This article provides an overview of the energy economy in the European Union (EU) in 2018, based on annual data from each Member State. Trends are shown for the main energy commodities for primary energy production, imports and exports, gross inland consumption and final energy consumption.

Gross inland energy consumption in the European Union in 2018 was slightly smaller than in 2017 (-0.8 %). Oil (crude oil and petroleum products) continues to be the most significant energy source for the European economy, despite the long-term downward trend, while natural gas remains the second largest energy source. Nevertheless, between 2014 and 2017, the use of oil and natural gas slowly increased, while in 2018 the use of the two energy sources decreased again. The contribution of renewable energy sources is constantly increasing, surpassing solid fossil fuels in 2018.

**Primary energy production**

Primary production of energy within the EU in 2018 was 635 million tonnes of oil equivalent (Mtoe), 1.1 % lower than in 2017. The biggest decrease was in natural gas (11.8 %) which continued to decrease year by year, followed by solid fossil fuels with the same downward trend (5.3 % decrease) and oil and petroleum products (2.1 % decrease). An increase was registered for renewable energies with 2.8 % and non-renewable waste with 1.5 %, while nuclear heat remained almost constant (0.1 % increase), see Figure 1. Renewable energies accounted for the highest share in primary energy production in EU in 2018 (34.2 %), followed by nuclear heat (30.8 %), solid fossil fuels (18.3 %), natural gas (9.3 %), oil and petroleum products (3.9 %) and non-renewable wastes (2.1 %).
Over the past decade (2008-2018), the trend in primary energy production was generally negative for solid fossil fuels, oil, natural gas and nuclear energy. The production of natural gas and oil and petroleum products accounted for the biggest decreases (with 46.4 % and 35.3 % respectively) while solid fossil fuels production fell by 27.9 %. However, there was a positive trend in the production of renewable energies over the same period (with an exception in 2011), with a 49.2 % increase, as well as for waste (non-renewable) with a 46.0 % increase.

**Imports and exports**

The decrease of primary energy production in the EU over the past decades resulted in increased imports of primary energy and energy products. The quantity of imported natural gas more than doubled over the period 1990–2018 to 330 Mtoe (Figure 2), making it the second highest imported energy product. In 2017, imports from natural gas reached the highest value, while in 2018 a decrease of 3.6 % was recorded compared to 2008. Crude oil ranked first in terms of quantities imported, though for 2018, the figure was 519 Mtoe, 8.5 % lower than 10 years previously.
Exports are much lower than imports (Figure 3). In 2018, gas oil and diesel oil (around 97 Mtoe) ranked highest, followed by motor gasoline (75 Mtoe) and natural gas (59 Mtoe).
Gross inland energy consumption

Gross inland energy consumption in the EU in 2018 was 1 479 Mtoe, 0.8 % lower than in 2017 (Figure 4). It was relatively stable during the period 1990-2010, with a strong decrease in 2009, mostly as a result of the financial and economic crisis¹.

¹Since 2010, a decreasing trend can be noticed until 2014, as in 2015, 2016 and 2017 it increased a bit, while in 2018 it decreased again. The weather, especially during winter periods for northern European countries and summer periods for southern European countries, also influences consumption of energy.

Figure 3: Exports of selected energy products, EU-27, 1990-2018(million tonnes of oil equivalent)
Source: Eurostat (online data code: nrg_bal_c)
In 2009, gross inland energy consumption decreased by 5.9 % compared with 2008, with the sharpest decrease in solid fossil fuels (11.4 %), followed by natural gas (6.0 %) and oil and petroleum products with 5.9 % (Figure 5).

There was a recovery in 2010, when gross inland energy consumption increased by 4.0 %, afterwards followed by consecutive decreases until 2015 when it started increasing again. The gross inland consumption in 2014 was just below the level recorded in 1990 and in 2018 it was 1.6 % above the 1990 levels.

A rise of over 200 % in renewable energies, a 29.9 % rise in natural gas and nuclear heat with 3.8 % contributed the most to the 2018 increase compared with 1990. In fact, the gross inland energy consumption in the EU in 1994 was the lowest since the historic time series allows for comparison (since 1990).
As for the structure of gross inland energy consumption in 2018, oil and petroleum products held the biggest share (34.1%), followed by natural gas (21.9%) and solid fossil fuels (14.2%), which means that 70.2% of all energy in the EU was produced from coals, crude oil and natural gas. The share of nuclear heat and renewable energies accounted for 13.2% and 15.0% respectively (Figure 6).
Figure 6: Gross inland energy consumption by fuel, 2018(%) Source: Eurostat (nrg_bal_c)
The mixture of fuels and their shares in gross inland energy consumption in different countries depends on the natural resources available, the structure of their economies and also national choices in energy systems.

Only in four EU countries is the cumulated share of solid fossil fuels, crude oil and petroleum products and natural gas (main fossil fuels), in gross inland energy consumption below 50 %: Estonia 8.9 %, Sweden 27.8 %, Finland 39.4 % and France 48.2 % (Figure 6). It should be noted that France and Sweden are the countries with the highest contribution of nuclear heat to the gross inland energy consumption (42.3 % and 32.9 % respectively).

In 2018, the share of solid fossil fuels in gross inland consumption was the highest in Poland (46.1 %) and Czechia (36.1 %). The EU average was 14.2 %. The smallest shares of solid fossil fuels in gross inland energy consumption (under 2 %) in 2018 were observed in Luxembourg, Latvia, Cyprus, Estonia and Malta (Figure 6).

However, it is to be mentioned that for Estonia, oil shale and oil sands cover 74.1 % of the gross inland consumption while for Finland and Ireland the share of peat and peat products in the gross inland consumption is respectively of 4.2 % and 4.1 %.

The largest shares of oil and petroleum products in gross inland energy consumption were observed in Cyprus (89.6 %), Luxembourg (64.7 %) and Malta (53.6 %). This is due to specific national characteristics: Malta and Cyprus are small islands while consumption in Luxembourg is affected by "fuel tourism" due to lower prices of fuels used in the transport sector.

Natural gas accounted for shares varying from 39.4 % in the Netherlands to under 2 % in Sweden and Cyprus. Natural gas was also a significant energy source in Italy, Hungary and Ireland with shares of over 30 %, and Romania nearly reaching the 30 % mark.

In two countries, Sweden and Latvia, renewable energies accounted for around 40 % of their gross inland energy consumption in 2018 (40.3 % and 39.1 % respectively). The lowest share of renewable energy in gross inland consumption was in Malta (5.4 %), the Netherlands (5.9 %) and Luxembourg (6.6 %).

In 2018, there were 13 Member States with nuclear power plants. The highest nuclear share was in France (a 42.3 % share of nuclear heat in gross inland energy consumption), followed by Sweden (32.9 %), Slovakia (22.1 %), Bulgaria (22.0 %) and Slovenia (20.0 %).

In 2018, gross inland consumption in Luxembourg and Finland was over 6 toe per capita. In Romania and Malta, consumption was under 2 toe per capita (Map 1, Figure 7). This indicator is influenced by the structure of industry in each country, the severity of the winter weather, as well as by other factors, such as fuel tourism in the case of Luxembourg. The EU average in 2018 is 3.3 toe per capita.

Please note that the definition of solid fossil fuels excludes peat and peat products as well as oil shale and oil sands.
Map 1: Energy consumption per capita, 2018, (toe per capita) Source: Eurostat (nrg_bal_s), (demo_pjan)
Between 1990 and 2018, the EU average decreased by 4.8%. However, at national level, the evolution varies. The biggest increase in gross inland consumption per capita between 1990 and 2018 was observed in Portugal (35.4%), followed by Spain (22.9%) and Austria (16.3%), while the biggest decrease was observed in Lithuania (37.1%), Romania (36.8%) and Germany (33.1%).

Figure 7: Gross inland energy consumption, 1990 and 2018 (tonnes of oil equivalent per capita)
Source: Eurostat (nrg_bal_s), (demo_pjan)
Note: Detailed information for all years can be found in the source file

Figure 8 shows the structural split of gross inland energy consumption in the EU by main categories of the energy balance. In 2018, the biggest share of energy in EU was used in energy transformation\(^3\) (25.7%), followed by the transport sector (19.4%), households (16.6%), industry sector (16.4%), services (9.0%), other sectors (6.8%) and non-energy use (6.2%).

\(^3\)Energy transformation includes energy lost during conversion of primary energy products into secondary energy products that are actually consumed by end users; for example crude oil refining into motor gasoline or production of electricity from coal.
Final energy consumption

Final energy consumption in EU in 2018 was 939 Mtoe, 0.1 % lower than in 2017 (Figure 9). Final energy consumption has increased slowly since 1994, reaching its highest value, 991 Mtoe, in 2006. By 2018, the final energy consumption decreased from its peak level by 5.1 %.
Since 1990, the amount and share of solid fossil fuels has fallen significantly (from 6.9 % in 1990, to 3.6 % in 2000, to 2.8 % in 2010, to 2.4 % in 2018). On the other hand, renewable energy sources have increased their share of the total, from 4.3 % in 1990, to 5.3 % in 2000, to 8.8 % in 2010, to 10.5 % in 2018, while natural gas has remained quite stable over the same period, with small variations between 18.8 % (in 1990) and 22.6 % (in 2005), reaching 21.4 % in 2018.

The biggest share in the structure of final energy consumption in 2018 was for oil and petroleum products (36.7 %), followed by electricity (23.0 %) and natural gas (21.4 %). Solid fossil fuels contributed only 2.4 % to the final energy consumption at the end-use level.

An analysis of the final end use of energy in the EU in 2018 shows three dominant categories: transport (30.5 %), households (26.1 %) and industry (25.8 %) — see Figure 10.
The total energy consumption of all transport modes in the EU amounted to 287 Mtoe in 2018. There was a marked change in the development of energy consumption for transport after 2007. Until that year consumption had consistently increased, rising each year from the start of the time series in 1990. However, in 2008, as the global financial and economic crisis started, the consumption of energy for transport purposes fell by 1.4 %. This fall intensified in 2009 (-2.5 %), continued at a more subdued pace in 2010 (-0.2 %) and 2011 (-0.4 %), and decreased again more strongly in 2012 (-3.5 %) and 2013 (-1.3 %), before increases of 1.3 %, were registered in 2014 and 2015, which continued also in 2016, 2017 and 2018 (2.4 %, 2.1 % and 0.6 % respectively). Overall, between the relative peak of 2007 and the low of 2013, final energy consumption for transport in the EU fell by 9.0 %.

(*) Data on “international aviation” are not included in category Transport and hence are included in the category “Other”.

Source: Eurostat (online data code: nrg_bal_s)
A similar analysis for all end uses (based again on the period from 2007 onwards) reveals that EU final energy consumption for industry fell overall by 12.0% during the period between 2007 and 2018. The overall decline in energy consumption for transport was 1.7%, while the rate of change for households’ (-1.5%) energy use was less pronounced. By contrast, final energy consumption by services increased during the period under consideration, rising overall by 6.1%.

There were considerable differences in the development of energy consumption across various transport modes, with rapid growth for international aviation (91.0% between 1990 and 2008). However, there followed a considerable reduction in energy consumption for international aviation in 2009, down 8.4%. For the next few years there was no clear pattern in terms of energy consumption developments for international aviation. However, there were six consecutive years of growth since 2013, such that the level of consumption in 2018 stood by 17.6% well above its previous relative peak of 2008.
As shown in Figure 12, international aviation had the highest growth in EU energy consumption among the principal modes of transport between 1990 and 2018 — rising 124.6 % overall. Road transport — by far the largest transport mode — and domestic aviation were the only other transport modes to report increases over this period, as their consumption rose by 32.8 % and 27.2 %, respectively. By contrast, energy consumption for rail transport in 2018 was 27.0 % lower than in 1990 and 18.3 % lower for transport via inland waterways.

In absolute terms, the largest decreases in energy consumption among the different transport modes were recorded for transport via inland waterways and for rail transport, where EU consumption was between 0.9 and 2.0 Mtoe lower in 2018 than in 1990 (for both these modes). There was a small increase in the energy consumed by domestic aviation (1.3 Mtoe), while the consumption of energy for international aviation rose by 22.7 Mtoe between 1990 and 2018; for comparison the 66.1 Mtoe increase recorded for road transport was nearly 3 times higher. These changes in energy consumption reflect the use of each transport mode, but can also be influenced by technological changes, especially when they relate to fuel-efficiency gains or losses.

Non-energy consumption

Final non-energy consumption includes fuels that are used as raw materials and are not consumed as fuel or transformed into another fuel (for example, chemical reactions or bitumen for road construction). Non-energy consumption in 2018 amounted to 91.1 Mtoe (Figure 13). Oil and petroleum products accounted for 74.6 %, natural gas 14.9 %, and 1.6 % of all non-energy consumption was from solid fossil fuels.
Energy dependency

Gross available energy represents the quantity of energy necessary to satisfy the energy needs of a country or a region. The ratio between net imports and gross available energy indicates the ability of a country or region to meet all its energy needs. In other words, it shows the extent to which a country or a region is dependent on energy imports. This is illustrated in Figure 14, where the light coloured proportion of the column shows net imports with respect to gross available energy (gross inland consumption + international maritime bunkers), which is represented by total column height.

Figure 13: Non-energy consumption by fuel, EU-27, 1990-2018 (million tonnes of oil equivalent)
Source: Eurostat (nrg_bal_c)
In 2018 in the EU, the highest need (gross inland consumption + international maritime bunkers) was for oil and petroleum products, 547.3 Mtoe, of which 94.6% were imported. For natural gas the need in 2018 was 324.6 Mtoe, 83.2% of it covered by imports. The production of solid fossil fuels in the EU has been in decline over the last two decades (Figure 1) as was its gross inland consumption. At EU level in 2018, 43.6% of solid fuels consumed were imported.

The long trend since 1990, when import dependency was 50.1%, shows an increased import dependency. On the aggregated level, this is increasing for all fuels, however in recent years some stabilisation of this increase was evident (since 2000 until 2017 the import dependency ranged from 55.7% to 57.8%), while in 2018 if further increased to 58.2%.

**Energy intensity**

Energy intensity can be considered as an approximation of the energy efficiency of a country’s economy and shows how much energy is needed to produce a unit of GDP. There are various reasons for observing improvements in energy intensity: the general shift from industry towards a service based economy in Europe, a shift within industry to less energy-intensive activities and production methods, the closure of inefficient units, or more energy-efficient appliances. In Map 2 the energy intensity is presented using GDP purchasing power standards (PPS) values that are more suited for comparison across countries in one specific year.
Map 2: Energy intensity of the economy, 2018(kilogram of oil equivalent per 1 000 EUR PPS)
Source: Eurostat (nrg_bal_s), (nama_10_gdp)
In Figure 15 the energy intensity is presented using chain-linked GDP values that are more suited for comparison of historic trends of each country. Compared with 2008, energy intensity declined in Malta, while in the last 5 years (2013-2018) energy intensity improved in almost all EU countries (except Cyprus and Malta).

**Energy intensity of the economy, in selected years, 2008-2018**
(kilogram of oil equivalent per thousand EUR)

Source: Eurostat (online data codes: nrg_ind_ei)

Figure 15: Energy intensity of the economy, in selected years, 2007-2018 (kilogram of oil equivalent per thousand EUR) Source: Eurostat (nrg_ind_e)

Source data for tables and graphs
- Energy statistics - an overview: tables and figures

Data sources

Data on energy are submitted on the basis of internationally agreed methodology in joint annual energy questionnaires (Eurostat - OECD /International Energy Agency (IEA) - UNECE). Data are available for all EU countries and the methodology is harmonised for all reporting countries. Consequently, data comparability across countries is very high.

Gross inland energy consumption represents the quantity of energy necessary to satisfy inland consumption of the geographical entity under consideration (excluding the international maritime bunkers). It is defined as primary production plus imports, recovered products and stock changes, less exports and fuel supply to maritime bunkers (for sea-going ships of all flags). It describes the total energy needs of a country (or entity), covering: consumption by the energy sector itself; distribution and transformation losses; final energy consumption by end-users; non-energy use of energy products and statistical differences.

Gross available energy covers the gross inland consumption plus the international maritime bunkers.

Final energy consumption includes the consumption of energy by all users except the energy sector itself (whether for transformation, and/or for its own use), and includes, for example, energy consumption by agriculture, industry, services and households, as well as energy consumption for transport. It should be noted that fuel quantities transformed in the electrical power stations of industrial auto-producers and the quantities of coke
transformed into blast-furnace gas are not part of overall industrial energy consumption but are classified instead as part of the transformation sector.

Energy intensity is measured as the ratio between gross available energy and GDP; this indicator is a key indicator for measuring progress under the Europe 2020 strategy for smart, sustainable and inclusive growth. The ratio is expressed in kilograms of oil equivalent (kgoe) per thousand euro, and to facilitate analysis over time the calculations are based on GDP at constant prices with reference year 2010. If an economy becomes more efficient in its use of energy and its GDP remains constant, then the ratio for this indicator should fall.

**Context**

Energy statistics are in the spotlight due to the strategic importance of energy on the agenda of competitive and sustainable economic growth. In recent years, the European Union has faced several important issues that have pushed energy towards the top of national and European political agendas. Energy statistics have provided crucial information for policy makers: volatility in oil prices, interruptions of energy supply from non-member countries, blackouts aggravated by inefficient connections between national electricity networks, and the difficulties of market access for suppliers in relation to gas and electricity markets.

Consequently, a major policy package was adopted and has become binding legislation, known as the 20-20-20 targets. This 'climate and energy package' includes the following targets for 2020:

- A reduction in EU greenhouse gas emissions of at least 20 % below 1990 levels;
- At least 20 % of EU gross final energy consumption to come from renewable energy sources;
- At least 10 % of transport final energy consumption to come from renewable energy sources;
- A 20 % reduction in primary energy use compared with projected levels, to be achieved by improving energy efficiency

These targets were further emphasised in the Europe 2020 strategy.

The European Commission adopted an Energy efficiency plan 2011 (COM(2011) 109 final) in March 2011, which was followed in October 2012 by a Directive (2012/27/EU) of the European Parliament and of the Council on energy efficiency. This aims to establish a common framework to promote energy efficiency and specifies actions to implement some of the proposals included in the energy efficiency plan; it also foresees the establishment of indicative national energy efficiency targets for 2020. The Commission hopes that these plans will be pursued in conjunction with other policy actions under the Europe 2020 flagship initiative for a resource-efficient Europe, including the Roadmap for moving to a competitive low carbon economy by 2050 (COM(2011) 112 final). The energy efficiency plan proposes several actions to:

- promote the role of the public sector and propose a binding target to accelerate the refurbishment rate of the public sector building stock; introduce energy efficiency criteria in public procurement;
- trigger the renovation process in private buildings and improve the energy performance of appliances;
- improve the efficiency of power and heat generation;
- foresee energy efficiency requirements for industrial equipment, improved information provision for small and medium-sized enterprises, and energy audits and energy management systems for large companies;
- focus on the roll-out of smart grids and smart meters providing consumers with the information and services necessary to optimise their energy consumption and calculate their energy savings.

Energy efficiency also features in the two most recent strategic developments, the EU’s energy security strategy (COM(2014) 330 final) and a framework strategy for a resilient energy union with a forward-looking climate change policy, as detailed in a European Commission Communication (COM(2015) 80 final). The first lists increasing energy efficiency and reaching the proposed 2030 energy and climate goals as one of five areas for action, while the latter lists energy efficiency as having the potential to moderate energy demand as one of its five dimensions; for more information see the introductory article on energy statistics. The European Commission is optimistic that the 20 % primary energy consumption target will be reached if the EU Member States adhere to their commitments and continue to implement existing energy efficiency legislation and energy efficiency programmes. The Commission publishes an assessment of the progress being made in relation to...
national energy efficiency targets for 2020 and towards the implementation of the Energy Efficiency Directive; for more information, see the 2018 progress report (COM(2019) 224 final).

By using energy more efficiently, Europeans can lower their energy bills, reduce their reliance on external suppliers of oil and gas, and help protect the environment. The EU harmonises national measures relating to the publication of information on the consumption of energy by household appliances, thereby allowing consumers to choose appliances on the basis of their energy efficiency. A range of different products (for example, light bulbs, refrigerators, washing machines) carry the EU’s energy label (Directive 2010/30/EU) that details the energy efficiency of products, rating them according to a scale that ranges from A to G, with ‘A’ (or even A+, A++ or A+++ for some types of appliances) as the most energy efficient products and ‘G’ the least efficient; a maximum of seven colours are also used with dark green always representing the most efficient and red the least efficient.

There are many factors that impact on energy use for transport, for example, overall economic growth, the efficiency of individual transport modes, the take-up of alternative fuels, advances in transport technology and fuel, and lifestyle choices. The globalised nature of the EU economy has fuelled demand for international freight movements (principally by ship), while within the single market there has been a considerable expansion in the use of road freight transport. The growth of low-cost airlines, an increase in motorisation rates (the average number of motor vehicles per inhabitant), a trend for living in suburban areas, or the expansion of tourism (more frequent breaks, and more long-haul destinations) are among some of the factors that have contributed to the longer-term increase in demand for energy as a result of personal travel (especially for road transport and international aviation).

Other articles
- All articles on energy

Tables
- Energy (t_nrg), see:

Energy statistics - main indicators (t_nrg_indic)

Database
- Energy (nrg), see:

Energy statistics - quantities, annual data (nrg_quanta)
  - Energy balances (nrg_bal)
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  - Energy indicator (nrg_ind)
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  - Stocks (nrg_stk)
  - Trade by partner country (nrg_t)

Dedicated section
- Energy
Publications

- Shedding light on energy in the EU — A guided tour of energy statistics (digital publication) — 2017 edition

Methodology

- Supply, transformation and consumption — commodity balances (ESMS metadata file — nrg_cb_esms)
- Final energy consumption by sector (ESMS metadata file — nrg_bal_esms)

Legislation

- Regulation (EC) No 1099/2008 on energy statistics
- Summaries of EU legislation: Common system for the production of energy statistics
- EUROPE 2020: A strategy for smart, sustainable and inclusive growth
- Summaries of EU legislation: Europe 2020: the European Union strategy for growth and employment
- A policy framework for climate and energy in the period from 2020 to 2030
- Energy Roadmap 2050
- Summaries of EU legislation: Moving toward competitive sustainable and secure energy for Europe

External links

- European Commission — Directorate-General for Energy — Energy strategy
- European Commission — Directorate-General for Mobility and Transport — European strategies
- International Energy Agency (IEA) — World Energy Outlook
- OECD — Green growth and sustainable development — Greening energy
- Energy Community
- INOGATE