

CONCEPTS AND DEFINITIONS

ELECTRICITY PROFILES

The electricity profiles intend to provide an overall picture of the electricity sector in countries and areas on a comparable basis. As such, a simplified approach is taken, where for production and capacity the three main electricity sources (or production processes) are singled out; namely, combustible fuels, hydro and nuclear; while the remaining electricity production processes (mostly renewable) are aggregated in the category Other. Detailed information on each source for the same countries and areas is available from the United Nations Energy Statistics Database.⁵

Each electricity profile is divided into three blocks, which are listed below and described in detail next:

- The top block on electricity production, trade and consumption;
- The middle block on net installed capacity; and
- The bottom block on combustible fuel input, output and efficiency.

Top block – Electricity production, trade and consumption

Electricity is defined in energy statistics as the transfer of energy through the physical phenomena involving electric charges and their effects when at rest and in motion.

Electricity can be generated through different processes such as: the conversion of energy contained in falling or streaming water, wind or waves; the direct conversion of solar radiation through photovoltaic processes in semiconductor devices (solar cells); or by the combustion of fuels.

Electricity **production** (or electricity generation) in the electricity profiles refers to gross production, which is the sum of the electrical energy production by all the generating units/installations concerned (including pumped storage) measured at the output terminals of the main generators.

The different types of technology/processes for the generation of electricity are defined as follows.

Electricity from **combustible fuels** refers to the production of electricity from the combustion of fuels which are capable of igniting or burning, i.e. reacting with oxygen to produce a significant rise in temperature.

Hydro electricity refers to electricity produced from devices driven by fresh, flowing or falling water.

Nuclear electricity refers to electricity generated by nuclear plants.

Other electricity includes all other processes, which are described below.

- Solar Electricity refers to electricity produced from solar photovoltaics, i.e. by the direct conversion of solar radiation through photovoltaic processes in semiconductor devices (solar cells), including concentrating photovoltaic systems; as well as electricity produced from solar thermal heat (both concentrating and non-concentrating).

Heat from concentrating solar thermal refers to high temperature heat produced from solar radiation captured by concentrating solar thermal systems. Heat from non-concentrating solar thermal refers to low temperature heat produced from solar radiation captured by non-concentrating solar thermal systems.

- Wind electricity refers to electricity produced from devices driven by wind.

- Wave electricity refers to electricity produced from devices driven by the motion of waves.

- Tidal electricity refers to electricity generated from devices driven by tidal currents or the differences of water level caused by tides.

- Other marine electricity refers to electricity generated from devices which exploit sources of marine energy not elsewhere specified. Examples of sources are non-tidal currents, temperature differences and salinity gradients in seas or salinity differences between sea and fresh water.

- Geothermal electricity refers to the electricity generated from the heat from geothermal sources.

- Electricity generated from chemical heat, which refers to recovered heat generated in the chemical industry by exothermic reactions other than combustion.

⁵ <http://data.un.org/Explorer.aspx?d=EDATA>

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- Electricity from other sources not elsewhere specified.

As regards the type of producer, both for electricity production and for net installed capacity, a distinction is made between main activity producers and autoproducers, as defined below:

Main activity producer are enterprises which produce electricity as their principal activity. Formerly known as public utilities, these enterprises may be privately or publicly owned companies.

Autoproducers are enterprises which produce electricity but for whom the production is not their principal activity.

In the *Electricity Profiles*, autoproducer figures are not provided explicitly, but can be easily derived as the difference between total producers and main activity producers.

Own use in electricity, CHP and heat plants refers to consumption of electricity for the direct support of electricity, CHP and heat plants. It includes consumption by station auxiliaries, and losses in transformers which are considered as integral parts of the electric energy, CHP or heat generating plants.

- **Electricity plants** refer to plants producing only electricity.

- **CHP plants** (Combined Heat and Power) refer to plants which produce both heat and electricity from at least one generating unit in the plant. They are sometimes referred to as “co-generation” plants.

- **Heat plants** refer to plants (including heat pumps and electric boilers) designed to produce heat only, for deliveries to third parties.

Net production is (gross) production minus own use in electricity, CHP and heat plants. It is equivalent to the electricity sent out from the plants that is available to the network or ready for use in the premises in the case of autoproducers.

Imports comprise all electricity entering the national territory.

Exports comprise all electricity leaving the national territory.

For electricity, as an exception to general energy statistics, trade data include electricity transmitted through the country from one neighbour to another, as there is no practical way of discerning which quantities are re-exported and which are consumed by the transit country.

Losses refer to losses during the transmission and distribution of electricity. Losses also include pilferage of electricity (sometimes referred to as non-technical losses).

Consumption in the *Electricity Profiles* refers to **Energy industries own use** and **Final consumption**.

Energy industries own use refers to consumption of electricity for the direct support of the production, and preparation for use of fuels and energy. Quantities which are used for transportation purposes in the energy industry are not included here, but in Consumption by transport. Quantities used for pumped storage are included here.

Note that pumped storage plants are plants where electricity is used during periods of lower demand to pump water into reservoirs for subsequent release and electricity generation during periods of higher demand. Less electricity is eventually produced than is consumed to pump the water into the higher reservoir.

In general energy statistics, Own use in electricity, CHP and heat plants is part of Energy industries own use, but it is displayed apart in this publication so that Net production can be derived.

Final consumption refers to the consumption of electricity by Manufacturing, construction and non-fuel mining, by Transport, and by households and other consumers (non-energy use being irrelevant for electricity).

By industry and construction refers to final electricity consumption by manufacturing, construction and non-fuel mining industries. The final consumption recorded under this category covers the use of electricity by economic units belonging to the industry groups listed below (excluding the use of energy products for transport, which is recorded under Transport in its respective row).

- Iron and steel
- Chemical and petrochemical
- Non-ferrous metals

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- Non-metallic minerals
- Transport equipment
- Machinery
- Mining and quarrying
- Food and tobacco
- Paper, pulp and print
- Wood and wood products (other than pulp and paper)
- Textile and leather
- Construction
- Industries, not elsewhere specified

By transport refers to the consumption of electricity by any economic entity to transport goods or persons between points of departure and destination within the national territory.

By households and other consumers: This group consists of energy consumers not classified in Manufacturing, construction and non-fuel mining industries, and consists of the following subgroups:

- Agriculture, Forestry, Fishing
- Commerce and public services
- Households
- Not elsewhere specified

Middle block – Net installed capacity

Net installed capacity refers to the Net maximum electrical capacity, which is the maximum active power that can be supplied continuously, with all plants running, at the point of outlet (i.e., after taking the power supplies for the station auxiliaries and allowing for the losses in those transformers considered integral to the station).

This assumes no restriction of interconnection to the network, but does not include overload capacity that can only be sustained for a short period of time (e.g., internal combustion engines momentarily running above their rated capacity).

The net maximum electricity-generating capacity represents the sum of all individual plants' maximum capacities available to run continuously throughout a prolonged period of operation in a day.

As mentioned for electricity production, a distinction is made between main activity producers and autoproducers. In the *Electricity Profiles*, autoproducer figures are not provided explicitly, but can be easily

derived as the difference between total producers and main activity producers.

Bottom block – Combustible fuel input, output and efficiency

As defined in the section about the top block, electricity from **combustible fuels** refers to the production of electricity from the combustion of fuels which are capable of igniting or burning, i.e. reacting with oxygen to produce a significant rise in temperature.

Therefore, for some countries and areas this block may be empty if such processes are not utilized in the country or area in question.

Combustible fuel input is the energy content (in Terajoules) of those fuels which are combusted to generate electricity. This input is broken down by fuel (as applicable) and is calculated from the fuel quantities expressed in their original units (e.g., thousand metric tons) through the application of conversion factors.

Up to 10 fuels (by input contribution in the latest year available) are displayed alphabetically, with the remaining ones, if any, aggregated in the category Others.

Total input is the total aggregate of combustible fuel input.

Total production is the total electricity production from combustible fuels (both main activity and autoproducers), expressed in Terajoules by using the equivalence: 1 GWh = 3.6 Terajoules.

The **estimated efficiency** (of total electricity generation from combustible fuels) is calculated by dividing the Total production by the Total input. It gives an idea of how much energy from the fuels is converted into electricity on average in the electricity and CHP plants in the country or area.

It is important to note that the formula considers all inputs to CHP plants but only the electricity output from these plants and not the heat generated, so the calculated efficiency should be used with caution to compare countries with differing levels of CHP generation (and these levels are not apparent from this publication).

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For ease of reference, the table below displays typical efficiencies for electricity and CHP plants for the main types of fuel used as input.

Generation process	Typical plant efficiency
Electricity plants	
Coal	32-40%
Oil	35-40%
Natural gas	45-55%
Biomass	20-30%
CHP plants	
Coal	50-75%
Oil	50-75%
Natural gas	60-90%
Biomass	60-85%