectric** plants by size became available in 2009.

Transformation

- For 2016 and 2017 data, due to confidentiality reasons, electricity production reported under **solar PV** auto-producer electricity plants includes **hydro** and **wind** electricity generation.
- In 2014, the breakdown of **hydro** electricity production by size is revised due to more accurate data.
- **Hydroelectricity** production data for 2012 were estimated based on the previous years.
- Electricity production from **wind** begins in 2001.

Consumption

- Since the 2017 edition, **solar thermal** production and direct consumption were revised, and are now estimated by the IEA Secretariat from 2012 onwards, using data published in the IEA-Solar Heating and Cooling Programme Annual Report. These estimations may create breaks in time series between 2011 and 2012.
- Data on imports and consumption of **charcoal** were estimated since 2012 based on figures for 2011.

Italy

Sources

Gestore dei Servizi Energetici - GSE S.p.A., Rome.

General notes

- The methodology of data collection for the **geo-thermal** sector changed in 2010, causing a break in time series between 2009 and 2010.

- A change in methodology leads to breaks in time series for industry and transformation between 2003 and 2004.

Supply

- **Biogasoline** includes **bio-ETBE**.
- From 2014, a distinction between trade and production became available for **other liquids biofuels**.

Transformation

- The methodology of data collection for **photovoltaic** electricity production changed in 2009 and the distinction between main activity and auto-producer plants could not be determined, causing a break in the time series.
- In 2008, data for **biofuels and waste** were reclassified, which results in several breaks in the time series for transformation.
- Heat production is reported starting in 2004 and includes self-generation in industry.
- Up to 2003, **solid biofuels** capacity includes industrial waste capacity.
- From 2000 onwards, the Italian administration defines electricity and heat production from auto-producers as generation from producers that consume more than 70% of their own electricity production. However, for the 2000 to 2002 period, all electricity production from autoproducers is reported with main activity producers.

Consumption

- The final consumption of **biogas** has been constant from 2013 to 2015 as these figures are the result of a survey which is not carried out annually. Figures are expected to be revised after the next survey.
- In the 2016 edition, the methodology used to calculate **solid biofuels** consumption in the residential sector for 2002 to 2014 was updated and this created a break in time series between 2001 and 2002. This also affects the indigenous production of **solid biofuels**. The revisions were limited backwards to 2002 because of reliability issues.

Japan

Source

The Institute of Energy Economics Japan, Tokyo.

General notes

- Starting in 1990, data are reported on a fiscal year basis (e.g. April 2015 to March 2016 for 2015).
- In the 2018 edition, data for Japan were revised back to 1990 based on new methodology.
- Consumption data for commercial/public services may include consumption in small and medium-size industries. The Japanese administration expects that this shortcoming be corrected in the near future.
- There was a large revision in **municipal waste** data in the 2016 edition of this publication. This revision has removed data for **municipal waste** for the entire time series up to 2010, which create breaks in time series between 2009 and 2010.
- For **municipal waste** data, the breakdown between renewable and non-renewable **municipal waste** is estimated by the IEA Secretariat.
- The net calorific value for **charcoal** since 2010 was estimated as equal to 2009 by the IEA Secretariat.
- Electricity generation capacities in 2016 for industrial waste, solid biofuels and biogases were estimated by the IEA Secretariat as equal to 2015 since data were not available at the time of publication.

Transformation

- The capacities of co-firing plants are reported under the dominant fuel.
- In the 2017 edition, the Japanese administration revised electrical capacity for combustible fuels back to 2003 creating breaks in time series between 2002 and 2003. Due to the data unavailability, **municipal waste** plant generation capacity now includes plants operating on **black liquor** since 2012, following the revision. Prior to 2012, **black liquor** capacity was included under **solid biofuels** capacity.
- Autoproducer **solar photovoltaic** capacity is derived from data from the Japanese administration as well as the IEA Photovoltaic Power Systems Programme (IEA-PVPS) report, "Trends in Photovoltaic Applications" published in 2017.
- Large increases in 2016 of main activity electricity generation from **solar PV** and **wind** are due to reclassification from autoproducer status after liberalisation of the Japanese power market in April 2016.
- Input data of **solid biofuels** to **charcoal** production are estimated by the IEA Secretariat assuming an efficiency of 40%.

- Data on heat produced for sale by autoproducer heat plants are not available.
- Electricity and heat produced in CHP plants are not included in the CHP data time series, but instead are reported as separate electricity or heat components.
- Heat production from **geothermal** and **solar thermal** sources in Japan is not reported by the Japanese administration.
- The **industrial waste** consumption in the transformation sector (non-specified) surged in 2013, because of the increase in use of waste plastics for coke production.
- From 2005 to 2007, the electricity produced in main activity electricity plants from **solar photovoltaic** decreased because plants were out of operation due to maintenance.
- Prior to 1998, the electricity produced using TRT technology (Top pressure Recovery Turbines) was included with electricity generated from **wood**, **wood waste** and other **solid waste**.
- Data on electricity production from **wind** began in 1993.

Korea

Source

Korea Energy Economics Institute, Ulsan.

General notes

- Due to the change of reporting methodology, breaks in time series may occur between 2013-2014 and 2014-2015.
- Prior to 2009, autoproducer heat production includes amounts of unsold heat.
- Data for 2002 onwards have been reported on a different basis, causing breaks in series between 2001 and 2002, especially for inputs and outputs to electricity generation and consumption in the iron and steel industry. The Korean administration is planning to revise the historical series as time and resources permit.
- Electricity statistics from 1971 to 1993 have been estimated by the IEA Secretariat based on the Korean National Statistics. Data from 1994 have been submitted by the Korean administration. This leads to breaks in time series between 1993 and 1994. Before 1994, electricity production from main activity producer CHP plants is included

with main activity producer electricity only plants. Heat data are available starting in 1993.

Transformation

- Inputs to autoproducer heat plants have been estimated by the IEA Secretariat because of efficiency issues for **municipal waste** prior to 2011 and in 2012 and for **biogas** in 2008, 2011 and 2012.
- New plants were included in the Korean survey creating breaks in time series in 2011.
- In 2007, some main activity heat plants and autoproducers in the commercial/public services sector were reclassified as main activity CHP plants, resulting in a break in the time series between 2006 and 2007 for **biogases**.
- Prior to 2007, the consumption of **landfill gas** in main activity CHP plants may have been included in main activity heat plants. Difficulties in ownership classification are also the reason **landfill gas** data only appears one time in the commercial and public services sector in 2006.
- Between 1993 and 1999, the breakdown of heat output by type of fuel was estimated by the IEA Secretariat. In 2000, the Korean administration started to report heat statistics for some heat plants which were not reported before.

Consumption

- Data for direct use of **geothermal heat** are available from 2002. **Geothermal** direct use data are overstated as it refers to heat production by **geothermal** heat pumps, which include inputs of electricity and/or gas in the transformation process.

Latvia

Source

Central Statistical Bureau, Riga.

General notes

- Data for Latvia are available starting in 1990. Prior to that, they are included in Former Soviet Union in the publication of *World Energy Statistics*.

Transformation

- From 2012 to 2015, electrical capacity of **solar photovoltaic** was not reported, because capacity was under 0.5 MW. For the same reason, electrical

capacity of **biodiesel** for 2010 to 2015 was not reported.

- From 2012 onwards, the increase in electricity production from **solid biofuels** is due to the deployment of six new main activity producer CHP plants running on **wood chips**.
- Due to a reclassification in 2004, there was break in time series of electricity production from auto-producer electricity plant fuelled by **biogas** between 2003 and 2004.

Consumption

- The increase in inland consumption (calculated) for **solid biofuels** from 2016 to 2017p is due to increased usage in the industry sector.
- From 2014, **biodiesel** consumption has been decreasing due to policies which support the sale of arctic diesel fuel without renewable additives.

Luxembourg

Source

STATEC, Institut national de la statistique et des études économiques du Grand-Duché du Luxembourg, Luxembourg.

General notes

- Most of the **hydro** production shown for Luxembourg is from the Vianden **pumped storage** plant and is exported directly to Germany.
- The Luxembourgian administration started including trade figure of **wood chips** in trade figure of **Solid biofuels** from 2015 data. This creates breaks in time series between 2014 and 2015.
- Data for **solar thermal** are available starting in 2001 and for **solar PV** starting in 2000.
- Data on **solid biofuels** are available from 1992.

Supply

- In 2015, imports and exports of **solid biofuel** figure includes the trade of wood chips.

Transformation

- The production of electricity from **solid biofuels** from 2013 corresponds to the opening of a new plant burning **wood wastes**.

- In 2011, the blending of **biogases** with **natural gas** started.
- Data on electricity production from **biogases** are available from 1998 and heat production from 2010.

Mexico

Source

Secretaría de Energía (SENER), Mexico City.

General note

- The Mexican administration is currently undertaking major work on revisions of the time series back to 1990. These revisions could not be implemented in the 2018 edition. As a consequence, breaks in time series appear between 2007 and 2008. Revisions to historical data are pending.
- The Mexican administration submitted data directly by questionnaire for the first time with 1992 data. As a result, some breaks in time series may occur between 1991 and 1992. For prior years, data are partly estimated based on the publication Balance Nacional - Energía.

Supply

- Data for **bagasse** production is available from 2008.
- Data on the production of **sewage sludge gas** are available from 1997.

Transformation

- Electricity production from **solid biofuels** and **biogases** data are available respectively from 1991 and 1997.
- Data on electricity production from **wind** and **solar photovoltaic** are available from 1990.

Consumption

- Data for **solid biofuels** used in autoproducer electricity plants from 1991 to 2005 have been estimated by the Mexican administration.
- Data on **biogases** consumption are available from 1997.
- Direct use of **solar thermal heat** is available from 1990.

Netherlands

Source

Statistics Netherlands, The Hague.

General note

- Statistics Netherlands has conducted reviews and revisions of their energy balance three times; in 2005, 2011 and 2015. The 2005 revisions were to improve basic energy statistics, particularly with respect to carbon and CO₂ reporting, while the 2011 revisions were part of a harmonization program with international energy statistics. The 2015 revisions were the result of increased data collection, availability of new source information, and further alignment with international energy definitions. More details are available here: www.cbs.nl.

Supply

- From 2009 to 2012, and again from 2014 the production and trade of pure **biogasoline** were confidential; net imports were estimated by the Dutch administration based on consumption.
- Trade data for **municipal waste** are available from 2011.

Transformation

- All **municipal solid waste** autoproducer electricity and heat only plants have been reclassified by Statistics Netherlands as autoproducers CHP from 2012, causing breaks in the time series.
- Prior to 2008, a few small autoproducer electricity plants using **solid biofuels** were included with main activity plants for reasons of confidentiality.
- In 2006, for **municipal waste** some plants changed ownership and were reclassified from electricity only to CHP plants as they started heat projects.
- For **biofuels and waste**, all electricity and heat produced prior to 1995 is included in CHP plants.
- Electricity production from **solar photovoltaic** is available from 1990.
- Heat produced from **biofuels and waste** is available from 1990.

Consumption

- Increases in **biodiesel** production for 2017p data are related to increased capacity of existing plants and increased demand.

- From 2014, a better allocation of heat own use was available for **biogas** digester prewarming, and in **municipal waste** burning plants for flue gas cleaning.
- The final consumption of **solid biomass** in the residential and agriculture sector increased in 2014 due to the results of new surveys and parameters.
- Direct use of **geothermal heat** in agriculture/forestry starting in 2008 is due to a new project extracting deep **geothermal heat**.

New Zealand

Source

Ministry of Business, Innovation and Employment, Wellington.

General note

- Due to improved wood data collection starting with 2016 data, increases in **solid biofuels** in transformation, supply and consumption may not be a true increase but more representative of increased data survey respondents. This results in a break in time series between 2015 and 2016.
- Prior to 1994, data refer to fiscal year (April 1993 to March 1994 for 1993). From 1994 data refer to calendar year.

Transformation

- In the 2018 edition, revisions were made to **biogas** transformation data back to 2002 due to reclassification and methodological changes. This results in a break in time series between 2001 and 2002.
- In the 2018 edition, revisions in electricity production in **hydro** plants back to 2002 are related to a change in methodology. This results in a break in time series between 2001 and 2002.
- Electricity production from autoproducer **geothermal** plant data are available from 1990.
- The New Zealand administration has updated efficiencies for electricity production from **geothermal heat** from 10% to 15% from 1990 onwards; this causes a break in the time series between 1989 and 1990.

Consumption

- In the 2018 edition, **electricity** consumption generated by autoproducer electricity and CHP plant

in the *Commercial and public services* sector for 2002 to 2016 have been estimated by the IEA Secretariat, based on revised biogas data, submitted in the Renewables and Waste questionnaire.

- Data on direct use of **geothermal heat** are available from 1990 and direct use of **solar thermal heat** from 2002.

Norway

Source

Statistics Norway, Oslo.

General notes

- In the 2018 edition, data for Norway were revised back to 2010, following the introduction of a new system for energy balances and energy accounts. Breaks in series may appear between 2009 and 2010 as a result. For more detailed information regarding the methodological changes, please refer to the documentation of statistics production since statistics year 2010 on the Statistics Norway website. At the time of writing, the document was available in Norwegian as “Dokumentasjon av statistikkproduksjonen fra statistikkår 2010 og fremover”.
- Prior to 2007, equal shares of renewable and non-renewable **municipal waste** were estimated because the actual split was not known.
- Data for **industrial waste** and **biogases** are available from 1991.

Supply

- In 2014, the **biodiesel** production facility closed.
- **Liquid biofuels** imports data are available starting in 2006.

Transformation

- No data on electricity production from **solar energy** are submitted separately to the IEA by the Norwegian administration.
- Breaks in the time series between 1996 and 1997 and between 2001 and 2002 and now 2009 and 2010 are due to a reclassification of main activity producers and autoproducers. This includes the apparent cessation of autoproducer pumped hydro and hydro electricity generation since 2010, where this generation has been reclassified as main activity in the 2018 edition.

- In the 2016 edition, Norway corrected the **industrial waste** consumption in heat plants, and reclassified some the corresponding heat output under other sources.
- For 2003 to 2009, estimates of **solar thermal collector** capacity were made by the IEA Secretariat using data published in the IEA-Solar Heating and Cooling Programme Annual Report.
- Heat production from **biogases** data are available from 1995.
- Electricity production from **wind** data are available from 1993.

Consumption

- Distribution losses for **biogases** are included in commercial/public services prior to 2003.

Poland

Source

Central Statistical Office, Warsaw.

General notes

- Several breaks in the **industrial wastes** time series are caused by difficulties in the classification of wastes.
- In the 2018 edition, **solid biofuels** were corrected for 2015 data.
- There is a break in time series between 2015 and 2016 for **biogases** due to reclassification from autoproducer to main activity plants.
- The increases in **municipal wastes** starting in 2016 are related to two new plants.
- Data on **biodiesels** are available from 2005, **bio-gasoline** from 2003, and **other liquid biofuels** from 2009.
- In 2008, a new questionnaire was launched which increased the coverage of renewable and waste data.
- In 1993 and 1995, new estimation methodologies were used for **solid biofuels** data and this creates a break in time series between 1992/1993 and 1994/1995.

Supply

- Under current Polish law, only producers and importers of **biodiesel** are obliged to fulfil the National Indicative Target of share of biofuels in

the total usage of transportation fuels. Since the regulation is currently not applied to retail distributors they, for economic reason, rather export the **biodiesel** than sell it domestically. This results in low domestic consumption and increase of exports in 2016.

- Production of **other liquid biofuels** increased in 2015 because new companies started to report their biofuel production to the Polish administration.

Transformation

- For plants where multiple fuels are used for electricity production, capacities are reported under the dominant fuel.
- State support for biomass co-firing was reduced in 2016, resulting in electricity production from **solid biofuels** falling during this period.
- In 2008, a number of CHP plants were reclassified from autoproducer to main activity producer due to an industry re-organisation.
- Prior to 2010, heat supply and consumption can include autoproducers unsold heat. Previous attempts to address such issue may have caused breaks for heat production and fuel in autoproducer heat plants (1993) and in autoproducer CHP plants, and for heat consumption in industry sub-sectors.
- Before 2000, industrial wastes were used interchangeably with light fuel oil in some plants, which might result in breaks in the time series.

Consumption

- Increases in consumption of **biodiesel** are related to a policy change in the middle of 2016.
- Data for **biogases** refer only to the gas from fermentation of biomass.
- Data for direct use of **geothermal heat** are available from 2000 and direct use of **solar thermal** heat in commercial/public services from 2002 and in residential from 2009.
- Until 1998, data for **industrial waste** include **other recovered gases** which have to be reported in Coal questionnaire, causing a break between 1997 and 1998.
- Between 1992 and 1993, due to data availability, there is a large increase in **solid biofuels** for residential, commercial/public services and agriculture/forestry.

Portugal

Source

Direcção Geral de Energia e Geologia, Lisbon.

General notes

- The production capacity of **other liquid biofuels** for the years 2006 to 2012 are estimated by the Portuguese administration.
- Data are available from 1994 for **biogases**, from 1999 for **municipal waste** and from 2003 for **industrial waste**.
- Data for **solid biofuels** were revised by the National administration from 1990 to 2001, which may result in breaks in time series between 1989 and 1990.

Transformation

- For 2017p data, **solar photovoltaic** electricity production includes own-use.
- The large decrease in electricity output from **hydro** in 2017p data is due to decreased rainfall.
- For 2016 data onwards, **heat** and **electricity** production from chemical sources have been reclassified as autoproducer CHP production from **industrial waste**, causing breaks in the industrial waste time series between 2015 and 2016.
- The power station that burns **industrial waste** started to work as a CHP plant in 2007, whereas previously it was only producing electricity.
- In 2007, some power plants that were previously reported as main activity CHP have been reclassified as autoproducer CHP.
- New plants fuelled by **solid biofuels** and by **municipal waste** started in 1999.
- Data for production of electricity from **solar photovoltaic** and **wind** are available from 1989.

Consumption

- The use of **biogasoline** for blending decreased with 2017p data because it is no longer compulsory to use biofuels in gasoline.
- Data on **solid biofuels** were further revised based on a new survey on industry, resulting in breaks in sub-sectoral consumption for 2012.
- Between 2009 and 2010 a new survey on energy consumption in households creates a break in time

series in the **solid biofuels** consumption in residential time series.

- Data for direct use of **solar thermal heat** are available from 1989 and direct use of **geothermal heat** from 1994.

Slovak Republic

Source

Statistical Office of the Slovak Republic, Bratislava.

General notes

- The Slovak Republic became a separate state in 1993 and harmonised its statistics to EU standards in 2000. These two facts lead to several breaks in time series between 1992 and 1993, and between 2000 and 2001.
- Data for **solar photovoltaic** are available from 2010.
- Prior to 2001, the data reported as **industrial waste** include **biogases** and **municipal waste**.
- **Hydroelectricity** capacity breakdown by plant size is available from 2001.

Transformation

- Electricity and heat production from combustible fuels from 1990 to 2000 have been estimated based on the data on fuel used for electricity and heat plants reported in the annual fuel questionnaires.
- Prior to 2001, electricity generation from primary **solid biofuels**, **municipal waste** and **biogases** are included with **industrial waste**.

Consumption

- Data for direct use of **geothermal heat** are available from 2001 and direct use of **solar thermal heat** from 2005.

Slovenia

Source

Statistical Office of the Republic of Slovenia, Ljubljana.

General notes

- Data for Slovenia are available starting in 1990. Prior to that, they are included in Former Yugoslavia in World Energy Statistics.
- A new energy data collection system was implemented in January 2001, causing some breaks in time series between 1999 and 2000.

Consumption

- Increases in consumption of **biodiesel** starting from 2017p are the result of an amended energy policy, which went into effect in mid-2017.
- The break in time series between 2008 and 2009 for **solid biofuels** is due to revisions based on a new household survey which is to be carried out on an annual basis.
- Direct use of **solar thermal** and **geothermal heat** is available from 2009.
- Breaks in total final consumption for **industrial waste** prior to 2008 are a result of a sectoral reclassification.

Spain

Source

Ministerio de Energía, Turismo y Agenda Digital, Madrid.

General notes

- New reporting systems were implemented in 2000 and again in 2006 which resulted in a reclassification of many plants from main activity to auto-producer and vice versa. This leads to breaks in the time series for the transformation sector and final consumption sectors between 1999 and 2000 and again between 2005 and 2006.
- The Spanish administration verifies that production and consumption of **industrial waste** do exist but data are not available after 2001.

Transformation

- Since January 2013, the tax exemption for biofuels has expired, and the mandatory **biodiesel** blending target has been reduced from 7% to 4.1%, causing a significant decrease in the amount of pure **biodiesel** sent to blending.

- From 2013 data, a revision of the industry sector of some companies causes breaks in time series for **solid biofuels**, **municipal wastes** and **biogases**.
- A reclassification of plants from main activity to autoproducer in 2008 has led to breaks in electricity production between 2008 and 2009.
- The National Energy Commission reclassified plants that consume **biogases**, leading to breaks in time series between 2007 and 2008.
- Data for electricity from **solar thermal** plants are available from 2007.
- Prior to 2006, inputs of **biogases** used to generate process heat by autoproducers were included as inputs to transformation when they should have been reported in the appropriate industry in final consumption.
- From 2005, residential rooftop **solar photovoltaic** electricity production data are included in main activity electricity plants according to the Spanish administration classification, previously they were reported under autoproducer.
- The breakdown of **hydro** production by plant size is reported from 1999.
- Electricity production from **wind** and **solar** are reported from 1989 when data became available.
- Prior to 1989 inputs and outputs from the use of biofuels and waste to generate electricity and/or heat (i.e. comprising solid and liquid biofuels, industrial waste, municipal waste and biogases) are reported under non-specified biofuels and waste.

Consumption

- Increased consumption of **biofuels** from 2016 to 2017p is a result of increased demand for motor gasoline/diesel.
- Prior to 2006, inputs of **biogases** used to generate process heat were erroneously included as inputs to transformation when they should have been reported in the appropriate industry in final consumption.
- The breakdown of **solid biofuels** direct use in the industry sector prior to 1999 is not available.
- Data for direct use of **geothermal heat** are available from 1990 and from 1994 for **solar thermal heat**.

Sweden

Sources

Statistics Sweden, Örebro.
Swedish Energy Agency, Eskilstuna.

General notes

- There are some breaks in time series between 2015 and 2016 in **pumped hydro**, **industrial waste** and **other liquid biofuels** figures due to the lack of data. The figures are expected to be modified in the 2018 edition.
- From 1990 to 2006, **municipal waste** was reported as 60% non-renewable and 40% renewable. In 2007, reanalysis of the waste revealed the content was 40% non-renewable and 60% renewable. This was reanalysed again starting from 2016 data, when the result of the analysis revealed the split should be 52% renewable and 48% non-renewable. This results in breaks in the time series between 2006 and 2007 and also 2015 and 2016 for both renewable and non-renewable **municipal waste**.
- In the 2018 edition, data for **biodiesels** were revised from 2006 to 2015 while **biogasoline** and **bioethanol** were revised from 2005 to 2015. The revisions affected indigenous production due to increased information about net trade, as well as the transformation sector, for blending with motor gasoline/diesel/kerosene and consumption in the road sector.

Supply

- In the 2018 edition, trade data were added for **primary solid biofuels** starting from 2012. As the net trade used to be reported together with indigenous production, this has resulted in a downward revision of indigenous production for 2012 – 2015.

Transformation

- **Heat** data for 2017p are based on a quarterly survey which does not have the same coverage as the annual survey.
- Heat production from **solid biofuels** in autoproducer CHP includes waste heat and chemical heat.
- For 2012 and 2013, small quantities of **bio-methanol** used to produce electricity are included in **other liquid biofuels**, under production, as well as input and output of autoproducer CHP.
- Prior to 1992, data on electricity production from **biogases** are included with **solid biofuels**.

Consumption

- Due to confidentiality issues, **solid biofuels** consumption in food, beverages and tobacco is reported with paper, pulp and printing for 2014 data.

- Consumption data by sector for **biogases** are available from 2011.
- In 2011, there was a change in the reporting methodology for consumption of **solid biofuels and waste** in the residential sector, which is responsible for breaks in concerned time series between 2010 and 2011.
- Data on direct use of **solar thermal** are available from 1989.

Switzerland

Sources

Swiss Federal Office of Energy (SFOE), Ittigen.
Carbura, Swiss Organisation for Stockholding of Liquid Fuels, Zurich.

General note

- From 1999, data on consumption result from a new survey and are not comparable with data of previous years.

Supply

- Due to a new program launched in September 2014 in which CO₂ emissions due to traffic can be compensated by substituting fossil gasoline and diesel by biofuels, the imports and road consumption of **biodiesels** and **biogasoline** increased sharply starting in 2015.

Transformation

- The capacity reported for **biogases** only refers to the sum of capacities of **landfill** and **sewage sludge gas**.
- All **hydro electricity** production is reported under large scale hydro (> 10 MW) due to the fact that production data are not being collected by different size capacity categories.
- In 2016, two new **pumped hydroelectric** plants went into operation.
- In 2015, the big decrease seen in electricity and heat production from **industrial wastes** is due to one large main activity CHP plant significantly reduced their activity. In 2016, this plant was fully shut down.
- From 2012, the **municipal waste** autoproducer plant previously reported as electricity plant met the CHP requirements and was reclassified as such.

- **Biogas** is no longer being used for heat production as of 2011.
- The autoproducer heat plant that produced heat for sale using **municipal waste** was closed in 2006.
- Electricity production from **wind** data are available from 1996 and from 1990 for **solar photovoltaic**.

Consumption

- **Geothermal** direct use is over-stated as it refers to heat production by **geothermal heat pumps**, which include inputs from electricity and/or gas in the transformation process.
- Consumption data for **biogases** in the transport sector are available from 1996 to 2012 as a **biogas** fuel station had stopped selling **biogas** in 2013.
- Data for direct use of **geothermal heat** and **solar thermal heat** are available from 1990.

Turkey

Source

Ministry of Energy and Natural Resources (Enerji ve Tabii Kaynaklar Bakanlığı), Ankara.

General notes

- The Turkish administration only intermittently surveys **renewables and waste** used for power and heat. Due to this fact, some breaks may appear in the **biofuels and waste** time series.
- In the 2006 edition, the Turkish Statistical Office started providing electricity and heat output on the basis of a new survey that revised time series back to 2000. This causes breaks in the time series between 1999 and 2000. Not all of the input time series have been revised.
- In 1995, the Turkish administration reclassified auto-producer plants by type and source to be consistent with IEA definitions. This caused breaks between 1994 and 1995 for electricity production.

Transformation

- In the middle of 2014, most autoproducer electricity, heat and CHP plants in Turkey were reclassified as main activity producer due to a change in the legislation. This has resulted in electricity and heat amounts for autoproducer plants to record sharp generation changes from 2014 onwards.

- Data on electricity generated from **biofuels** are available from 1991.
- Electricity production from **wind** is available starting in 1998.

Consumption

- Prior to 1998, consumption in the **wood and wood products** sector includes that of the paper, pulp and printing industry.

United Kingdom

Source

Department for Business, Energy and Industrial Strategy (BEIS), London.

General notes

- In the 2017 edition, the UK government revised the data time series for **municipal waste** and **solid biofuels** back to 2001. As a result, breaks in time series may occur between 2000 and 2001.
- The launch of a feed-in-tariff scheme in April 2010 resulted in a rapid increase of capacity and corresponding electricity production growth from **solar PV** in the following years

Supply

- In 2009, the **biogasoline** production was above the reported production capacity. This is because of the fact that the capacity had reduced at the end of the year, due to closure.

Transformation

- From 2015, the UK administration started collecting data from the main activity **solar PV** companies. Prior to this, all data were included under autoproducers.
- The consumption of **solid biofuels** has increased in 2015, as the largest power station in the UK half-way through the year converted a further unit from **coal** to **biomass**, plus the previously converted unit had a full year of operation in 2015 rather than just the last few months of 2014.
- Prior to 2013, due to data confidentiality reasons, one or two main-activity **municipal waste** plants had to be included within the autoproducer plant category. Since 2013, as there have been at least three main-activity companies, these plants have been reclassified from autoproducer plant to main

activity electricity plant, with some CHP plants included under main electricity due to confidentiality reasons.

- New data for electricity production from main activity electricity **wind** plant became available in 2007.
- Heat production started to be reported from 2008 onward.
- Electricity production data for **solar PV** are available from 1999.

Consumption

- In the 2018 edition, following a review of the consumption of **biogases** and **municipal wastes** for 2015 and 2016 data, data that were allocated to other sectors have been reallocated to the industry sectors. This has caused a break in time series between 2014 and 2015. A review prior to 2015 is expected in the next cycle.
- The UK administration undertook a survey of domestic wood consumption in 2015 and revised figures back to 2008. This resulted in breaks in time series for solid biofuels consumption in residential sector between 2007 and 2008.

United States

Source

U.S. Energy Information administration, Washington DC.

General notes

- Capacity is net summer capacity.
- Due to the change in reporting methodology for **liquid biofuels**, breaks in time series occur between 2009 and 2010. This is especially noticeable in **biodiesel** time series.
- **Solar PV** electricity production reported for main activity producers refers only for grid-connected central power stations. The IEA Secretariat estimated US **photovoltaic (PV)** electricity generation from autoproducers starting in 1999 by multiplying the dispersed and distributed **PV** capacity estimated by the US administration by an average capacity factor of 12%. The capacity factor was based on a report published in 2007 by the IEA Photovoltaic Power Systems Programme, Cost and Performance Trends in Grid-Connected Photovoltaic Systems and Case Studies.

- **Geothermal** supply and transformation data are estimated by the IEA Secretariat starting in 2009 because of efficiency discrepancies.
- Data on **liquid biofuels** became available in 1993.
- Data on **industrial waste** and gas from **biomass** for 1990 and 1991 were estimated by IEA Secretariat.

Supply

- Indigenous production of **industrial waste** has been decreasing since May 2014 due to reclassification, resulting in a break in series between 2013 and 2014.
- Indigenous production of **biodiesel** is estimated in 2010 based on the EIA's Monthly Energy Report.

Transformation

- The EIA collects generation and consumption data from all plants 1 MW or more in capacity.
- Starting in 2015, many plants did not report **industrial waste** capacity as a primary energy source. This results in break in time series between 2014 and 2015.
- From 2007 to 2009, **industrial waste** includes recovered heat from industrial processes. From 2010, the electricity produced from recovered heat is reported under other sources.
- The **solar collector surface** figures are estimated by IEA Secretariat since 2010.
- In the 2009 edition, the US administration changed their methodology for calculating heat production in CHP plants, and revised data back to 2006. This leads to breaks in time series between 2005 and 2006.
- For the United States, prior to 2000, autoproducers include small and independent power producers, which under IEA definitions are considered main activity producers.

- Prior to 1999, **solar thermal electricity** production includes generation from natural gas because some natural gas units are attached to **solar thermal** plants and their production could not be separated.
- In the 2003 edition, the US administration reclassified some plants to autoproducers. This reclassification causes more breaks between 1998 and 1999.
- Heat production data for **solid biofuels** became available in 1991.

Consumption

- Due to an improved estimation methodology, there are some breaks in time series of the industrial and other sectors between 2009 and 2010 for many fuels types: For the industrial sector, this can be found in **geothermal**, **biogases** and **industrial waste** (paper, pulp and printing). For other sectors, breaks can be shown in **geothermal** and **solar thermal**.
- Prior to 2008, heat produced by heat pumps was reported as **geothermal** use in residential and commercial/public services.
- Direct use of **solar thermal heat** in residential is available from 1999.
- Due to problems in reporting, there are numerous breaks in time series for the US data, particularly in 1992, 1999, 2001 and 2002. Care should be taken when evaluating consumption by sector since inputs of fuel to autoproducers are included in final consumption for some years. No data are available for most energy products in the construction and mining and quarrying industries.

Energy Data Officer/Statistician

Possible staff vacancies

International Energy Agency, Paris, France

The IEA

The International Energy Agency, based in Paris, acts as energy policy advisor to 30 member countries in their effort to ensure reliable, affordable and clean energy for their citizens. Founded during the oil crisis of 1973-74, the initial role of the IEA was to co-ordinate measures in times of oil supply emergencies. As energy markets have changed, so has the IEA. Its mandate has broadened to incorporate the “Three E’s” of balanced energy policy making: energy security, economic development and environmental protection. Current work focuses on climate change policies, market reform, energy technology collaboration and outreach to the rest of the world, especially major consumers and producers of energy like China, India, Russia and the OPEC countries.

The Energy Data Centre, with a staff of around 30 people, provides a dynamic environment for young people just finishing their studies or with one to two years of work experience.

Job description

The data officers/statisticians compile, verify and disseminate information on all aspects of energy including production, transformation and consumption of all fuels, energy efficiency indicators, CO₂ emissions, and energy prices and taxes. The data officers are responsible for the production of data sets through receiving, reviewing and inputting data submissions from member countries and other sources. They check for completeness, correct calculations, internal consistency, accuracy and consistency with definitions. Often this entails proactively investigating and helping to resolve anomalies in collaboration with national administrations. The data officers/statisticians also design and implement computer macros used in the preparation of their energy statistics publication(s) alongside analysis of the data.

Principal qualifications

- University degree in a topic relevant to energy, or statistics. We currently have staff with degrees in mathematics, statistics, information technology, economics, engineering, physics, environmental studies, etc.
- Experience in the basic use of databases and computer software. Experience in Visual Basic is an advantage.
- Ability to work accurately, pay attention to detail and work to deadlines; ability to deal simultaneously with a wide variety of tasks and to organise work efficiently.
- Good communication skills; ability to work well in a team and in a multicultural environment, particularly in liaising with contacts in national administrations and industry; ability to understand, and communicate data.
- An excellent written and oral command of English; knowledge of other languages would be an asset.
- Some knowledge of energy industry operations and terminology would also be an advantage, but is not required.

Nationals of any IEA member country are eligible for appointment. Basic salaries start at 3 300 euros per month. The possibilities for advancement are good for candidates with appropriate qualifications and experience. Tentative enquiries about future vacancies are welcomed from men and women with relevant qualifications and experience. Applications in English, accompanied by a curriculum vitae, should be sent to:

Office of Management and Administration
International Energy Agency
31-35 rue de la Fédération
75739 Paris Cedex 15, France

Online data services

Users can instantly access not only all the data published in this book, but also all the time series used for preparing this publication and all the other statistics publications of the IEA. The data are available online, either through annual subscription or pay-per-view access. More information on this service can be found on our website at <http://data.iea.org>.

Nine annual publications

■ World Energy Statistics 2018

World Energy Statistics provides comprehensive world energy statistics on all energy sources – coal, gas, oil, electricity, renewables and waste. It covers energy supply and consumption for 150 countries and regions, including all OECD countries, over 100 other key energy producing and consuming countries, as well as world totals and various regional aggregates. The book includes detailed tables by country in original units, and summary time series on production, trade, and final consumption by sector.

Published August 2018 - Price: Print €120; PDF €96

■ World Energy Balances 2018

World Energy Balances provides comprehensive energy balances for all the world's largest energy producing and consuming countries. It contains detailed data on the supply and consumption of energy for 150 countries and regions, including all OECD countries, over 100 other key energy producing and consuming countries, as well as world totals and various regional aggregates. The book includes graphs and detailed data by country for all energy sources – coal, gas, oil, electricity, renewables and waste - expressed in balance format. Alongside this, there are summary time series on production, trade, final consumption by sector, as well as key energy and economic indicators and an overview of trends in global energy production and use.

Published August 2018 - Price: Print €120; PDF €96

■ Coal Information 2018

Coal Information provides a comprehensive review of historical and current market trends in the world coal sector. It provides an overview of world coal developments covering coal production and coal reserves, coal demand by type, coal trade and coal prices. A detailed and comprehensive statistical picture of historical and current coal developments in the 35 OECD member countries, by region and individually is presented in tables and charts. Complete coal balances and coal trade data for selected years are presented on 22 major non-OECD coal-producing and -consuming countries, with summary statistics on coal supply and end-use statistics for about 40 countries and regions worldwide.

Published August 2018 - Price: Print €165; PDF €132

■ Electricity Information 2018

Electricity Information provides a comprehensive review of historical and current market trends in the OECD electricity sector. It provides an overview of the world electricity developments covering world electricity and heat production, input fuel mix, supply and consumption, and electricity imports and exports. More detail is provided for the 35 OECD countries with information covering production, installed capacity, input energy mix to electricity and heat production, consumption, electricity trades, input fuel prices and end-user electricity prices. It provides comprehensive statistical details on overall energy consumption, economic indicators, electricity and heat production by energy form and plant type, electricity imports and exports, sectoral energy and electricity consumption, as well as prices for electricity and electricity input fuels for each country and regional aggregate.

Published August 2018 - Price: Print €150; PDF €120

■ Natural Gas Information 2018

Natural Gas Information is a detailed reference work on gas supply and demand covering OECD countries and the rest of the world. The publication contains essential information on LNG and pipeline trade, gas reserves, storage capacity and prices. The main part of the book concentrates on OECD countries, showing a detailed supply and demand balance for each country and for the three OECD regions: Americas, Asia-Oceania and Europe, as well as a breakdown of gas consumption by end user. Import and export data are reported by source and destination.

Published August 2018 - Price: Print €165; PDF €132

■ Oil Information 2018

Oil Information is a comprehensive reference book on current developments in oil supply and demand. This publication contains key data on world production, trade, prices and consumption of major oil product groups, with time series back to the early 1970s. Its core consists of a detailed and comprehensive picture of oil supply, demand, trade, production and consumption by end-user for each OECD country individually and for the OECD regions. Trade data are reported extensively by origin and destination.

Published August 2018 - Price: Print €165; PDF €132

■ Renewables Information 2018

Renewables Information provides a comprehensive review of historical and current market trends in OECD countries. It provides an overview of the development of renewables and waste in the world since 1990. A greater focus is given to the OECD countries with a review of electricity generation and capacity from renewable and waste energy sources, including detailed tables. However, an overview of developments in the world and OECD renewable and waste market is also presented. The publication encompasses energy indicators, generating capacity, electricity and heat production from renewable and waste sources, as well as production and consumption of renewables and waste.

Published August 2018 - Price: Print €110; PDF €88

■ CO₂ Emissions from Fuel Combustion 2018

CO₂ Emissions from Fuel Combustion provides a full analysis of emissions stemming from energy use. The data in this book cover the emissions of CO₂ for 150 countries and regions by sector and by fuel. The publication contains estimates of CO₂ emissions, selected indicators such as CO₂/GDP, CO₂/capita and CO₂/TPES and a decomposition of CO₂ emissions into driving factors for more than 150 countries and regions. Emissions are calculated using IEA energy databases and the default methods and emission factors from the *2006 IPCC Guidelines for National Greenhouse Gas Inventories*.

Published November 2018 - Price: Print €165; PDF €132

■ Energy Efficiency Indicators Highlights 2018

Energy Efficiency Indicators Highlights is designed to help understand what drives final energy use in IEA member countries in order to improve and track national energy efficiency policies. It provides the first comprehensive selection of data that the IEA has been collecting each year after its member states recognised in 2009 the need to better monitor energy efficiency policies. The report includes country-specific analysis of end uses across the largest sectors – residential, services, industry and transport. It answers questions such as:

- What are the largest drivers for energy use trends in each country?
- Was energy saved because of efficiency progress over time?
- How much energy is used for space heating, appliances or cooking?
- What are the most energy-intensive industries?

Improving energy efficiency is a critical step for governments to take to move towards a sustainable energy system. This report highlights the key role of end-use energy data and indicators in monitoring progress in energy efficiency around the world.

Published December 2018 - Free pdf

Two quarterlies

■ Oil, Gas, Coal and Electricity

Oil, Gas, Coal and Electricity provides detailed and up-to-date quarterly statistics on oil, natural gas, coal and electricity for the OECD countries. Oil statistics cover production, trade, refinery intake and output, stock changes and consumption for crude oil, NGL and nine selected product groups. Statistics for electricity, natural gas and coal show supply and trade. Oil and coal import and export data are reported by origin and destination. Gas imports and exports data are reported by entries and exits of physical flows. Moreover, oil and coal production are reported on a worldwide basis.

Published Quarterly - Price €120, annual subscription: Print €380; PDF €304

■ Energy Prices and Taxes

Energy Prices and Taxes provides up-to-date information on prices and taxes in national and international energy markets. It contains crude oil import prices by crude stream, industry prices and consumer prices. The end-user prices for OECD member countries cover main oil products, gas, coal and electricity. Every issue includes full notes on sources and methods and a description of price and tax components in each country.

Published Quarterly - Price €120, annual subscription: Print €380; PDF €304

Electronic editions

To complement its publications, the Energy Data Centre produces online data services containing the complete databases which are used for preparing the statistics publications. Built-in software allows you to access and manipulate all these data in a very user-friendly manner and includes graphic facilities.

Annual Databases

- World Energy Statistics 2018 Price: €800 (single user)
- World Energy Balances 2018 Price: €800 (single user)
- **World Energy Statistics and Balances 2018** Price: €1 400 (single user)
(Combined subscription of the above two series)
- Coal Information 2018 Price: €550 (single user)
- Electricity Information 2018 Price: €550 (single user)
- Natural Gas Information 2018 Price: €550 (single user)
- Oil Information 2018 Price: €550 (single user)
- Renewables Information 2018 Price: €400 (single user)
- CO₂ Emissions from Fuel Combustion 2018 Price: €400 (single user)
- Energy Efficiency Indicators 2018 Price: €400 (single user)

Quarterly Databases

- Energy Prices and Taxes Price: (four quarters) €900 (single user)

Other services

■ Emissions Factors 2018

The *Emissions Factors* database includes a series of indicators related to emissions from electricity and heat generation for over 150 countries and regions, based on the IEA *World Energy Balances* and *CO₂ Emissions from Fuel Combustion* data. The main factors included are: CO₂, CH₄ and N₂O emissions per kWh of electricity and heat; adjustments due trade (for OECD) and to losses; emission factors by fuel for sectors other than electricity. The database is available in Excel format.

Price: €550 (single user)

■ World Energy Prices 2018

The *World Energy Prices* data service contains annual end-use energy prices for selected products and sectors for over one hundred countries in the world. Complementing the quarterly OECD *Energy Prices and Taxes*, the world database focuses on prices for gasoline and diesel for transport; as well as electricity for households and industry.

Price: €400 (single user)

■ Energy Prices & Taxes and World Energy Prices package

This service is a package containing both the *Energy Prices and Taxes* and *World Energy Prices* online data services offered at a reduced rate.

Price: €1 100 (single user)

Detailed descriptions of all these data services are available on our website at <http://data.iea.org>.

■ The Monthly Oil Data Service

The *Monthly Oil Data Service* provides the detailed databases of historical and projected information which is used in preparing the IEA's monthly *Oil Market Report* (OMR). The *Monthly Oil Data Service* is available as an annual subscription and includes twelve monthly updates. The service comprises three packages available separately or combined. The data are released on the same day as the official release of the *Oil Market Report*.

The packages include:

- | | |
|---------------------------------------|------------------------------------|
| ■ Supply, Demand, Balances and Stocks | Price: €6 150 (single user) |
| ■ Trade | Price: €2 050 (single user) |
| ■ Field-by-Field Supply | Price: €3 080 (single user) |
| ■ Complete Service | Price: €9 200 (single user) |

A description of this service is available on our website at www.iea.org/statistics/mods.

■ The Monthly Gas Data Service

The *Monthly Gas Data Service* provides the following monthly natural gas data for OECD countries:

- Supply balances in terajoules and cubic metres;
- Production, trade, stock changes and levels where available, gross inland deliveries, own use and losses;
- Highly detailed trade data with about 50 import origins and export destinations;
- LNG trade detail available from January 2002,
- From 2011 onwards, transit volumes are included and trade data corresponds to entries/exits.

The databases cover the time period January 1984 to current month with a time lag of two months for the most recent data.

Price: €800 (single user)

For more information consult www.iea.org/statistics/mgds.

Moreover, the IEA statistics website contains a wealth of free statistics covering oil, natural gas, coal, electricity, renewables, energy-related CO₂ emissions and more for 150 countries and regions and historic data for the last 20 years. It also contains Sankey flows to enable users to explore visually how a country's energy balance shifts over up to 40 years, starting with production and continuing through transformation to see important changes in supply mix or share of consumption. The IEA Energy Atlas offers panoramas on every aspect of energy on a global basis and for 150 individual countries, with interactive maps and customisable charts that detail and compare a host of data based on the Agency's authoritative statistics. The website also includes free headline energy data in excel format for all OECD countries and global regions from 1971 onwards as well as for Association countries from 1990 onwards.

The IEA statistics website can be accessed at www.iea.org/statistics/

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Unless otherwise indicated, all material presented in figures and tables is derived from IEA data and analysis.

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Renewables Information is one of a series of annual IEA statistical publications on major energy sources; other reports are *Coal Information*, *Electricity Information*, *Natural Gas Information* and *Oil Information*.

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