This article provides an overview on the production and consumption of electricity and derived heat in the European Union (EU). The figures are based on the annual data provided by the Member States. Eurostat's energy statistics contain data as from 1990 for all Member States and 14 non-EU countries. This article focuses primarily on data for the EU between 2000 and 2019. The article also presents a simplified electricity and derived heat balance as well as trade data and some derived indicators of consumption linking to population and GDP.

**General overview**

Gross electricity production in the EU increased from 2 657 TWh in 2000 to its peak of 2 995 TWh in 2008. In 2019, the gross electricity production decreased compared with 2018 by 1.2 % and reached 2 904 TWh, but showed a decrease of 3.8 % compared with the 2008 peak value.

In 2019 renewable energy sources were the largest contributor to electricity production, surpassing natural gas and manufactured gases, solid fossil fuels (coal) and nuclear energy. Since 2000, the electricity generation from renewable energy sources more than doubled (from 436 to 1005 TWh). Compared with 5 years ago, electricity production from renewable sources increased by 16 %.

**Production of electricity**

Total gross electricity production in 2019 in the EU did not follow the increasing trend of recent years and was 2 904 TWh in 2019. Following the 5.1 % decrease from 2008 to 2009, there was almost a full recovery in 2010. From 2010, the production decreased until 2015, when it began to slightly increase once again (Figure 1).
The highest share of electricity in 2019 was produced in power plants using renewable energy sources (34.6 %), followed by nuclear power plants (26.4 %), gas fired plants\(^1\) (20.6 %) and coal fired power plants (15.5 %). Lower shares were noticed for oil\(^2\) (1.8 %) and non-renewable wastes (0.7 %). The detailed data on gross electricity production by fuel are shown in Table 1.

### Table 1: Gross electricity production by fuel, EU, 2000-2019 (GWh) Source: Eurostat (nrg_bal_peh)

There have been significant changes in the contribution of the different renewable energy sources to electricity production over the last two decades. In 2000, 87.0 % of renewable electricity was produced from hydro energy,\(^3\)

\(^1\)Gas includes natural gas and derived gases; and excludes biogas included in renewable energy sources.

\(^2\)Oil includes crude oil and petroleum products.

---

**Figure 1:** Gross electricity production by fuel, EU, 2000-2019 (GWh) Source: Eurostat (nrg_bal_peh)
a share which dropped to 34.3% in 2019. Other renewable energy sources with large shares in electricity production in 2019 were wind (36.5%), solar photo voltaic (11.9%), primary solid biofuels (8%) and biogases (5.4%).

The time series for gross electricity production by fuel is presented in Figure 1. Since 2000 electricity generation from renewable energy sources has more than doubled and it is the only source which continued to grow after 2008 (with only a small decrease in 2011). The electricity production of coal fired power plants in 2019 was at its lowest level in the EU since 2000. Electricity generated from natural gas increased from 331 TWh in 2000 to its peak of 614 TWh in 2008. However, by 2014 the electricity generation from natural gas decreased to 357 TWh and began to increase once again from 2015 to 2017, followed by a small decrease in 2018, and an increase again in 2019, reaching 569 TWh. The trend of electricity production from nuclear power plants shows a peak in 2004, with a moderate increase from 2000 to 2004 (+8.0%) and a decrease from 2004 to 2019 (-17.6%).

### Installed electrical capacity

The installed electrical capacity in the EU is presented in Table 2. It increased by 54.5% in the period from 2000 to 2019. Its structure changed significantly over this period. In 2000, the highest share of installed capacity was accounted for combustible fuels (55.5%), followed by hydro (22.0%), nuclear (20.4%) and wind (2.0%), with all others at less than 2.0%. In 2019, the share of installed capacity of combustible fuels decreased to 41.9%, the share of hydro to 15.9% and the share of nuclear to 11.6%. On the other hand, the share of wind increased to 17.6% and the share of solar photovoltaic to 12.5%, while geothermal and tide, wave and ocean remained negligible.

<table>
<thead>
<tr>
<th>Year</th>
<th>Coal</th>
<th>Natural Gas</th>
<th>Nuclear</th>
<th>Solar</th>
<th>Biofuels</th>
<th>Biogases</th>
<th>Others</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>55.5</td>
<td>22.0%</td>
<td>20.4%</td>
<td>2.0%</td>
<td>5.5%</td>
<td>5.5%</td>
<td>5.5%</td>
</tr>
<tr>
<td>2019</td>
<td>41.9</td>
<td>15.9%</td>
<td>11.6%</td>
<td>12.5%</td>
<td>5.5%</td>
<td>5.5%</td>
<td>5.5%</td>
</tr>
</tbody>
</table>

Table 2: Maximum electrical capacity, EU-27, 2000-2019 (MW) Source: Eurostat (nrg_inf_epc)

### Import and export of electricity

At an overall EU level, net imports of electricity in 2019 represented only 0.1% of the electricity consumption by end-users. However, there are significant differences between various EU Member States. Having a close look at the relative shares of electricity consumption, the net imports of electricity in Luxembourg represented 91.9% of electricity consumption, in Lithuania 81.9%, in Croatia 37.0%, in Hungary 30.3%; and in Estonia 27.7%, while the percentages of net exports of electricity in Czechia were 21.8%, in Sweden 20.5%, in Bulgaria 18.4%, in France 13.1% and in Germany 6.4%.

In 2019, the biggest net importers of electricity in absolute values were Italy, Finland and Hungary, while France, Germany and Sweden were the biggest net exporters of electricity (Table 3).
Table 3: Electricity consumption and trade, 2019 (GWh) Source: Eurostat (nrg_nrg_cb_e)

**Derived heat production**

EU total gross production of derived heat in 2019 was 622 TWh. The highest share of heat was produced from natural gas and manufactured gases (37.7 %), followed by renewable energies (30.0 %) and solid fossil fuels (21.8 %). The detailed data on gross heat production by fuel are shown in Table 4 and Figure 2.
Production of derived heat from solid fossil fuels continued its long term decreasing trend: since 2000 it decreased by 35.7% and reached a record low of 135 TWh in 2019. Oil and petroleum products showed a similar trend for heat production: since 2000 a decrease of 70.0% with a record low of 19 TWh in 2019. Natural gas, which peaked in 2005, increased by 8.5% in 2019. Renewable energy continued its long term increasing trend. Since 2000 heat produced from renewable sources increased by 257.8%. However, in total, renewable energy sources contribute only by 30.0% to the total derived heat generation. Derived heat from nuclear power plants plays only a very minor role due to its specific technology.

Consumption of electricity and derived heat

Electricity grids and distribution systems of derived heat always have to be in balance: all produced electricity and derived heat need to be consumed in one way or another. While there are transmission and distribution losses, the overall consumption pattern follows the production pattern very closely.

In the EU the consumption of electricity increased significantly during the 90’s but stabilised over the last 10 years. The households and services sectors are responsible for the growth of electricity consumption, while consumption in the transport sector remained stable over the years. Consumption of electricity in the industrial sector follows the economic cycle.
The consumption of electricity by selected sectors (Figure 3) shows that electricity consumption in the services sector increased by more than a third in the period from 2000 to 2019 (+33.9 %), while electricity consumption in the households sector increased by 16.5 % during the same period. While in 2000 electricity consumption of households was 11.2 % higher than that of services, in recent years the electricity consumption of the services sector has exceeded the electricity consumption in households.

Figure 3: Consumption of electricity by sector, EU-27, 2000-2019 (GWh) Source: Eurostat (nrg_cb_e)

In 2019, electricity consumption was 934 TWh in the industry sector, 729 TWh in the services sector, 706 TWh in the residential sector and 59 TWh in the transport sector.

The detailed data on electricity and derived heat production and consumption for 2019 are also presented in the simplified electricity and heat balance in Table 5.

Simplified electricity and derived heat balance

The simplified electricity and derived heat balance is derived from the complete energy balance and presents the most relevant flows for electricity and derived heat - their production and consumption in 2019 (Table 5). All data in the simplified electricity and heat balance for the EU are presented in a common energy unit (ktoe - thousand tonnes of oil equivalent). The simplified balance presents in the first part the fuels input to electricity and heat production, in the second part the electricity and heat produced and in the third part the consumption, offering a more detailed view of the consumption by industry sectors.
Consumption of electricity per capita in the households sector

Electricity consumption per capita in the households sector in the EU in 2019 was 1.6 MWh per capita (1 581 kWh). The range of electricity consumption per capita in the households sector in the EU Member States in 2019 varied widely, from consumption below 1 MWh per capita in Romania, Poland and Latvia, to consumption of over 4 MWh per capita in Sweden and Finland (Figure 4).
Looking on electricity consumption per capita in the households sector in non-EU countries, an even wider range is observed: from 0.5 MWh in Moldova to 7.5 MWh in Norway. The range is affected by the choice of energy used for space heating, the climate conditions as well as the level of economic development of each country.

**Consumption of electricity per unit of GDP**

Electricity consumption per unit of GDP (using purchasing power standards) in the EU in 2019 was 179.4 kWh per 1 000 EUR (Figure 5). The amount of electricity consumed per unit of GDP depends on many factors, such as the general standard of living, the economy and weather conditions as well as the energy efficiency of buildings and appliances. Using GDP in purchasing power standards allows for better comparison across countries in one year.

The EU Member States with the lowest electricity consumption per unit of GDP in 2019 were Ireland, Romania, Luxembourg and Denmark. The highest rates of electricity consumption per unit of GDP were registered in Finland, Sweden and Bulgaria.
Source data for tables and graphs

- Download the MS Excel file containing the data for the Tables and Figures.

Data sources

Data on energy are submitted on the basis of an internationally agreed methodology in joint annual energy questionnaires (Eurostat - OECD / IEA - UNECE). Data are available for all EU Member States and the methodology is harmonised for all reporting countries. Consequently, comparisons across countries can be performed.

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 significant issues that have pushed energy towards the top of national and European political agendas. In this respect, energy statistics have provided crucial information for policy makers.

Modern societies are dependent on electricity. Maintaining reliable and secure electricity services underpins economic growth and community prosperity. Derived heat plays a significant role in the supply of district heating in several countries in Europe. It is particularly widespread in North, Central and Eastern Europe.

Other articles

- Energy statistics - an overview
- Energy statistics introduced
- Electricity price statistics
- Natural gas price statistics
- Natural gas market indicators
- Renewable energy statistics
- The EU in the world — energy

Publications

- Shedding light on energy in the EU — A guided tour of energy statistics (digital publication) — 2017 edition
- Statistical analysis of EU trade in energy products, with focus on trade with the Russian Federation
Main 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)
  Supply, transformation and consumption - commodity balances (nrg_cb)
  Energy indicator (nrg_ind)
  Energy infrastructure and capacities (nrg_inf)
  Stocks (nrg_stk)
  Trade by partner country (nrg_t)

Dedicated section

- Energy

Methodology

According to the purpose of production, power plants can be classified as main activity producers (enterprises, both privately or publicly owned, which generate electricity and/or heat for sale to third parties as their principal activity) and autoproducers (enterprises, both privately or publicly owned, which generate electricity and/or heat wholly or partly for their own use as an activity which supports their primary activity). Both main activity producers and autoproducers can produce only electricity, a combination of heat and electricity (CHP) or heat only.

Detailed data on gross electricity production by fuel and by main activity producers and autoproducers, as well as CHP main activity producers and CHP autoproducers are presented in Eurostat’s energy database.

Derived heat includes heat produced in main activity producer plants and heat sold produced in autoproducer plants. Heat produced at the final place of consumption in the final consumption sectors (such as households) is not counted as the final energy consumption of "derived heat"; it is counted as the final energy consumption of the respective fuel (electricity, natural gas, etc.).

Gross electricity production is the total amount of electricity produced in power plants. Power plants consume some electricity for their own use; by deducting the own use of power plants from gross electricity production net electricity production is obtained. Net electricity production is transmitted and distributed via grids to final consumers.

- Supply, transformation and consumption — commodity balances (ESMS metadata file — nrg_cb_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

- International Energy Agency (IEA)
- OECD-NEA (Nuclear Energy Agency)
- Eurelectric
- Euroheat & Power
- European Network of Transmission System Operators for Electricity