This article is part of a set of statistical articles based on Eurostat’s publication *The EU in the world 2018*. The article focuses on energy statistics in the European Union (EU) and the 15 non-EU members of the Group of Twenty (G20). It covers key indicators on energy production and consumption and gives an insight into the EU’s energy sector in comparison with the major economies in the rest of the world, such as its counterparts in the so-called Triad — Japan and the United States — and the BRICS composed of Brazil, Russia, India, China and South Africa.

**Primary production**

Primary production of energy is any extraction of energy products in a useable form from natural sources. This occurs either when natural sources are exploited (for example, in coal mines, crude oil fields, hydro power plants) or in the fabrication of biofuels. Primary production of energy in the EU-28 totalled 771 million tonnes of oil equivalent (toe) in 2015 and 757 million toe in 2016, while worldwide production reached 13.79 billion toe in 2015. Among the G20 members, China, the United States and Russia recorded higher levels of production than the EU-28.

Between 2005 and 2015, world primary production of energy increased by 19.4 % while in the EU-28 production fell by 14.8 %. The G20 members’ share of the world total increased from 70.9 % in 2005 to 72.0 % in 2015. China’s share of world production increased strongly during this period, up 3.6 percentage points (see Figure 1). The EU-28’s share of world production fell 2.2 points, reflecting supplies becoming exhausted and/or producers considering the exploitation of limited resources uneconomical.
The source of energy production in 2015 in the EU-28 was more balanced than in any of the other G20 members.

For many of the G20 members the mix of energy sources for primary production in 2015 was dominated by just one energy type (see Figure 2). In South Africa, Australia and China, three quarters or more of primary production came from solid fuels (for example, coal and lignite), while in Indonesia the share of solid fuels was just over half. In Saudi Arabia and Mexico crude oil was dominant, while in South Korea nuclear energy contributed by far the largest share, and in Japan (after the suspension of the operation of many nuclear plants) the main source of primary production was renewables and waste. Production in Turkey, Brazil and India was a mixture from renewables and waste as well as one type of fossil fuel: crude oil for Brazil and solid fuels for India and Turkey. By contrast, Argentina, Canada, Russia and the United States had substantial shares of production spread across two or three types of fossil fuels, with none of them accounting for more than half of their total production. Energy production in the EU-28 was more varied than in any of the other G20 members with only crude oil among the five types of energy sources shown in Figure 2 (just) failing to attain at least a 10.0 % share of total production in 2015, while none of the other types of energy saw their share exceed 30.0 %. This balance reflects the availability of different fossil fuel deposits and the potential for hydro power among EU Member States as well as differing policies towards nuclear fuels and renewables.
Renewable energy sources are sources that replenish (or renew) themselves naturally and include biomass and renewable wastes, hydro power, geothermal energy, wind energy, solar energy, wave and tidal power. Non-renewable waste may be industrial or municipal waste.

Trade in energy products

The main difference between levels of primary energy production and gross inland consumption (also known as total primary energy supply) is international trade: a shortfall of production needs to be met by positive net imports (the balance of imports minus exports) and a production surplus is generally accompanied by negative net imports.

Among the G20 members, the largest net exporters of energy in 2015 were Russia and Saudi Arabia, while net exports from Australia, Indonesia and Canada were also substantial; South Africa and Mexico also recorded smaller net exports. The largest net importer of energy among the G20 members was the EU-28, followed by China, Japan, India, the United States and South Korea.

Petroleum products dominated energy imports in 2015

A study of the composition of gross energy imports (see Table 1) shows that petroleum products (including crude oil) dominated worldwide (67.1% of all energy imports) and in most G20 members. These products accounted for close to or more than half of all energy imports in each of the G20 members except for Turkey, Argentina and Russia; gas formed a large part of Argentina’s and Turkey’s energy imports, while in Russia more than half of all energy imports were solid fuels.
Table 1: Energy imports and exports, 2015

<table>
<thead>
<tr>
<th></th>
<th>Imports (million toe)</th>
<th>Exports</th>
<th>Net imports (*)</th>
<th>Analysis of gross imports by energy type (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Solid fuels</td>
</tr>
<tr>
<td>EU-28</td>
<td>1,478.6</td>
<td>797.6</td>
<td>902.9</td>
<td>10.2</td>
</tr>
<tr>
<td>World</td>
<td>5,387.5</td>
<td>5,385.7</td>
<td>2.7</td>
<td>14.9</td>
</tr>
<tr>
<td>Argentina</td>
<td>163</td>
<td>4.4</td>
<td>15.7</td>
<td>7.3</td>
</tr>
<tr>
<td>Australia</td>
<td>283.1</td>
<td>297.8</td>
<td>44.8</td>
<td>4.3</td>
</tr>
<tr>
<td>Brazil</td>
<td>70.4</td>
<td>46.1</td>
<td>24.3</td>
<td>21.1</td>
</tr>
<tr>
<td>Canada</td>
<td>85.0</td>
<td>284.1</td>
<td>-209.2</td>
<td>6.1</td>
</tr>
<tr>
<td>China</td>
<td>3,478.0</td>
<td>58.9</td>
<td>4,897.9</td>
<td>19.9</td>
</tr>
<tr>
<td>India</td>
<td>371.3</td>
<td>64.5</td>
<td>306.8</td>
<td>32.1</td>
</tr>
<tr>
<td>Indonesia</td>
<td>25.7</td>
<td>233.0</td>
<td>-197.3</td>
<td>3.6</td>
</tr>
<tr>
<td>Japan</td>
<td>3,279.8</td>
<td>19.8</td>
<td>4,089.1</td>
<td>27.5</td>
</tr>
<tr>
<td>Mexico</td>
<td>70.7</td>
<td>72.2</td>
<td>-1.5</td>
<td>7.5</td>
</tr>
<tr>
<td>Russia</td>
<td>27.5</td>
<td>923.5</td>
<td>-901.9</td>
<td>51.8</td>
</tr>
<tr>
<td>Saudi Arabia</td>
<td>35.0</td>
<td>453.3</td>
<td>-428.3</td>
<td>5.0</td>
</tr>
<tr>
<td>South Africa</td>
<td>35.1</td>
<td>55.9</td>
<td>-20.8</td>
<td>1.7</td>
</tr>
<tr>
<td>South Korea</td>
<td>299.8</td>
<td>62.8</td>
<td>237.0</td>
<td>27.1</td>
</tr>
<tr>
<td>Turkey</td>
<td>112.2</td>
<td>8.5</td>
<td>103.7</td>
<td>19.6</td>
</tr>
<tr>
<td>United States</td>
<td>500.6</td>
<td>302.9</td>
<td>197.7</td>
<td>11.1</td>
</tr>
</tbody>
</table>

(*) A negative value for net imports indicates that the country concerned is a net exporter.
Source: Eurostat (online data code: nrg100a) and the International Energy Agency (Balances)

In Japan, South Korea, Turkey and the EU-28 more than half of energy needs were met by imports in 2015

The energy dependency indicator shown in Figure 3 reveals the extent to which gross inland energy consumption was met by net imports as opposed to primary production: those G20 members with a negative value are net exporters. Japan, South Korea, Turkey and the EU-28 all had energy dependency ratios in excess of 50 % in 2015, indicating that more than half of their energy needs was met by net imports. Lower, positive dependency ratios were recorded for India, China, Argentina, the United States and Brazil. By contrast, Saudi Arabia’s and Australia’s net exports were nearly twice as high as their gross inland energy consumption leading to energy dependency ratios that were close to -200 %.
Between 2005 and 2015, Argentina moved from being a net exporter to being a net importer of energy, as a result of which its dependency ratio moved from negative to positive. During the same period, negative energy dependency ratios increased in Indonesia, Canada and Australia, as their net exports grew more rapidly than their gross consumption (in Australia consumption actually fell slightly), while the negative ratios of South Africa, Saudi Arabia and Mexico decreased, reflecting a fall in net exports while consumption continued to increase; Russia’s negative energy dependency ratio was the same in 2015 as it had been in 2005. The United States’ positive energy dependency ratio fell between 2005 and 2015, as net imports fell faster than gross consumption (reflecting in part an expansion in domestic production of oil or gas from shale), while Brazil’s positive ratio fell as net imports grew more slowly than gross consumption. The positive energy dependency ratios for the EU-28 and Japan increased as net imports fell more slowly than gross consumption, and Turkey, India and China also reported increasing positive ratios as net imports grew faster than gross consumption.

Russia was the largest supplier of fossil fuels to the EU-28 in 2016

As noted earlier, the EU-28 is one of the most energy dependent members of the G20. Figure 4 identifies the main countries of origin of the EU-28’s gross imports of fossil fuels from non-member countries. Russia was the single largest supplier of EU-28 imports for all three fossil fuel categories, providing 30 % of solid fuels, 35 % of petroleum products and 40 % of natural gas. Norway was the second largest supplier of petroleum products and natural gas. Imports of solid fuels and of natural gas were particularly concentrated among the largest suppliers, as the top seven providers of solid fuels together supplied 95 % of the EU-28’s imports while the top five providers of natural gas supplied 96 % of the total. By contrast, despite the large share of imports from Russia, the supply of petroleum products was less concentrated, as the top nine providers together supplied 80 % of the EU-28’s imports.
Energy consumption

Gross inland consumption is the total energy demand of a country or region; it represents the quantity of energy necessary to satisfy inland consumption of the geographical entity under consideration. This covers consumption by the energy sector itself, distribution and transformation losses, and final energy consumption by end users.

Worldwide gross energy consumption was 13.6 billion toe in 2015, of which the G20 members accounted for around four fifths (79 %), significantly higher than their collective share of total energy production. China consumed one fifth (21.8 %) of the world energy total in 2015, more than any other G20 member, followed by the United States (16.0 %) and the EU-28 (11.9 %); these three members together consumed nearly half (49.8 %) of all energy worldwide.
Brazil, Indonesia, India and Canada recorded above average shares for renewables and waste in energy consumption in 2015

In 2015, just over three tenths of worldwide gross consumption of energy was composed of petroleum products, while solid fuels accounted for a slightly lower share, and just over one fifth of the total was gas; combined these three fossil fuels accounted for just over four fifths of world energy consumption (see Table 2). Gross inland consumption was entirely satisfied by such fossil fuels in Saudi Arabia and these three fuels provided more than 90 % of gross inland consumption in Japan, Australia and Mexico, and close to this level in China, Argentina and Russia (see Figure 5). South Korea had the highest share of nuclear energy in gross inland consumption (just under 16 %), but this share was considerably lower than for primary production, indicating South Korea’s high dependency on imported fossil fuels, notably petroleum products and solid fuels. The EU-28 had the second highest share of nuclear energy in gross inland consumption, followed by the United States and Canada.
Worldwide, renewables and waste accounted for 13.6% of gross inland energy consumption. As for primary production, Brazil, Indonesia and India recorded above average shares for renewables and waste in gross inland consumption, as did Canada reflecting its large net exports of fossil fuels. By contrast, Turkey and Japan recorded below average shares of renewables and waste in gross inland energy consumption, despite above average primary production, reflecting their net imports of fossil fuels.

**Energy intensity**

Energy intensity is an indicator of an economy’s energy efficiency and relates the quantity of energy consumed to the level of economic output, the latter represented by gross domestic product (GDP). In order to facilitate a comparison over time, GDP is shown in constant prices (2010) to remove the effects of inflation. To facilitate spatial comparisons, GDP is calculated in a common currency (United States dollars are used in Figure 6) using purchasing power parities (PPPs) rather than market exchange rates: PPPs are indicators of price level differences across countries. It should be noted that the economic structure of an economy plays an important role in determining energy intensity, as post-industrial economies with large service sectors tend to have considerably lower energy use than economies characterised by heavy, traditional, industrial activities.

Energy intensity fell between 2005 and 2015 in nearly all G20 members

Energy intensity fell between 2005 and 2015 for all G20 members (see Figure 6) other than Brazil where the energy intensity ratio remained stable and Saudi Arabia where it increased slightly. During this period, substantial energy efficiencies were achieved in the economies of China and Indonesia as their energy intensities fell by more than one fifth, while decreases in the energy intensity of the United States, the EU-28, Mexico, Japan and South Africa were closer to the average observed worldwide. Despite a decrease between 2005 and 2015, Russia maintained its position as having the most energy intense economy among the G20 members.
followed by South Africa. By contrast, Brazil, Japan, Mexico, Indonesia, the EU-28 and Turkey had the lowest energy intensities in 2015.

Figure 6: Energy intensity, 2005 and 2015 (toe per 1 000 international USD)

Source: the International Energy Agency (Indicators)

Electricity generation

Electricity generation (also known as gross electricity production), is the total amount of electrical energy produced by transforming other forms of energy, for example nuclear or wind power. Total gross electricity generation worldwide was 24.3 million gigawatt hours (GWh) in 2015 (see Table 3), of which 84.2% was generated by G20 members. In absolute terms, China and the United States had the highest levels of electricity generation among G20 members. A total of 3.2 million GWh of electricity was generated in the EU-28 in 2015 and 3.3 million GWh in 2016.
**Table 3: Gross electricity generation, 2015**

Source: Eurostat (nrg105a) and the International Energy Agency (Electricity)

<table>
<thead>
<tr>
<th>Total (GWh)</th>
<th>Solid fuels</th>
<th>Petroleum products</th>
<th>Gas</th>
<th>Nuclear</th>
<th>Hydro (%)</th>
<th>Other renewables and waste</th>
</tr>
</thead>
<tbody>
<tr>
<td>EU-28</td>
<td>2,335,241</td>
<td>24.5</td>
<td>1.9</td>
<td>16.4</td>
<td>26.5</td>
<td>11.5</td>
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<tr>
<td>World</td>
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<td>10.2</td>
<td>4.1</td>
<td>22.8</td>
<td>16.9</td>
<td>18.3</td>
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<td>15.4</td>
<td>49.3</td>
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<td>20.9</td>
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<td>5.7</td>
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<td>5.6</td>
<td>13.7</td>
<td>2.5</td>
<td>51.8</td>
</tr>
<tr>
<td>Canada</td>
<td>573,051</td>
<td>0.8</td>
<td>1.2</td>
<td>10.0</td>
<td>16.1</td>
<td>56.8</td>
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<td>0.2</td>
<td>2.5</td>
<td>2.9</td>
<td>19.3</td>
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<td>India</td>
<td>1,383,004</td>
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<td>1.7</td>
<td>4.9</td>
<td>2.7</td>
<td>10.0</td>
</tr>
<tr>
<td>Indonesia</td>
<td>233,064</td>
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<td>8.4</td>
<td>25.2</td>
<td>0.9</td>
<td>5.9</td>
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<td>Japan</td>
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<td>9.8</td>
<td>39.4</td>
<td>0.9</td>
<td>8.8</td>
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<td>Mexico</td>
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<td>10.1</td>
<td>59.9</td>
<td>3.7</td>
<td>9.9</td>
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<tr>
<td>Russia</td>
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<td>0.9</td>
<td>46.6</td>
<td>16.3</td>
<td>15.9</td>
</tr>
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<td>228,235</td>
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<td>44.2</td>
<td>55.9</td>
<td>0.0</td>
<td>0.0</td>
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<tr>
<td>South Africa</td>
<td>249,055</td>
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<td>0.1</td>
<td>0.0</td>
<td>4.9</td>
<td>1.5</td>
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<td>22.2</td>
<td>29.8</td>
<td>1.0</td>
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<td>0.6</td>
<td>37.9</td>
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<td>25.5</td>
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<tr>
<td>United States</td>
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<td>34.1</td>
<td>0.6</td>
<td>31.8</td>
<td>16.2</td>
<td>6.3</td>
</tr>
</tbody>
</table>

(*) Other sources not shown.

| Source: Eurostat (cell line data code: nrg_105a) and the International Energy Agency (Electricity) |

Nuclear power contributed 26.5 % of the electricity generated in 2015 in the EU-28

Solid fuel combustion power stations generated nearly two fifths (39.2 %) of electricity worldwide in 2015; this share was boosted by a high use of these fuels in South Africa, India, China and Australia. Gas-fired power stations generated more than one fifth (22.8 %) of the world’s electricity with this fuel providing more than half of the electricity generated in Mexico and Saudi Arabia, nearly half of the total in Russia and Argentina, and nearly two fifths of the total in Japan and Turkey. While oil-fired power stations provided just 4.1 % of the world’s electricity, this source was important in Saudi Arabia, providing the 44.2 % of the total that was not produced from gas. Nuclear power contributed some 26.5 % of the electricity generated in the EU-28 in 2015, which was more than double the world’s average (10.6 %) and the second highest share among G20 members, behind South Korea (29.8 %).

Hydro provided less than half of the EU-28’s electricity generated from renewables and waste in 2015

Hydro-electric power, other renewables and waste supplied 23.3 % of the world’s electricity in 2015, with a higher share recorded in the EU-28 (30.6 %) — see Figure 7. The G20 members with the highest proportion of gross electricity generation from renewables and waste were Brazil (74.0 %) and Canada (63.0 %), while the next highest share was 32.0 % in Turkey. Hydro-electricity provided more than half of the electricity generated from renewables and waste in most G20 members in 2015, the exceptions (which used more waste or other renewables) were: the United States, South Africa, South Korea and Australia; Saudi Arabia had no hydro power and a negligible share of electricity generated from renewables and waste.
Between 2005 and 2015, the share of electricity generated from renewables (including hydro) and waste increased worldwide by 4.8 points, up from 18.5% to 23.3%. The largest increases, in percentage point terms, were observed among the G20 members in the EU-28 (15.2 points), China (8.1 points), Japan (7.7 points) and Turkey (7.4 points). In India, Russia, Indonesia, Argentina and most notably Brazil (down 13.2 points), the share from renewables (including hydro) and waste decreased between these years.

Canada had by far the highest level of electricity generation per inhabitant in 2015 among the G20 members.

Relative to population size, Canada had by far the highest electricity generation among the G20 members, 18.7 MWh per inhabitant in 2015, 5.7 times as high as the world average (see Figure 8). The EU-28 ranked in the middle of the G20 members, with 6.4 MWh of electricity generated per inhabitant in 2015, a little less than double the world average. Brazil, Mexico, India and Indonesia were the only G20 members with ratios of electricity generation to population size that were below the world average.
Between 2005 and 2015, electricity generation increased worldwide by 0.48 MWh per inhabitant. Among the G20 members this ratio fell in the United States, Japan, Australia, Canada, South Africa and the EU-28, while it increased most strongly in China, South Korea and Saudi Arabia.

Source data for tables and graphs

- Energy: tables and figures

Data sources

The statistical data in this article were extracted during April 2018.

The indicators are often compiled according to international — sometimes worldwide — standards. Although most data are based on international concepts and definitions there may be certain discrepancies in the methods used to compile the data.

EU data

Nearly all of the indicators presented for the EU have been drawn from Eurobase, Eurostat’s online database. Eurobase is updated regularly, so there may be differences between data appearing in this article and data that is subsequently downloaded. Some of the data have been extracted from international sources for reasons of comparability or availability.

G20 members from the rest of the world
For the 15 non-EU G20 members, the data presented have been compiled by the International Energy Agency; population data from the World Bank have also been used.

**Context**

A competitive, reliable and sustainable energy sector is considered essential for all advanced economies. The energy sector has been under the spotlight due to a number of issues that have pushed energy up the political agenda, including the volatility of prices, interruptions to energy supplies, and increased attention to anthropogenic (human-induced) effects of energy use on climate change, in particular, increased levels of greenhouse gas emissions.

**Other articles**

- All articles on energy
- All articles on the non-EU countries
- Other articles from The EU in the world

**Publications**

- The EU in the world 2018
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- Smarter, greener, more inclusive? Indicators to support the Europe 2020 strategy — 2017 edition
- Globalisation patterns in EU trade and investment
- 40 years of EU-ASEAN cooperation — 2017 edition
- Energy, transport and environment indicators — 2017 edition
- Key figures on the enlargement countries — 2017 edition
- Asia-Europe Meeting (ASEM) — A statistical portrait — 2016 edition
- The European Union and the BRIC countries
- The European Union and the Republic of Korea — 2012

**Database**

- Energy (nrg), see:

  Energy statistics - quantities (nrgquant)
  
  Energy statistics - quantities, annual data (nrgquanta)
  
  Energy statistics - supply, transformation and consumption (nrg10)
  
  Simplified energy balances - annual data (nrg100a)
  
  Supply, transformation and consumption of electricity - annual data (nrg105a)
Energy statistics - imports (nrg12)
Imports - solid fuels - annual data (nrg122a)
Imports - oil - annual data (nrg123a)
Imports - gas - annual data (nrg124a)

- Population change – Demographic balance and crude rates at national level (demogind)

Dedicated section
- Energy

Visualisations
- Shedding light on energy in the EU

External links
- International Energy Agency (IEA)
- Statistics
- The World Bank
- DataBank

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