ELECTRICITY INFORMATION
2018 EDITION

DATABASE DOCUMENTATION
This document provides support information for the IEA *Electricity Information* database. This document can be found online at: [http://wds.iea.org/wds/pdf/ele_documentation.pdf](http://wds.iea.org/wds/pdf/ele_documentation.pdf).

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1. CHANGES FROM LAST EDITION

Geographical coverage

For the 2018 edition, the IEA regional aggregates (IEA Americas, IEA Asia Oceania and IEA Europe) have been removed due to their close similarity to the OECD regional aggregates.

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 aggregate for data starting in 1971 and for the entire time series.

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 1971 and for the entire time series.

Changes to variables names

<table>
<thead>
<tr>
<th>Old longname</th>
<th>New longname</th>
<th>Shortname</th>
<th>Old shortname (if changed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Africa (UN)</td>
<td>Memo: Africa (UN)</td>
<td>AFRICATOT</td>
<td></td>
</tr>
<tr>
<td>Americas (UN)</td>
<td>Memo: Americas (UN)</td>
<td>AMERICAS</td>
<td></td>
</tr>
<tr>
<td>Asia (UN)</td>
<td>Memo: Asia (UN)</td>
<td>ASIATOT</td>
<td></td>
</tr>
<tr>
<td>Europe (UN)</td>
<td>Memo: Europe (UN)</td>
<td>EUROPE</td>
<td></td>
</tr>
<tr>
<td>Oceania (UN)</td>
<td>Memo: Oceania (UN)</td>
<td>OCEANIA</td>
<td></td>
</tr>
</tbody>
</table>
2. DATABASE STRUCTURE

The database *Electricity Information* includes:

Annual data for:
- **countries**: 170 countries and regional aggregates (see section *Geographical coverage*);
- **years**: 1960-2017 (OECD countries and regions unless otherwise specified);
  - 1960-2017 (OECD Imports and Exports to partner countries)
  - 1971-2016 (non-OECD countries and regions; world unless otherwise specified);
  - 2017 (provisional energy supply data)

Monthly data for:
- **countries**: 34 countries and regional aggregates (see section *Geographical coverage*);
- **years**: January 2000-December 2017 (OECD countries and regions unless otherwise specified);

**OECD files (last updated July 2018):**

**EleHeatBal_OECD.IVT**
OECD, *Electricity and Heat Supply and Consumption (GWh, TJ)*
Electricity and heat balance (35 OECD countries + 5 aggregates; 54 flows).
Data begin in 1974.

**EleHeatGen.IVT**
OECD, *Electricity and Heat Generation (GWh, TJ, kt)*
Gross electricity and heat production by fuel and plant types (35 OECD countries + 5 aggregates; 63 products; 7 plant types).

**EleAuto.IVT**
OECD, *Net Electricity and Heat Production by Auto-producers (GWh, TJ)*
Net electricity and heat production by autoproducers in all plants, by sector (35 OECD countries + 5 aggregates; 40 sectors).

**EleImp.IVT**
OECD, *Electricity Imports by Origin (GWh)*
Electricity imports by origin (35 countries + 5 aggregates; 51 import countries).

**EleExp.IVT**
OECD, *Electricity Exports by Destination (GWh)*
Electricity exports by destination (35 countries + 5 aggregates; 52 export countries).

**EleCap.IVT**
OECD, *Net Electrical Capacity (MWe)*
Net electrical capacity by type of energy (35 countries + 5 aggregates; 28 sources).
EleMonthly.IVT  
**OECD, Monthly Net Electricity Supply (GWh)**
Monthly net electricity production from main sources and trades from January 2000 to December 2017 (33 countries + 5 aggregates; 8 sources).

**World files (last updated July 2018):**

EleHeatBal.IVT  
**World, Electricity and Heat Supply and Consumption (GWh, TJ)**
Reduced electricity and heat balance (145 countries + 22 aggregates; 8 flows).

Differences may exist for OECD countries and aggregates between this database and the updated preliminary databases in shared flows, and the interactive specific information (such as country notes or product definitions) provided for each element. This also means that the information provided in this documentation may supersede the interactive information.
## 3. FLOW DEFINITIONS

<table>
<thead>
<tr>
<th>Flow</th>
<th>Short name</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross production</td>
<td>GROSPROD</td>
<td>This is the total gross electricity or heat production.</td>
</tr>
<tr>
<td>Own use</td>
<td>OWNUSE</td>
<td>This is the difference between Gross and Net production, i.e. it is the electricity and heat used by power station auxiliaries directly related to generation and including that used for fuel handling plant, cooling water plant, power station services, heating, lighting, workshops and administrative buildings directly associated with the power station during both on-load and off-load periods.</td>
</tr>
<tr>
<td>Net production</td>
<td>NETPROD</td>
<td>This is the total net electricity or heat production.</td>
</tr>
<tr>
<td>Imports</td>
<td>TOTIMPSB</td>
<td>Amounts are considered as imported when they have crossed the national territorial boundaries of the country. If electricity is “wheeled” or transited through a country, the amount is shown as both an import and an export.</td>
</tr>
<tr>
<td>Exports</td>
<td>TOTEXPSB</td>
<td>Amounts are considered as exported when they have crossed the national territorial boundaries of the country. If electricity is “wheeled” or transited through a country, the amount is shown as both an import and an export.</td>
</tr>
<tr>
<td>Used for heat pumps</td>
<td>EHEAT</td>
<td>This is the electricity used in heat pumps (as defined previously).</td>
</tr>
<tr>
<td>Used for electric boilers</td>
<td>EBOILER</td>
<td>This is the electricity used in electric boilers.</td>
</tr>
<tr>
<td>Used for pumped Storage</td>
<td>EPUMPST</td>
<td>This is the electricity consumed by pumping in hydro-electric power plants.</td>
</tr>
<tr>
<td>Used for electricity production</td>
<td>EELE</td>
<td>Heat from chemical processes used as a primary energy form, and purchased secondary waste heat consumed as input to electricity generation.</td>
</tr>
<tr>
<td>Flow</td>
<td>Short name</td>
<td>Definition</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Energy supplied</td>
<td>SUPPLY</td>
<td>For <em>electricity</em>, this is the electrical energy supplied from the plant. In the case of a national network this is equal to the sum of the net electrical energy production supplied by all power stations within the country, reduced by the amount used simultaneously for pumping as well as the amount used for heat sold using heat pumps and electric boilers. It is then reduced or increased by exports to or imports from abroad. For <em>heat</em>, this is equal to the sum of the net heat production for sale by all plants within a country reduced or increased by exports or imports from abroad.</td>
</tr>
<tr>
<td>Transmission and distribution Losses</td>
<td>DISTLOSS</td>
<td>This comprises all losses due to transport and distribution of electrical energy and heat. For electricity, losses in transformers which are not considered as integral parts of the power plants are also included.</td>
</tr>
<tr>
<td>Total consumption (calculated)</td>
<td>TFCCALC</td>
<td>This equals the Energy Supplied minus Transmission and Distribution Losses.</td>
</tr>
<tr>
<td>Statistical difference</td>
<td>STATDIFF</td>
<td>This equals the Total Consumption (calculated) – Total Consumption (observed).</td>
</tr>
<tr>
<td>Total consumption (observed)</td>
<td>TFCOBS</td>
<td>This is the amount actually recorded in surveys of end-use sectors. It should, in principle, correspond to the total consumption (calculated).</td>
</tr>
</tbody>
</table>
### Energy Industry

<table>
<thead>
<tr>
<th>Flow</th>
<th>Short name</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total energy industry</td>
<td>TOTENGY</td>
<td>All electricity and purchased heat consumed by the energy sector to support the extraction (mining, oil and gas production) and plant operation of transformation activities. It exclude Own use by plant, Used for pumped storage, Used by heat pumps and Used for electric boilers, which are reported elsewhere. Heat consumed by auto-producers for their own use is not included. Consumption in support of the operation of pipelines (e.g. oil, gas, and coal slurry) is reported in the Transport sector. The Energy Sector covers ISIC1 Divisions 05, 06, 19 and 35, Group 091, Classes 0892 and 0721 (NACE2 Divisions 05, 06 19, and 35, Group 09.1, Classes 08.92 and 07.21). The Energy sector includes the manufacture of chemical materials for atomic fission and fusion and the products of these processes. Electricity and heat used in the manufacture of fuel briquettes and packaged fuel from coal, lignite or peat and consumption in coke ovens, gas works, blast furnaces, liquefaction plants, gasification plants, charcoal production plants and other transformation industries is also reported here.</td>
</tr>
<tr>
<td>Coal mines</td>
<td>EMINES</td>
<td>Electricity and purchased heat consumed to support the extraction and preparation of coal within the coal mining industry.</td>
</tr>
<tr>
<td>Oil and gas extraction</td>
<td>EOILGASEX</td>
<td>Electricity and purchased heat consumed to support the operation of oil and gas extraction facilities.</td>
</tr>
<tr>
<td>Patent fuel plants</td>
<td>EPATFUEL</td>
<td>Electricity and purchased heat consumed at patent fuel plants.</td>
</tr>
<tr>
<td>Coke ovens</td>
<td>ECOKEOVS</td>
<td>Electricity and purchased heat consumed at coke ovens.</td>
</tr>
<tr>
<td>Gas works</td>
<td>EGASWKS</td>
<td>Electricity and purchased heat consumed at gas works plants and coal gasification plants.</td>
</tr>
<tr>
<td>Blast furnaces</td>
<td>EBLASTFUR</td>
<td>Electricity and purchased heat consumed at blast furnaces operations.</td>
</tr>
<tr>
<td>Gasification plants for biogas</td>
<td>EBIOGAS</td>
<td>Electricity and purchased heat consumed at biogas gasification plants.</td>
</tr>
<tr>
<td>BKB/PB plants</td>
<td>EBKB</td>
<td>Electricity and purchased heat consumed at briquetting plants.</td>
</tr>
<tr>
<td>Oil refineries</td>
<td>EREFINER</td>
<td>Electricity and purchased heat consumed at oil refineries.</td>
</tr>
<tr>
<td>Coal liquefaction plants</td>
<td>ECOALLIQ</td>
<td>Electricity and purchased heat consumed at coal liquefaction plants.</td>
</tr>
<tr>
<td>Liquefaction (LNG) / regasification plants</td>
<td>ELNG</td>
<td>Electricity and purchased heat consumed at natural gas liquefaction and regasification plants.</td>
</tr>
<tr>
<td>Gas-to-liquids (GTL) plants</td>
<td>EGTL</td>
<td>Electricity and purchased heat consumed at gas-to-liquids plants.</td>
</tr>
<tr>
<td>Nuclear industry</td>
<td>ENUC</td>
<td>Electricity and purchased heat consumed at nuclear power plants.</td>
</tr>
<tr>
<td>Charcoal production plants</td>
<td>ECHARCOAL</td>
<td>Electricity and purchased heat consumed at charcoal production plants.</td>
</tr>
<tr>
<td>Not elsewhere specified (energy)</td>
<td>ENONSPEC</td>
<td>Electricity and purchased heat consumed for other purposes not reported above.</td>
</tr>
<tr>
<td>Flow</td>
<td>Short name</td>
<td>Definition</td>
</tr>
<tr>
<td>-----------------------------</td>
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<td>-------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Total industry</td>
<td>TOTIND</td>
<td>Consumption of industry is specified in the following sub-sectors (energy used for transport by industry is not included here but is reported under transport):</td>
</tr>
<tr>
<td>Iron and Steel</td>
<td>IRONSTL</td>
<td>[ISIC Group 241 + Class 2431 (NACE Groups 24.1, 24.2, 24.3, Classes 24.51 and 24.52)]. To avoid double counting, electricity used in blast furnaces is reported in the Energy sector.</td>
</tr>
<tr>
<td>Chemical and petrochemical</td>
<td>CHEMICAL</td>
<td>[ISIC and NACE Divisions 20 and 21]</td>
</tr>
<tr>
<td>Non-ferrous metals</td>
<td>NONFERR</td>
<td>[ISIC Group 242 + Class 2432 (NACE Group 24.4, Classes 24.53 and 24.54)] Basic industries.</td>
</tr>
<tr>
<td>Non-metallic minerals</td>
<td>NONMET</td>
<td>[ISIC and NACE Division 23] Such as glass, ceramic, cement, and other building materials industries.</td>
</tr>
<tr>
<td>Transport equipment</td>
<td>TRANSEQ</td>
<td>[ISIC and NACE Divisions 29 and 30]</td>
</tr>
<tr>
<td>Machinery</td>
<td>MACHINE</td>
<td>[ISIC and NACE Divisions 25, 26, 27 and 28] Fabricated metal products, machinery and equipment other than transport equipment.</td>
</tr>
<tr>
<td>Mining and quarrying</td>
<td>MINING</td>
<td>[ISIC Divisions 07 and 08 + Group 099 (NACE Divisions 07 and 08 + Group 09.9)] Mining (excluding fuels) and quarrying.</td>
</tr>
<tr>
<td>Food and tobacco</td>
<td>FOODPRO</td>
<td>[ISIC and NACE Divisions 10, 11 and 12].</td>
</tr>
<tr>
<td>Paper, pulp and print</td>
<td>PAPERPRO</td>
<td>[ISIC and NACE Divisions 17 and 18].</td>
</tr>
<tr>
<td>Wood and wood products</td>
<td>WOODPRO</td>
<td>[ISIC and NACE Division 16] Wood and wood products other than pulp and paper.</td>
</tr>
<tr>
<td>Construction</td>
<td>CONSTRUC</td>
<td>[ISIC and NACE Divisions 41, 42 and 43].</td>
</tr>
<tr>
<td>Textile and leather</td>
<td>TEXTILES</td>
<td>[ISIC and NACE Divisions 13, 14 and 15].</td>
</tr>
<tr>
<td>Not elsewhere specified - industry</td>
<td>INONSPEC</td>
<td>[ISIC and NACE Divisions 22, 31 and 32] 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.</td>
</tr>
<tr>
<td>Total transport</td>
<td>TOTTRANS</td>
<td>Electricity used for all transport activity irrespective of the economic sector, in which the activity occurs (except military fuel use, see Not elsewhere specified - Other). Electricity and purchased heat used for heating and lighting at railway and bus stations and airports is reported in Commercial and public services. [ISIC and NACE categories: Divisions 49, 50 and 51] Consumption in transport covers all transport activity and is divided into the following sub-sectors: rail, pipeline, road and non-specified transport.</td>
</tr>
<tr>
<td>Rail</td>
<td>RAIL</td>
<td>Electricity consumption for use in rail traffic, including industrial railways and consumption for use in rail transport as part of urban or suburban transport systems.</td>
</tr>
</tbody>
</table>
## Final Consumption

<table>
<thead>
<tr>
<th>Flow</th>
<th>Short name</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pipeline transport</td>
<td>PIPELINE</td>
<td>Electricity consumption in support of the operations of both sub-marine and overland pipelines transporting gases, liquids, slurries and other commodities up to the distributors network, including the energy used for pump stations and maintenance of the pipeline. Use for pipeline distribution of natural or manufactured gas, hot water or steam (ISIC 35) from the distributor to the final users is excluded and is reported in the Energy sector while use for the final distribution of water (ISIC 36) to household, industrial, commercial and other users is included in the Commercial/public services sector.</td>
</tr>
<tr>
<td>Road</td>
<td>ROAD</td>
<td>Electricity use in road vehicles. This includes electricity consumption in road transport vehicles such as electric buses, electric cars and trolley buses when the electricity is supplied from external sources to directly generate mechanical energy or used to charge batteries. Include use by agricultural vehicles on highways. Exclude use in stationary engines (see Not elsewhere specified – Other), non-highway use in tractors (see Agriculture/forestry – Other sector), and military use (see Not elsewhere specified – Other). It is to be noted that the consumption of vehicles running on rails in urban transport (trams, metro, etc.) is included under Rail transport.</td>
</tr>
<tr>
<td>Not elsewhere specified - transport</td>
<td>TRNONSPE</td>
<td>Electricity use for transport activities not included elsewhere.</td>
</tr>
<tr>
<td>Residential sector</td>
<td>RESIDENT</td>
<td>[ISIC and NACE Divisions 97 and 98] Includes consumption by households, excluding fuels used for transport. Includes households with employed persons.</td>
</tr>
<tr>
<td>Commercial and public services</td>
<td>COMMPUB</td>
<td>[ISIC and NACE Divisions 33, 36, 37, 38, 39, 45, 46, 47, 52, 53, 55, 56, 58, 59, 60, 61, 62, 63, 64, 65, 66, 68, 69, 70, 71, 72, 73, 74, 75, 77, 78, 79, 80, 81, 82, 84 (excluding Class 8422), 85, 86, 87, 88, 90, 91, 92, 93, 94, 95, 96 and 99]. Consumption by businesses and offices in the public and private sectors. Note that electricity and purchased heat use at railway, bus stations, shipping piers and airports is reported in this category and not shown in the Transport sector.</td>
</tr>
<tr>
<td>Agriculture/forestry</td>
<td>AGRICULT</td>
<td>[ISIC and NACE Divisions 01 and 02]. 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).</td>
</tr>
<tr>
<td>Fishing</td>
<td>FISHING</td>
<td>[ISIC and NACE Division 03]. 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.</td>
</tr>
<tr>
<td>Flow</td>
<td>Short name</td>
<td>Definition</td>
</tr>
<tr>
<td>------------------------------------</td>
<td>------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Non elsewhere specified - other</td>
<td>ONONSPEC</td>
<td>Includes all electricity and heat use not elsewhere specified as well as consumption in the above-designated categories for which separate figures have not been provided. This category includes military use for all mobile and stationary consumption (e.g. ships, aircraft, and energy used in living quarters) within the country regardless of whether the use is by the military of that country or by the military of another country.</td>
</tr>
</tbody>
</table>
## 4. PRODUCT DEFINITIONS

### Electricity and Heat Output

Electricity is expressed in gigawatt hours and heat is expressed in terajoules. Direct use of geothermal and solar thermal is in terajoules on a net calorific value basis.

<table>
<thead>
<tr>
<th>Product</th>
<th>Short name</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td>ELECTR</td>
<td><strong>Gross electricity</strong> production is the sum of the electrical energy production by all the generating sets concerned (including pumped storage) measured at the output terminals of the main generators. <strong>Net electricity</strong> production is equal to the gross electricity production less the electrical energy absorbed by the generating auxiliaries and the losses in the main generator transformers (Own use). Production in hydro stations includes production from pumped storage plants.</td>
</tr>
<tr>
<td>Heat</td>
<td>HEAT</td>
<td><strong>Gross heat production</strong> is the total heat produced by the installation and includes the heat used by the installation’s auxiliaries which use a hot fluid (space heating, liquid fuel heating etc.) and losses in the installation/network heat exchanges, as well as heat from chemical processes used as a primary energy form. Note that for <strong>autoproducers</strong>, heat used by the undertaking for its own processes is not included here; only heat sold to third parties is reported. As only heat sold to third parties is reported, gross heat production for autoproducers will be equal to net heat production. <strong>Net heat production</strong> is the heat supplied to the distribution system as determined from measurements of the outgoing and return flows.</td>
</tr>
</tbody>
</table>
Primary Electricity and Heat Sources

Electricity is expressed in gigawatt hours and heat is expressed in terajoules. Direct use of geothermal and solar thermal is in terajoules on a net calorific value basis.

<table>
<thead>
<tr>
<th>Product</th>
<th>Short name</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nuclear</td>
<td>NUCLEAR</td>
<td>Energy released by nuclear fission or nuclear fusion.</td>
</tr>
<tr>
<td>Hydro</td>
<td>HYDRO</td>
<td>Potential and kinetic energy of water converted into electricity in hydroelectric plants. Electricity from pure and mixed pump storage plants is included in both the total hydro and the pumped hydro.</td>
</tr>
<tr>
<td>Pumped hydro production</td>
<td>HYDPUMP</td>
<td>Electricity produced in hydroelectric power stations from water pumped above the station.</td>
</tr>
</tbody>
</table>
| Geothermal                       | GEOTHERM         | 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. |
  It includes solar photovoltaic and solar thermal.  
  - Passive solar energy for the direct heating, cooling and lighting of dwellings or other buildings is not included. |
| Solar photovoltaic               | SOLARPV          | Converts sunlight into electricity by the use of solar cells usually made of semi-conducting materials which exposed to light generate electrical current. |
| Solar thermal                    | SOLARTH          | It can consist of:  
  - solar thermal-electric plants, or  
  - equipment for the production of domestic/commercial hot water or for the seasonal heating of swimming pools (e.g. flat plate collectors). |
| Tide, wave and ocean             | TIDE             | Mechanical energy derived from tidal movement, wave motion or ocean current and exploited for electricity generation. |
| Wind                             | WIND             | Kinetic energy of wind exploited for electricity generation in wind turbines. |

Combustible Fuels

Electricity is expressed in gigawatt hours and heat is expressed in terajoules under this fuel aggregate.

<table>
<thead>
<tr>
<th>Product</th>
<th>Short name</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Combustible fuels</td>
<td>COMBFUEL</td>
<td>Refers to fuels that are capable of igniting or burning, i.e. reacting with oxygen to produce a significant rise in temperature. They are combusted directly for the production of electricity and/or heat.</td>
</tr>
</tbody>
</table>
## Coal and Coal Derived Products

With the exception of coal gases, the fuels in this section are expressed both in thousand tonnes and terajoules. The coal gases are expressed only in terajoules on a **gross calorific value** basis.

<table>
<thead>
<tr>
<th>Product</th>
<th>Short name</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hard coal and patent fuel</td>
<td>HARDCOAL</td>
<td>Prior to 1990, hard coal includes anthracite, coking coal, other bituminous coal, patent fuel, coke oven coke and gas coke.</td>
</tr>
<tr>
<td>Brown coal and BKB</td>
<td>BROWN</td>
<td>Prior to 1990, brown coal includes sub-bituminous coal, lignite, coal tar and BKB.</td>
</tr>
<tr>
<td>Coal gases</td>
<td>MANGAS</td>
<td>Prior to 1990, coal gases include coke oven gas, blast furnace gas oxygen steel furnace gas.</td>
</tr>
<tr>
<td>Anthracite</td>
<td>ANTCOAL</td>
<td>High rank coal normally used for industrial and residential applications. It has generally less than 10% volatile matter and a high carbon content (about 90% fixed carbon). Its gross calorific value is equal to or greater than 24 000 kJ/kg (5 732 kcal/kg) on an ash-free but moist basis.</td>
</tr>
<tr>
<td>Coking coal</td>
<td>COKCOAL</td>
<td>Bituminous coal with a quality that allows the production of a coke suitable to support a blast furnace charge. Its gross calorific value is equal to or greater than 24 000 kJ/kg (5 732 kcal/kg) on an ash-free but moist basis.</td>
</tr>
<tr>
<td>Other bituminous coal</td>
<td>BITCOAL</td>
<td>Coal used for steam raising purposes and includes all bituminous coal that is not included under coking coal nor anthracite. It is characterised by higher volatile matter than anthracite (more than 10%) and lower carbon content (less than 90% fixed carbon). Its gross calorific value is equal to or greater than 24 000 kJ/kg (5 732 kcal/kg) on an ash-free but moist basis.</td>
</tr>
<tr>
<td>Sub-bituminous coal</td>
<td>SUBCOAL</td>
<td>Non-agglomerating coal with a gross calorific value equal to or greater than 20 000 kJ/kg (4 777 kcal/kg) and less than 24 000 kJ/kg (5 732 kcal/kg) containing more than 31% volatile matter on an ash free moist basis.</td>
</tr>
<tr>
<td>Lignite</td>
<td>LIGNITE</td>
<td>Non-agglomerating coal with a gross calorific value less than 20 000 kJ/kg (4 777 kcal/kg) and greater than 31% volatile matter on an ash free moist basis.</td>
</tr>
<tr>
<td>Patent fuel</td>
<td>PATFUEL</td>
<td>A composition fuel manufactured from hard coal fines with the addition of a binding agent. The amount of patent fuel produced is, therefore, slightly higher than the actual amount of coal consumed in the transformation process.</td>
</tr>
<tr>
<td>Coke Oven Coke and Lignite Coke</td>
<td>OVENCOKE</td>
<td>The solid product obtained from the carbonisation of coal, principally coking coal, at high temperature. It is low in moisture content and volatile matter. Coke oven coke is used mainly in the iron and steel industry, acting as energy source and chemical agent. Coke breeze and foundry coke are included in this category. Semi-coke (a solid product obtained from carbonisation of coal at low temperature) is included in this category. This heading also includes coke, coke breeze and semi-coke made from lignite coal.</td>
</tr>
<tr>
<td>Gas coke</td>
<td>GASCOKE</td>
<td>By-product of hard coal used for the production of town gas in gas works. Gas coke is used for heating purposes.</td>
</tr>
</tbody>
</table>
## Coal and Coal Derived Products

With the exception of coal gases, the fuels in this section are expressed both in thousand tonnes and terajoules. The coal gases are expressed only in terajoules on a gross calorific value basis.

<table>
<thead>
<tr>
<th>Product</th>
<th>Short name</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coal tar</td>
<td>COALTAR</td>
<td>A result of the destructive distillation of bituminous coal or of the low-temperature carbonisation of brown coal. Coal tar from bituminous coal is the liquid by-product of the distillation of coal to make coke in the coke oven process. Coal tar can be further distilled into different organic products (e.g. benzene, toluene, naphthalene), which normally would be reported as a feedstock to the petrochemical industry.</td>
</tr>
<tr>
<td>BKB (Brown coal briquettes)</td>
<td>BKB</td>
<td>A composition fuel manufactured from lignite coal, or sub-bituminous coal, produced by briquetting under high pressure without the addition of a binding agent. These figures include dried lignite fines and dust.</td>
</tr>
<tr>
<td>Gas works gas</td>
<td>GASWKSGS</td>
<td>Covers all types of gases produced in public utility or private plants, whose main purpose is manufacture, transport and distribution of gas. It includes gas produced by carbonisation (including gas produced by coke ovens and transferred to gas works gas), by total gasification with or without enrichment with oil products (LPG, residual fuel oil, etc.), and by reforming and simple mixing of gases and/or air. The quantity of fuel is reported on a gross calorific value basis.</td>
</tr>
<tr>
<td>Coke oven gas</td>
<td>COKEOVGS</td>
<td>Obtained as a by-product of the manufacture of coke oven coke for the production of iron and steel. The quantity of fuel is reported on a gross calorific value basis.</td>
</tr>
<tr>
<td>Blast furnace gas</td>
<td>BLFURGS</td>
<td>Produced during the combustion of coke in blast furnaces in the iron and steel industry. It is recovered and used as a fuel partly within the plant and partly in other steel industry processes or in power stations equipped to burn it. The quantity of fuel is reported on a gross calorific value basis. In addition, off-gases from all iron-production reduction processes utilising air as the oxygen source (such as Direct reduced iron) are reported here.</td>
</tr>
<tr>
<td>Other recovered gases</td>
<td>OGASES</td>
<td>By-product of the production of steel in an oxygen furnace, recovered on leaving the furnace. The gases are also known as converter gas, LD gas or BOS gas. Also covers non-specified manufactured gases not mentioned above, such as combustible gases of solid carbonaceous origin recovered from manufacturing and chemical processes not elsewhere defined. The quantity of recuperated fuel is reported on a gross calorific value basis.</td>
</tr>
<tr>
<td>Peat</td>
<td>PEAT</td>
<td>A combustible soft, porous or compressed, fossil sedimentary deposit of plant origin with high water content (up to 90 per cent in the raw state), easily cut, of light to dark brown colour. Peat used for non-energy purposes is not included. Milled peat is included here.</td>
</tr>
<tr>
<td>Peat products</td>
<td>PEATPROD</td>
<td>Products such as peat briquettes derived directly or indirectly from sod peat and milled peat.</td>
</tr>
</tbody>
</table>
### Coal and Coal Derived Products

With the exception of coal gases, the fuels in this section are expressed both in thousand tonnes and terajoules. The coal gases are expressed only in terajoules on a **gross calorific value** basis.

<table>
<thead>
<tr>
<th>Product</th>
<th>Short name</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oil shale and oil sands</td>
<td>OILSHALE</td>
<td>Oil shale and oil sands are sedimentary rock which contains organic matter in the form of kerogen. Kerogen is a waxy hydrocarbon-rich material regarded as a precursor of petroleum. Oil shale may be burned directly or processed by heating to extract shale oil. Shale oil and other products derived from liquefaction are reported under “Other oil products”.</td>
</tr>
</tbody>
</table>

### Crude, NGL and Petroleum Products

The fuels in this section are expressed in both thousand tonnes and in terajoules on a **gross calorific basis**.

<table>
<thead>
<tr>
<th>Product</th>
<th>Short name</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liquid Fuels and Refinery Gas</td>
<td>LIQFUELS</td>
<td>Prior to 1990, liquid fuels include all petroleum products (crude oil, NGL, refinery gas, LPG, naphtha, jet fuel, other kerosene, gas/diesel oil, residual fuel oil, bitumen, petroleum coke, other oil products) and refinery gases.</td>
</tr>
<tr>
<td>Crude oil</td>
<td>CRUDEOIL</td>
<td>A mineral oil consisting of a mixture of hydrocarbons of natural origin and associated impurities, such as sulphur. It exists in the liquid phase under normal surface temperatures and pressure and its physical characteristics (density, viscosity, etc.) are highly variable. It includes field or lease condensates (separator liquids) which are recovered from associated and non-associated gas where it is commingled with the commercial crude oil stream.</td>
</tr>
<tr>
<td>Natural gas liquids</td>
<td>NGL</td>
<td>Liquid or liquefied hydrocarbons recovered from natural gas in separation facilities or gas processing plants. Natural gas liquids include ethane, propane, butane (normal and iso-), (iso) pentane and pentanes plus (sometimes referred to as natural gasoline or plant condensate).</td>
</tr>
<tr>
<td>Refinery gas</td>
<td>REFININGAS</td>
<td>A mixture of non-condensed gases mainly consisting of hydrogen, methane, ethane and olefins obtained during distillation of crude oil or treatment of oil products (e.g. cracking) in refineries. This also includes gases which are returned from the petrochemical industry.</td>
</tr>
<tr>
<td>Liquefied petroleum gases</td>
<td>LPG</td>
<td>Are light paraffinic hydrocarbons derived from the refinery processes, crude oil stabilisation and natural gas processing plants. They consist mainly of propane ((C_3H_8)) and butane ((C_4H_{10})) or a combination of the two. They could also include propylene, butylene, isobutene and isobutylene. LPG are normally liquefied under pressure for transportation and storage.</td>
</tr>
<tr>
<td>Product</td>
<td>Short name</td>
<td>Definition</td>
</tr>
<tr>
<td>-------------------------</td>
<td>------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Naphtha</td>
<td>NAPHTHA</td>
<td>A feedstock destined for either the petrochemical industry (e.g. ethylene manufacture or aromatics production) or for gasoline production by reforming or isomerisation within the refinery. Naphtha comprises material in the 30°C and 210°C distillation range or part of this range.</td>
</tr>
<tr>
<td>Kerosene type jet fuel</td>
<td>JETKERO</td>
<td>A distillate used for aviation turbine power units. It has the same distillation characteristics between 150°C and 300°C (generally not above 250°C) and flash point as kerosene. In addition, it has particular specifications (such as freezing point) which are established by the International Air Transport Association (IATA).</td>
</tr>
<tr>
<td>Kerosene</td>
<td>OTHKERO</td>
<td>Kerosene comprises refined petroleum distillate and is used in sectors other than aircraft transport. It distils between 150°C and 300°C.</td>
</tr>
<tr>
<td>Gas/diesel oil</td>
<td>GASDIES</td>
<td>A medium distillate distilling between 180°C and 380°C. It is comprised of road diesel, heating and other gasoil.</td>
</tr>
<tr>
<td>Fuel oil</td>
<td>RESFUEL</td>
<td>This covers all residual (heavy) fuel oils (including those obtained by blending). Kinematic viscosity is above 10 cSt at 80°C. The flash point is always above 50°C and density is always more than 0.90 kg/l.</td>
</tr>
<tr>
<td>Bitumen</td>
<td>BITUMEN</td>
<td>A solid, semi-solid or viscous hydrocarbon with a colloidal structure that is brown to black in colour. It is obtained by vacuum distillation of oil residues from atmospheric distillation of crude oil. Bitumen is often referred to as asphalt and is primarily used for surfacing of roads and for roofing material. This category includes fluidised and cut back bitumen as well as Orimulsion.</td>
</tr>
<tr>
<td>Petroleum coke</td>
<td>PETCOKE</td>
<td>A black solid by-product, obtained mainly by cracking and carbonising petroleum derived feedstock, vacuum bottoms, tar and pitches in processes such as delayed coking or fluid coking. It consists mainly of carbon (90 to 95%) and has a low ash content. It is used as a feedstock in coke ovens for the steel industry, for heating purposes, for electrode manufacture and for production of chemicals. The two most important qualities are &quot;green coke&quot; and &quot;calcinated coke&quot;. This category also includes &quot;catalyst coke&quot; deposited on the catalyst during refining processes; this coke is not recoverable and is usually burned as refinery fuel.</td>
</tr>
<tr>
<td>Non-specified petroleum products</td>
<td>OPRODS</td>
<td>All products not specifically mentioned above, for example: tar, sulphur, and shale oil. Oil products not specifically mentioned above.</td>
</tr>
</tbody>
</table>
### Gas

Natural gas is expressed in terajoules on a **gross calorific value** basis.

<table>
<thead>
<tr>
<th>Product</th>
<th>Short name</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural gas and gas works gas</td>
<td>GAS</td>
<td>Prior to 1990, this aggregate includes natural gas and gas works gas.</td>
</tr>
<tr>
<td>Natural gas</td>
<td>NATGAS</td>
<td>Consists mainly of methane occurring naturally in underground deposits. This includes colliery gas. The quantity of fuel used is reported on a <strong>gross</strong> calorific value basis.</td>
</tr>
</tbody>
</table>

### Biofuels and Wastes

The fuels in this section are expressed in terajoules on a **net calorific value** basis, with the exception of biodiesel, liquid biofuels and non-specified combustible renewables and waste, which are in thousand tonnes.

<table>
<thead>
<tr>
<th>Product</th>
<th>Short name</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Municipal waste</td>
<td>MUNWASTE</td>
<td>Prior to 1990, municipal waste consists of products that are combusted directly to produce heat and/or power and comprises wastes produced by households, industry, hospitals and the tertiary sector that are collected by local authorities for incineration at specific installations. After 1989, municipal waste is split into renewable and non-renewable.</td>
</tr>
<tr>
<td>Industrial waste</td>
<td>INDWASTE</td>
<td>Wastes of industrial non-renewable origin (solids or liquids) combusted directly for the production of electricity and/or heat. Renewable industrial waste is reported in the Solid biomass, Biogas and/or Liquid Biofuels categories. The quantity of fuel used is reported on a <strong>net</strong> calorific value basis.</td>
</tr>
<tr>
<td>Municipal waste (renewable)</td>
<td>MUNWASTER</td>
<td>Portion of waste produced by households, industry, hospitals and the tertiary sector which is biological material collected by local authorities and incinerated at specific installations. The quantity of fuel used is reported on a <strong>net</strong> calorific value basis.</td>
</tr>
<tr>
<td>Municipal waste (non-renewable)</td>
<td>MUNWASTEN</td>
<td>Portion of waste produced by households, industry, hospitals and the tertiary sector which is non-biological material collected by local authorities and incinerated at specific installations. The quantity of fuel used is reported on a <strong>net</strong> calorific value basis.</td>
</tr>
</tbody>
</table>
## Biofuels and Wastes

The fuels in this section are expressed in terajoules on a net calorific value basis, with the exception of biodiesel, liquid biofuels and non-specified combustible renewables and waste, which are in thousand tonnes.

<table>
<thead>
<tr>
<th>Product</th>
<th>Short name</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solid biofuels</td>
<td>SBIOFUELS</td>
<td>Covers organic, non-fossil material of biological origin which may be used as fuel for heat production or electricity generation. It comprises:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- <strong>Charcoal</strong>: covers the solid residue of the destructive distillation and pyrolysis of wood and other vegetal material.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- <strong>Fuelwood, wood residues and by-products</strong>: 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. The quantity of fuel used is reported on a net calorific value basis.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- <strong>Black liquor</strong>: Energy from the alkaline-spent liquor obtained from the digesters during the production of sulphate or soda pulp required for paper manufacture.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- <strong>Bagasse</strong>: Fuel obtained from the fibre which remains after juice extraction in sugar cane processing.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- <strong>Animal waste</strong>: 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.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- <strong>Other vegetal materials and residuals</strong>: 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.</td>
</tr>
<tr>
<td>Biogas</td>
<td>BIOGASES</td>
<td>A gas composed principally of methane and carbon dioxide produced by anaerobic digestion of biomass, or by thermal processes. The quantity of fuel used is reported on a net calorific value basis. It includes Landfill gas, Sewage sludge gas, Other biogases from anaerobic digestion and Biogases from thermal processes.</td>
</tr>
<tr>
<td>Landfill gas</td>
<td>LANDFILL</td>
<td>Landfill gas is formed by the digestion of landfilled wastes. Data for inputs and outputs to heat production and electricity generation are available up to 2011.</td>
</tr>
<tr>
<td>Sewage sludge gas</td>
<td>SLUDGEGS</td>
<td>Sewage sludge gas, produced from the anaerobic fermentation of sewage sludge. Data for inputs and outputs to heat production and electricity generation are available up to 2011.</td>
</tr>
<tr>
<td>Other biogases</td>
<td>OBIOGAS</td>
<td>Other biogases, such as biogas produced from the anaerobic fermentation of animal slurries and of wastes in abattoirs, breweries and other agro-food industries. Data for inputs and outputs to heat production and electricity generation are available up to 2011.</td>
</tr>
</tbody>
</table>
Biofuels and Wastes

The fuels in this section are expressed in terajoules on a \textit{net calorific value} basis, with the exception of biodiesel, liquid biofuels and non-specified combustible renewables and waste, which are in thousand tonnes.

<table>
<thead>
<tr>
<th>Product</th>
<th>Short name</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biodiesel</td>
<td>BIODIESEL</td>
<td>This category includes biodiesel (a methyl-ester produced from vegetable or animal oil, of diesel quality), biodimethylether (dimethylether produced from biomass), Fischer-Tropsch (Fischer-Tropsch produced from biomass), cold pressed biooil (oil produced from oil seed through mechanical processing only) used straight as road diesel or for electricity and heat generation.</td>
</tr>
<tr>
<td>Liquid biofuels</td>
<td>OBIOLIQ</td>
<td>Liquid fuels produced from biofuels, biodegradable organic waste, used frying oils, or other organic material. This category includes liquid biofuels not included in biodiesels. Please note that the quantities of liquid biofuels reported in this category should relate to the quantities of biofuel and not to the total volume of liquids into which the biofuels are blended.</td>
</tr>
<tr>
<td>Non-specified comb. renew. and waste</td>
<td>RENEWNS</td>
<td>This item is used when the detailed breakdown for primary biofuels and waste is not available.</td>
</tr>
</tbody>
</table>
## Other Generation Sources

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

<table>
<thead>
<tr>
<th>Product</th>
<th>Short name</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heat pumps</td>
<td>HEATPUMP</td>
<td>Heat output from heat pumps only where the heat is sold to third parties (i.e. in cases where production occurs in the Transformation sector).</td>
</tr>
<tr>
<td>Electric boilers</td>
<td>BOILER</td>
<td>Heat from electric boilers where the output is sold to third parties.</td>
</tr>
<tr>
<td>Heat from Chemical Sources</td>
<td>CHEMHEAT</td>
<td>Heat originating from processes without input energy, such as a chemical reaction (e.g. the treatment of zinc oxide ore with hydrochloric acid). Note that waste heat originating from energy driven processes is not considered as a primary energy source. Therefore, it is reported as heat produced from the corresponding fuel.</td>
</tr>
<tr>
<td>Other sources</td>
<td>OTHER</td>
<td>Electricity production from sources other than those listed, e.g. from fuel cells. Heat from other sources; for example, recovered waste heat from industry sold to third parties.</td>
</tr>
<tr>
<td>Heat output from non-specified comb fuels</td>
<td>HEATNS</td>
<td>This item is only used if the detailed breakdown is not available.</td>
</tr>
<tr>
<td>Total Sources</td>
<td>TOTAL</td>
<td>This item represents the sum of all the sources of electricity and heat generation.</td>
</tr>
</tbody>
</table>
## Electricity and Heat Generation Flows

<table>
<thead>
<tr>
<th>Flow</th>
<th>Short name</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fuel input (kton)</td>
<td>INPUTTON</td>
<td>This is the quantity of fuel used to produce electricity and heat measured in thousand metric tons.</td>
</tr>
<tr>
<td>Fuel input (TJ)</td>
<td>INPUTTJ</td>
<td>This is the quantity of fuel used to produce electricity and heat measured in terajoules (TJ). Quantities are reported using net calorific values, except for gases which are reported in gross calorific values.</td>
</tr>
<tr>
<td>Gross electricity</td>
<td>GELEPROD</td>
<td>Gross Electricity Production is the sum of the electrical energy production by all the generating sets concerned (including pumped storage) measured at the output terminals of the main generators.</td>
</tr>
<tr>
<td>production</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Net electricity</td>
<td>NELEPROD</td>
<td>Net Electricity Production is equal to the gross electricity production less the electrical energy absorbed by the generating auxiliaries and the losses in the main generator transformers.</td>
</tr>
<tr>
<td>production</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gross heat production</td>
<td>GHEATPRO</td>
<td>Gross Heat Production is the total heat produced by the installation and includes the heat used by the installation's auxiliaries which use a hot fluid (space heating, liquid fuel heating, etc.) and losses in the installation/network heat exchanges.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Note that for autoproducers, heat used by the undertaking for its own processes is not included here; only heat sold to third parties is reported. As only heat sold to third parties is reported, gross heat production for autoproducers is equal to net heat production.</td>
</tr>
<tr>
<td>Net heat production</td>
<td>NHEATPRO</td>
<td>Net Heat Production is the heat supplied to the distribution system as determined from measurements of the outgoing and return flows.</td>
</tr>
<tr>
<td>Flow</td>
<td>Short name</td>
<td>Definition</td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Main activity producer electricity plants</td>
<td>MAINELEC</td>
<td>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. Main activity producers (formerly referred to as public supply undertakings) generate electricity for sale to third parties, as their primary activity. They may be privately or publicly owned. Note that the sale need not take place through the public grid.</td>
</tr>
<tr>
<td>Main activity producer CHP plants</td>
<td>MAINCHP</td>
<td>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. Main activity producers (formerly referred to as public supply undertakings) generate electricity and/or heat for sale to third parties, as their primary activity. They may be privately or publicly owned. Note that the sale need not take place through the public grid.</td>
</tr>
<tr>
<td>Main activity producer heat plants</td>
<td>MAINHEAT</td>
<td>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. Main activity producers (formerly referred to as public supply undertakings) generate heat for sale to third parties, as their primary activity. They may be privately or publicly owned. Note that the sale need not take place through the public grid.</td>
</tr>
<tr>
<td>Auto-producer electricity plants</td>
<td>AUTOELEC</td>
<td>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. Auto-producer undertakings generate electricity wholly or partly for their own use as an activity which supports their primary activity. They may be privately or publicly owned.</td>
</tr>
<tr>
<td>Auto-producer CHP plants</td>
<td>AUTOCHP</td>
<td>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. 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. Auto-producer undertakings generate electricity and/or heat, wholly or partly for their own use as an activity which supports their primary activity. They may be privately or publicly owned.</td>
</tr>
</tbody>
</table>
### Plant Type

<table>
<thead>
<tr>
<th>Flow</th>
<th>Short name</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auto-producer heat plants</td>
<td>AUTOHEAT</td>
<td>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. Auto-producer undertakings generate heat, wholly or partly for their own use as an activity which supports their primary activity. They may be privately or publicly owned.</td>
</tr>
<tr>
<td>Total main activity producer plants</td>
<td>MAINTOT</td>
<td>This refers to inputs to and outputs from all main activity producer plants.</td>
</tr>
<tr>
<td>Total autoproducer plants</td>
<td>AUTOTOT</td>
<td>This refers to inputs to and outputs from all autoproducer plants.</td>
</tr>
<tr>
<td>Total plants</td>
<td>TOTAL</td>
<td>This refers to inputs to and outputs from all plants.</td>
</tr>
</tbody>
</table>
## Electricity Capacity

<table>
<thead>
<tr>
<th>Flow</th>
<th>Short name</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total capacity</td>
<td>TOTCAP</td>
<td>The capacity at 31st December is reported. It includes electrical capacity of both electricity (only) and CHP plants. Data for fuel cells are reported in the row &quot;Other fuel sources&quot;. Net Maximum Electrical Capacity: the sum of the net maximum capacities of all stations taken individually at a given period of operation. The 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 (i.e. after taking the power supplies for the station auxiliaries and allowing for the losses in those transformers considered integral to the station). It represents the sum of all individual plants' maximum capacities available to run continuously throughout a prolonged period of operation in a day. 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). 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 hydro plant; grade and quantity of fuel in hand and water supply, temperature, and purity in the case of thermal plant, and assuming that the output and method of production in CHP plant are those which lend to maximum electricity production). <strong>Mixed (hydro) plants</strong> are hydro plants with natural inflow where part or all equipment can be used for pumping water uphill and also for producing electricity from natural inflow and pump storage. <strong>Pure pumped storage plants</strong> are plants with no natural inflow, producing electricity only from water previously pumped uphill.</td>
</tr>
<tr>
<td>Solid/liquid</td>
<td>SOLLIQ</td>
<td>Refers to units capable of generating electricity using solid and liquid fuel.</td>
</tr>
<tr>
<td>Solid/natural gas</td>
<td>SOLGAS</td>
<td>Refers to units capable of generating electricity using solid fuel and natural gas.</td>
</tr>
<tr>
<td>Liquid/natural gas</td>
<td>LIQGAS</td>
<td>Refers to units capable of generating electricity using liquid fuels and natural gas.</td>
</tr>
<tr>
<td>Solid/liquid/gas</td>
<td>SOLIGAS</td>
<td>Refers to units capable of generating electricity using solid, liquid fuels and natural gas.</td>
</tr>
<tr>
<td>Steam</td>
<td>STEAM</td>
<td>Refers to two main types of steam turbines -- non-condensing (or open cycle), also called back-pressure turbines, and condensing turbines (or closed cycle). In non-condensing turbines, the exhaust steam leaving the turbine is used either as co-generated process steam or, more rarely, released into the atmosphere. In a condensing turbine, the exhaust steam is condensed and the water thus formed supplies the feed-water for the generator. The boilers supplying steam turbines can be fuelled by all forms of fossil fuels.</td>
</tr>
</tbody>
</table>
### Electricity Capacity

<table>
<thead>
<tr>
<th>Flow</th>
<th>Short name</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal combustion</td>
<td>INTCOMB</td>
<td>Refers to the engines based on the gasoline or diesel cycle, which work on the spark ignition or the compression-ignition principle. Diesel-type engines can use a variety of fuels ranging from natural gas to liquid fuels.</td>
</tr>
<tr>
<td>Gas turbine</td>
<td>GASTURB</td>
<td>The gas turbine uses high temperature, high pressure gas as fuel, in which part of the heat supplied by the gas is converted into rotational energy. Fuel can be natural gas, coal gases or liquid fuels.</td>
</tr>
<tr>
<td>Combined cycle</td>
<td>COMBINED</td>
<td>The combined cycle system refers to electricity produced by coupling two heat engines in a sequence to drive generators. The heat discharged from one heat engine serves as the energy source for the next engine. The gas turbine is generally used as the first heat engine and a conventional condensing steam turbine at the second stage.</td>
</tr>
<tr>
<td>Other Type of Generation</td>
<td>OTHGEN</td>
<td>This refers to electric generating capacity not included elsewhere.</td>
</tr>
<tr>
<td>Peak load</td>
<td>PEAKLOAD</td>
<td>This is the highest value of the power absorbed or supplied by a network or combination of networks within the country. The peak load demand is the highest simultaneous demand for electricity satisfied during the year. Note that the electricity supply at the time of peak demand may include demand satisfied by imported electricity or alternatively the demand may include exports of electricity. Total peak load on the national grid is not the sum of the peak loads during the year on every power station as they may occur at different times.</td>
</tr>
<tr>
<td>Capacity at peak</td>
<td>PEAKCAP</td>
<td>The available capacity of an installation at peak period is the maximum power at which it can be operated under the prevailing conditions at the time, assuming no external constraints. It depends on the technical state of the equipment and its ability to operate, and may differ from the Net maximum capacity due to lack of water for hydro capacity, plant maintenance, unanticipated shutdown, or other outages at the time of peak load.</td>
</tr>
</tbody>
</table>
5. GEOGRAPHICAL COVERAGE

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 country or territory, as the case may be. Data start in 1960 for OECD countries and regions, and in 1971 for non-OECD countries and regions, unless otherwise specified.

<table>
<thead>
<tr>
<th>Long name</th>
<th>Short name</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>AUSTRALI</td>
<td>Excludes the overseas territories.</td>
</tr>
<tr>
<td>Austria</td>
<td>AUSTRIA</td>
<td></td>
</tr>
<tr>
<td>Belgium</td>
<td>BELGIUM</td>
<td></td>
</tr>
<tr>
<td>Canada</td>
<td>CANADA</td>
<td></td>
</tr>
<tr>
<td>Chile</td>
<td>CHILE</td>
<td>Data start in 1971.</td>
</tr>
<tr>
<td>Czech Republic</td>
<td>CZECH</td>
<td>Data start in 1971.</td>
</tr>
<tr>
<td>Denmark</td>
<td>DENMARK</td>
<td>Excludes the Faroe Islands and Greenland</td>
</tr>
<tr>
<td>Estonia</td>
<td>ESTONIA</td>
<td></td>
</tr>
<tr>
<td>Finland</td>
<td>FINLAND</td>
<td></td>
</tr>
<tr>
<td>France</td>
<td>FRANCE</td>
<td>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.</td>
</tr>
<tr>
<td>Germany</td>
<td>GERMANY</td>
<td>Includes the new federal states of Germany from 1970 onwards</td>
</tr>
<tr>
<td>Greece</td>
<td>GREECE</td>
<td></td>
</tr>
<tr>
<td>Hungary</td>
<td>HUNGARY</td>
<td>Data start in 1965.</td>
</tr>
<tr>
<td>Iceland</td>
<td>ICELAND</td>
<td></td>
</tr>
<tr>
<td>Ireland</td>
<td>IRELAND</td>
<td></td>
</tr>
</tbody>
</table>
## Countries and Regions

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 country or territory, as the case may be. Data start in 1960 for OECD countries and regions, and in 1971 for non-OECD countries and regions, unless otherwise specified.

<table>
<thead>
<tr>
<th>Long name</th>
<th>Short name</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Israel</td>
<td>ISRAEL</td>
<td>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. Data start in 1971.</td>
</tr>
<tr>
<td>Italy</td>
<td>ITALY</td>
<td>Includes San Marino and the Holy See.</td>
</tr>
<tr>
<td>Japan</td>
<td>JAPAN</td>
<td>Includes Okinawa.</td>
</tr>
<tr>
<td>Korea</td>
<td>KOREA</td>
<td>Data start in 1971.</td>
</tr>
<tr>
<td>Latvia</td>
<td>LATVIA</td>
<td>Data start in 1990. Prior to that, they are included within Former Soviet Union. Note: Latvia joined the OECD in July 2016.</td>
</tr>
<tr>
<td>Luxembourg</td>
<td>LUXEMBOU</td>
<td></td>
</tr>
<tr>
<td>Mexico</td>
<td>MEXICO</td>
<td>Data start in 1971.</td>
</tr>
<tr>
<td>Netherlands</td>
<td>NETHLAND</td>
<td>Excludes Suriname, Aruba and the other former Netherlands Antilles (Bonaire, Curaçao, Saba, Saint Eustatius and Sint Maarten).</td>
</tr>
<tr>
<td>New Zealand</td>
<td>NZ</td>
<td></td>
</tr>
<tr>
<td>Norway</td>
<td>NORWAY</td>
<td></td>
</tr>
<tr>
<td>Poland</td>
<td>POLAND</td>
<td></td>
</tr>
<tr>
<td>Portugal</td>
<td>PORTUGAL</td>
<td>Includes the Azores and Madeira.</td>
</tr>
<tr>
<td>Slovak Republic</td>
<td>SLOVAKIA</td>
<td>Data start in 1971.</td>
</tr>
<tr>
<td>Slovenia</td>
<td>SLOVENIA</td>
<td>Data start in 1990. Prior to that, they are included within Former Yugoslavia.</td>
</tr>
<tr>
<td>Spain</td>
<td>SPAIN</td>
<td>Includes the Canary Islands.</td>
</tr>
<tr>
<td>Sweden</td>
<td>SWEDEN</td>
<td></td>
</tr>
<tr>
<td>Switzerland</td>
<td>SWITLAND</td>
<td>Does not include Liechtenstein.</td>
</tr>
<tr>
<td>Turkey</td>
<td>TURKEY</td>
<td></td>
</tr>
<tr>
<td>United Kingdom</td>
<td>UK</td>
<td>Does not include the Channel Islands and the Isle of Man.</td>
</tr>
<tr>
<td>United States</td>
<td>USA</td>
<td>Includes the 50 states and the District of Columbia.</td>
</tr>
</tbody>
</table>
## Countries and Regions

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<thead>
<tr>
<th>Long name</th>
<th>Short name</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>OECD Total</td>
<td>OECDTOT</td>
<td>Includes Australia, Austria, Belgium, Canada, Chile, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel¹, Italy, Japan, Korea, Latvia², Luxembourg, Mexico, the Netherlands, New Zealand, Norway, Poland, Portugal, the Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey, the United Kingdom and the United States. Estonia, Latvia and Slovenia are included starting in 1990. Prior to 1990, data for Estonia and Latvia are included in Former Soviet Union and data for Slovenia in Former Yugoslavia. 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.</td>
</tr>
<tr>
<td>OECD Americas</td>
<td>OECDAM</td>
<td>Includes Canada, Chile, Mexico and the United States.</td>
</tr>
<tr>
<td>OECD Asia Oceania</td>
<td>OECDAO</td>
<td>Includes Australia, Israel¹, Japan, Korea and New Zealand.</td>
</tr>
<tr>
<td>OECD Europe</td>
<td>OECDEUR</td>
<td>Includes Austria, Belgium, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia², Luxembourg, the Netherlands, Norway, Poland, Portugal, the Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom. Estonia, Latvia and Slovenia are included starting in 1990. Prior to 1990, data for Estonia and Latvia are included in Former Soviet Union and data for Slovenia in Former Yugoslavia.</td>
</tr>
</tbody>
</table>

¹. 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.
². Latvia became an OECD member in July 2016. Accordingly, Latvia appears in the list of OECD members and is included in the zone aggregates for data from 1990, starting with the 2017 edition. Prior to 1990, data for Latvia are included in Former Soviet Union.
³. 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.
**Countries and Regions**

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<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>IEA Total</td>
<td>IEATOT</td>
<td>Includes Australia, Austria, Belgium, Canada, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Korea, Luxembourg, Mexico, the Netherlands, New Zealand, Norway, Portugal, the Slovak Republic, Spain, Sweden, Switzerland, Turkey, the United Kingdom and the United States. Estonia is included starting in 1990. Prior to 1990, data for Estonia are included in Former Soviet Union.</td>
</tr>
<tr>
<td>The IEA and Accession/Association countries</td>
<td>IEAFAMILY</td>
<td>Includes: IEA member countries: Australia, Austria, Belgium, Canada, the Czech Republic, Denmark, Estonia, 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 countries: Chile; Association countries: Brazil, the People’s Republic of China; India; Indonesia; Morocco; Singapore; Thailand.</td>
</tr>
<tr>
<td>Argentina</td>
<td>ARGENTINA</td>
<td></td>
</tr>
<tr>
<td>Bolivia</td>
<td>BOLIVIA</td>
<td></td>
</tr>
<tr>
<td>Brazil</td>
<td>BRAZIL</td>
<td></td>
</tr>
<tr>
<td>Colombia</td>
<td>COLOMBIA</td>
<td></td>
</tr>
<tr>
<td>Costa Rica</td>
<td>COSTARICA</td>
<td></td>
</tr>
<tr>
<td>Cuba</td>
<td>CUBA</td>
<td></td>
</tr>
<tr>
<td>Netherlands Antilles/ Curaçao</td>
<td>CURACAO</td>
<td>The Netherlands Antilles was dissolved on 10 October 2010, resulting in two new constituent countries, Curaçao and Sint Maarten, with the remaining islands joining Netherlands as special municipalities. In this edition, the methodology for accounting for the energy statistics of Netherlands Antilles has been revised in order to follow the above-mentioned geographical changes. From 2012 onwards, data now account for the energy statistics of Curaçao Island only. Prior to 2012, data remain unchanged and still cover the entire territory of the former Netherlands Antilles.</td>
</tr>
<tr>
<td>Dominican Republic</td>
<td>DOMINICANR</td>
<td></td>
</tr>
<tr>
<td>Ecuador</td>
<td>ECUADOR</td>
<td></td>
</tr>
<tr>
<td>El Salvador</td>
<td>ELSALVADOR</td>
<td></td>
</tr>
</tbody>
</table>

4. Estonia is included starting in 1990. Prior to 1990, data for Estonia are included in Former Soviet Union.
### Countries and Regions

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<tbody>
<tr>
<td>Guatemala</td>
<td>GUATEMALA</td>
<td></td>
</tr>
<tr>
<td>Haiti</td>
<td>HAITI</td>
<td></td>
</tr>
<tr>
<td>Honduras</td>
<td>HONDURAS</td>
<td></td>
</tr>
<tr>
<td>Jamaica</td>
<td>JAMAICA</td>
<td></td>
</tr>
<tr>
<td>Nicaragua</td>
<td>NICARAGUA</td>
<td></td>
</tr>
<tr>
<td>Panama</td>
<td>PANAMA</td>
<td></td>
</tr>
<tr>
<td>Paraguay</td>
<td>PARAGUAY</td>
<td></td>
</tr>
<tr>
<td>Peru</td>
<td>PERU</td>
<td></td>
</tr>
<tr>
<td>Suriname</td>
<td>SURINAME</td>
<td>Data for Suriname are available starting in 2000. Prior to that, they are included in Other non-OECD Americas.</td>
</tr>
<tr>
<td>Trinidad</td>
<td>TRINIDAD</td>
<td></td>
</tr>
<tr>
<td>Uruguay</td>
<td>URUGUAY</td>
<td></td>
</tr>
<tr>
<td>Venezuela</td>
<td>VENEZUELA</td>
<td></td>
</tr>
<tr>
<td>Other non-OECD Americas</td>
<td>OTHERLATIN</td>
<td>Includes Anguilla, Antigua and Barbuda; Aruba; Bahamas; Barbados; Belize; Bermuda; Bonaire (from 2012); British Virgin Islands; the Cayman Islands; Dominica; Falkland Islands (Malvinas); French Guiana; Grenada; Guadeloupe; Guyana; Martinique; Montserrat; Puerto Rico (for natural gas and electricity); 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); and Turks and Caicos Islands.</td>
</tr>
<tr>
<td>Non-OECD Americas</td>
<td>LATINAMERI</td>
<td>Includes Argentina; Plurinational State of Bolivia (Bolivia); Brazil; Colombia; Costa Rica; Cuba; Curaçao; Dominican Republic; Ecuador; El Salvador; Guatemala; Haiti; Honduras; Jamaica; Nicaragua; Panama; Paraguay; Peru; Trinidad and Tobago; Uruguay; Bolivarian Republic of Venezuela (Venezuela) and Other non-OECD Americas.</td>
</tr>
<tr>
<td>Albania</td>
<td>ALBANIA</td>
<td></td>
</tr>
<tr>
<td>Bosnia</td>
<td>BOSNIAHERZ</td>
<td>Data for Bosnia and Herzegovina are available starting in 1990. Prior to that, they are included in Former Yugoslavia.</td>
</tr>
<tr>
<td>Bulgaria</td>
<td>BULGARIA</td>
<td></td>
</tr>
<tr>
<td>Croatia</td>
<td>CROATIA</td>
<td>Data for Croatia are available starting in 1990. Prior to that, they are included in Former Yugoslavia.</td>
</tr>
</tbody>
</table>
## Countries and Regions

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<table>
<thead>
<tr>
<th>Long name</th>
<th>Short name</th>
<th>Definition</th>
</tr>
</thead>
</table>
| Cyprus                                     | CYPRUS     | **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. |
| Former Yugoslav Republic of Macedonia      | FYROM      | Data for Former Yugoslav Rep. of Macedonia are available starting in 1990. Prior to that, they are included in Former Yugoslavia.                                                                            |
| Gibraltar                                  | GIBRALTAR  |                                                                                                                                                                                                          |
| Kosovo                                     | KOSOVO     | Data for Kosovo are available starting in 2000. Between 1990 and 1999, data for Kosovo are included in Serbia. Prior to 1990, they are included in Former Yugoslavia. 
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. |
| Malta                                      | MALTA      |                                                                                                                                                                                                          |
| Montenegro                                 | MONTENEGRO | Data for Montenegro are available starting in 2005. Between 1990 and 2004, data for Montenegro are included in Serbia. Prior to 1990, they are included in Former Yugoslavia. |
| Romania                                    | ROMANIA    |                                                                                                                                                                                                          |
| Serbia                                     | SERBIA     | Data for Serbia are available starting in 1990. Prior to that, they are included in Former Yugoslavia. Serbia includes Montenegro until 2004 and Kosovo until 1999. |
| Former Yugoslavia (if no detail)           | YUGOND     | Before 1990, includes Bosnia and Herzegovina; Croatia; Former Yugoslav Republic of Macedonia; Kosovo; Montenegro; Slovenia and Serbia.                                                                    |

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6. 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.
Countries and Regions

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<tr>
<th>Long name</th>
<th>Short name</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-OECD Europe and Eurasia</td>
<td>EURASIA</td>
<td>Includes Albania; Armenia; Azerbaijan; Belarus; Bosnia and Herzegovina; Bulgaria; Croatia; Cyprus(^7); Former Yugoslav Republic of Macedonia; Georgia; Gibraltar; Kazakhstan; Kosovo; Kyrgyzstan; Lithuania(^8); Malta; Republic of Moldova (Moldova); Montenegro; Romania; Russian Federation; Serbia(^5); Tajikistan; Turkmenistan; Ukraine; Uzbekistan; Former Soviet Union (prior to 1990) and Former Yugoslavia (prior to 1990).</td>
</tr>
<tr>
<td>Armenia</td>
<td>ARMENIA</td>
<td>Data for Armenia are available starting in 1990. Prior to that, they are included in Former Soviet Union.</td>
</tr>
<tr>
<td>Azerbaijan</td>
<td>AZERBAIJAN</td>
<td>Data for Azerbaijan are available starting in 1990. Prior to that, they are included in Former Soviet Union.</td>
</tr>
<tr>
<td>Belarus</td>
<td>BELARUS</td>
<td>Data for Belarus are available starting in 1990. Prior to that, they are included in Former Soviet Union.</td>
</tr>
<tr>
<td>Georgia</td>
<td>GEORGIA</td>
<td>Data for Georgia are available starting in 1990. Prior to that, they are included in Former Soviet Union.</td>
</tr>
<tr>
<td>Kazakhstan</td>
<td>KAZAKHSTAN</td>
<td>Data for Kazakhstan are available starting in 1990. Prior to that, they are included in Former Soviet Union.</td>
</tr>
<tr>
<td>Kyrgyzstan</td>
<td>KYRGYZSTAN</td>
<td>Data for Kyrgyzstan are available starting in 1990. Prior to that, they are included in Former Soviet Union.</td>
</tr>
<tr>
<td>Lithuania</td>
<td>LITHUANIA</td>
<td>Data for Lithuania are available starting in 1990. Prior to that, they are included in Former Soviet Union.</td>
</tr>
<tr>
<td>Republic of Moldova</td>
<td>MOLDOVA</td>
<td>Data for Moldova are available starting in 1990. Prior to that, they are included in Former Soviet Union.</td>
</tr>
<tr>
<td>Russian Federation</td>
<td>RUSSIA</td>
<td>Data for Russia are available starting in 1990. Prior to that, they are included in Former Soviet Union.</td>
</tr>
<tr>
<td>Tajikistan</td>
<td>TAIKJISTAN</td>
<td>Data for Tajikistan are available starting in 1990. Prior to that, they are included in Former Soviet Union.</td>
</tr>
<tr>
<td>Turkmenistan</td>
<td>TURKMEANIST</td>
<td>Data for Turkmenistan are available starting in 1990. Prior to that, they are included in Former Soviet Union.</td>
</tr>
</tbody>
</table>

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7. 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".

8. 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.

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INTERNATIONAL ENERGY AGENCY
## Countries and Regions

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<table>
<thead>
<tr>
<th>Long name</th>
<th>Short name</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ukraine</td>
<td>UKRAINE</td>
<td>Data for Ukraine are available starting in 1990. Prior to that, they are included in Former Soviet Union.</td>
</tr>
<tr>
<td>Uzbekistan</td>
<td>UZBEKISTAN</td>
<td>Data for Uzbekistan are available starting in 1990. Prior to that, they are included in Former Soviet Union.</td>
</tr>
<tr>
<td>Former Soviet Union (if no detail)</td>
<td>FSUND</td>
<td>Before 1990, includes Armenia; Azerbaijan; Belarus; Estonia; Georgia; Kazakhstan; Kyrgyzstan; Latvia; Lithuania; Republic of Moldova; Russian Federation; Tajikistan; Turkmenistan; Ukraine and Uzbekistan.</td>
</tr>
<tr>
<td>Algeria</td>
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<td>Angola</td>
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<tr>
<td>Benin</td>
<td>BENIN</td>
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</tr>
<tr>
<td>Botswana</td>
<td>BOTSWANA</td>
<td>Data for Botswana are available from 1981. Prior to that, they are included in Other Africa.</td>
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<tr>
<td>Cameroon</td>
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<tr>
<td>Congo</td>
<td>CONGO</td>
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<tr>
<td>Democratic Republic of the Congo</td>
<td>CONGOREP</td>
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<td>Côte d’Ivoire</td>
<td>COTEIVOIRE</td>
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<tr>
<td>Egypt</td>
<td>EGYPT</td>
<td>Data for Egypt are reported on a fiscal year basis. Data for 2016 are for 1 July 2016-30 June 2017.</td>
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<tr>
<td>Eritrea</td>
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<td>Data for Eritrea are available from 1992. Prior to that, they are included in Ethiopia.</td>
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<td>Ethiopia</td>
<td>ETHIOPIA</td>
<td>Ethiopia includes Eritrea prior to 1992.</td>
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<tr>
<td>Gabon</td>
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<td>Ghana</td>
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<td>Kenya</td>
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<td>Morocco</td>
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<td>Mozambique</td>
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<tr>
<td>Namibia</td>
<td>NAMIBIA</td>
<td>Data for Namibia are available starting in 1991. Prior to that, data are included in Other Africa.</td>
</tr>
<tr>
<td>Niger</td>
<td>NIGER</td>
<td>Prior to 2000, data for Niger are presented in Other Africa.</td>
</tr>
</tbody>
</table>
## Countries and Regions

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<tr>
<th>Long name</th>
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<tbody>
<tr>
<td>Nigeria</td>
<td>NIGERIA</td>
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<tr>
<td>Senegal</td>
<td>SENEGAL</td>
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<tr>
<td>South Africa</td>
<td>SOUTHAFRIC</td>
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<tr>
<td>South Sudan</td>
<td>SSUDAN</td>
<td>Data for South Sudan are available from 2012. Prior to 2012, they are included in Sudan.</td>
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<tr>
<td>Sudan</td>
<td>SUDAN</td>
<td>South Sudan became an independent country on 9 July 2011. From 2012, data for South Sudan are reported separately.</td>
</tr>
<tr>
<td>United Republic of Tanzania</td>
<td>TANZANIA</td>
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<td>Togo</td>
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<td>Tunisia</td>
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<td>Zimbabwe</td>
<td>ZIMBABWE</td>
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<tr>
<td>Other Africa</td>
<td>OTHERAFRIC</td>
<td>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; Seychelles; Sierra Leone; Somalia; Swaziland; Uganda and Western Sahara (from 1990).</td>
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<td>AFRICA</td>
<td>Includes Algeria; Angola; Benin; Botswana (from 1981); Cameroon; Republic of the Congo (Congo); Côte d’Ivoire; Democratic Republic of the Congo; Egypt; Eritrea; Ethiopia; Gabon; Ghana; Kenya; Libya; Mauritius; Morocco; Mozambique; Namibia (from 1991); Niger (from 2000); Nigeria; Senegal; South Africa; South Sudan⁹ (from 2012); Sudan; United Republic of Tanzania (Tanzania); Togo; Tunisia; Zambia; Zimbabwe and Other Africa.</td>
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<td>Bahrain</td>
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<td>Islamic Republic of Iran</td>
<td>IRAN</td>
<td>Data are reported according to the Iranian calendar year. Data for 2015 correspond to 20 March 2015 – 19 March 2016.</td>
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<tr>
<td>Iraq</td>
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<tr>
<td>Jordan</td>
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</tbody>
</table>

⁹ South Sudan became an independent country on 9 July 2011. Data for South Sudan are available from 2012. Prior to 2012, they are included in Sudan.
Countries and Regions

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<th>Long name</th>
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<td>Kuwait</td>
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<td>Qatar</td>
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<td>Saudi Arabia</td>
<td>SAUDIARABI</td>
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<td>Syrian Arab Republic</td>
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<td>United Arab Emirates</td>
<td>UAE</td>
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<td>Yemen</td>
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<tr>
<td>Middle East</td>
<td>MIDDLEEAST</td>
<td>Includes Bahrain, Islamic Republic of Iran, Iraq, Jordan, Kuwait, Lebanon,</td>
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<td>Oman, Qatar, Saudi Arabia, Syrian Arab Republic, United Arab Emirates and</td>
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<td>Yemen.</td>
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<tr>
<td>Bangladesh</td>
<td>BANGLADESH</td>
<td>Data for Bangladesh are reported on a fiscal year basis. Data for 2016 are</td>
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<td>for 1 July 2016-30 June 2017.</td>
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<td>BRUNEI</td>
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<td>Cambodia</td>
<td>CAMBODIA</td>
<td>Data for Cambodia are available starting in 1995. Prior to that, they are</td>
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<td>included in Other Asia.</td>
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<td>India</td>
<td>INDIA</td>
<td>Data are reported on a fiscal year basis. Data for 2016 are for 1 April</td>
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<td>Indonesia</td>
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<td>Democratic People’s</td>
<td>KOREADPR</td>
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<td>Republic of Korea</td>
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<td>Mongolia</td>
<td>MONGOLIA</td>
<td>Data for Mongolia are available starting in 1985. Prior to that, they are</td>
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<td>included in Other Asia.</td>
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<tr>
<td>Myanmar</td>
<td>MYANMAR</td>
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<tr>
<td>Nepal</td>
<td>NEPAL</td>
<td>Data for Nepal are reported on a fiscal year basis.</td>
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<td>Pakistan</td>
<td>PAKISTAN</td>
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<td>Philippines</td>
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<td>Singapore</td>
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<td>Sri Lanka</td>
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<tr>
<td>Chinese Taipei</td>
<td>TAIPEI</td>
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<tr>
<td>Thailand</td>
<td>THAILAND</td>
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</tbody>
</table>
### Countries and Regions

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</tr>
</thead>
<tbody>
<tr>
<td>Vietnam</td>
<td>VIETNAM</td>
<td>Includes Afghanistan; Bhutan; Cambodia (until 1994); Cook Islands; Fiji; French Polynesia; Kiribati; the Lao People’s Democratic Republic; Macau, China; Maldives; Mongolia (until 1984); New Caledonia; Palau (from 1994); Papua New Guinea; Samoa; Solomon Islands; Timor-Leste; Tonga and Vanuatu.</td>
</tr>
<tr>
<td>Other non-OECD Asia</td>
<td>OTHERASIA</td>
<td>Includes Bangladesh; Brunei Darussalam; Cambodia (from 1995); Democratic People’s Republic of Korea; India; Indonesia; Malaysia; Mongolia (from 1985); Myanmar; Nepal; Pakistan; the Philippines; Singapore; Sri Lanka; Chinese Taipei; Thailand; Viet Nam and Other Asia.</td>
</tr>
<tr>
<td>Non-OECD Asia excluding China</td>
<td>ASIA</td>
<td>Includes Bangladesh; Brunei Darussalam; Cambodia (from 1995); Democratic People’s Republic of Korea; India; Indonesia; Malaysia; Mongolia (from 1985); Myanmar; Nepal; Pakistan; the Philippines; Singapore; Sri Lanka; Chinese Taipei; Thailand; Viet Nam and Other Asia.</td>
</tr>
<tr>
<td>People's Republic of China</td>
<td>CHINA</td>
<td>In early 2016, the National Bureau of Statistics (NBS) of the People’s Republic of China (China) supplied the IEA with detailed energy balances for 2000 to 2010 and the IEA revised its data accordingly. In September 2015, the NBS published China’s energy statistics for 2013, as well as revised statistics for the years 2011 and 2012. These have already been taken into account by the IEA in the “Special data release with revisions for the People’s Republic of China” in November 2015.</td>
</tr>
<tr>
<td>Hong Kong, China</td>
<td>HONGKONG</td>
<td></td>
</tr>
<tr>
<td>China Region</td>
<td>CHINAREG</td>
<td>Includes Hong Kong, China and the People’s Republic of China.</td>
</tr>
<tr>
<td>Non-OECD Total</td>
<td>NONOECDTOT</td>
<td>Includes OECD Total; Africa; Asia (excluding China); China Region (People’s Republic of China and Hong Kong, China); Non-OECD Americas; Middle East; Non-OECD Europe and Eurasia. It is also the sum of Africa, Americas, Asia, Europe, Oceania, World aviation bunkers and World marine bunkers.</td>
</tr>
<tr>
<td>World</td>
<td>WORLD</td>
<td>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.</td>
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### Countries and Regions

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<tr>
<th>Long name</th>
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<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Americas (UN)</td>
<td>AMERICAS</td>
<td>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; Curacao; Dominica; the Dominican Republic; Ecuador; El Salvador; the Falkland Islands (Malvinas); Guatemala; French Guiana; Grenada; Guadeloupe; Guyana; Haiti; Honduras; Jamaica; Martinique; Mexico; Montserrat; Nicaragua; Panama; Paraguay; Peru; Puerto Rico (for natural gas and electricity); 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).</td>
</tr>
<tr>
<td>Asia (UN)</td>
<td>ASIATOT</td>
<td>Includes Afghanistan; Armenia; Azerbaijan; Bahrain; Bangladesh; Bhutan; Brunei Darussalam; Cambodia; the People’s Republic of China; Cyprus; Georgia; Hong Kong, China; India; Indonesia; the Islamic Republic of Iran; Iraq; Israel; Japan; Jordan; the Democratic People’s Republic of Korea; Korea; Kazakhstan; Kuwait; Kyrgyzstan; the 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; Turkey; Turkmenistan; the United Arab Emirates; Uzbekistan; Viet Nam; and Yemen.</td>
</tr>
<tr>
<td>Europe (UN)</td>
<td>EUROPE</td>
<td>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; Kosovo(^{10}); Latvia; Lithuania; Luxembourg; Malta; the Republic of Moldova (Moldova); Montenegro; the Netherlands; Norway; Poland; Portugal; Romania; the Russian Federation; Serbia(^{11}); the Slovak Republic; Slovenia; Spain; Sweden; Switzerland; Ukraine; the United Kingdom.</td>
</tr>
</tbody>
</table>

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10. 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.

### Countries and Regions

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</tr>
</thead>
<tbody>
<tr>
<td>Oceania (UN)</td>
<td>OCEANIA</td>
<td>Includes Australia; New Zealand; Cook Islands; Fiji; French Polynesia; Kiribati; New Caledonia; Palau; Papua New Guinea; Samoa; the Solomon Islands; Tonga; Vanuatu.</td>
</tr>
</tbody>
</table>

Please note that the following countries have not been considered:

- **Non-OECD Europe and Eurasia**: Andorra; Faroe Islands (after 1990); Liechtenstein; 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.
6. COUNTRY NOTES AND SOURCES

GENERAL NOTES APPLICABLE TO ALL COUNTRIES

These notes refer to data from 1960 to 2017p.

As a general rule, most series show a more detailed breakdown from 1970, due to limited availability of data prior to that year. Data on inputs to and output from combined heat and power plants and from heat plants may have been estimated by the Secretariat.

Prior to 1974, there is no split available between main activity producer and autoproducer electricity plants for any country.

In general, more detailed notes are available for data starting in 1990. Data are obtained through annual submission of five fuel questionnaires from national administrations, as indicated for each country in the section on sources.

In some instances it has been necessary for the IEA Secretariat to estimate some data; explanations of the estimates are provided in the country notes. For more information on fuel-specific methodologies, please refer to the various IEA information books. Energy data reported for 2017 (shown as 2017p) in the final release are provisional supply data based on submissions received in early 2018 and on monthly submissions to the IEA from member countries.

This section lists a few specific notes that apply to all countries, and it is followed by a time series of comprehensive country-specific notes by fuel and flow.

Prior to 1974, most fuel inputs and electricity and heat outputs for autoproducers are included in main activity producers. The figures for the quantities of fuels used for the generation of electricity and heat and the corresponding outputs in CHP and heat plants should be used with caution. Despite estimates introduced by the IEA Secretariat, inputs and outputs are not always consistent. Please refer to notes below under Electricity and heat.

Data for anthracite, coking coal, other bituminous coal, sub-bituminous coal and lignite are available separately from 1978. Prior to 1978, only data for hard coal and brown coal (lignite/sub-bituminous coal) are available.

In 1996, the IEA Secretariat extensively revised data on coal and coke use in blast furnaces, and in the iron and steel industry (for those countries with blast furnaces), based on data provided to the OECD Steel Committee and other sources. The quantities of fuels transformed into blast furnace gas have been estimated by the IEA Secretariat based on its blast furnace model.

For biofuels and waste (i.e. solid biofuels, biogases, liquid biofuels, industrial waste and municipal waste), there may be breaks in time series between 1988 and 1989, as in 1997 the IEA Secretariat extensively revised these data based on data from Eurostat (for the EU-15 member countries) and on other national sources for other OECD member countries, and data from Eurostat were generally available from 1989. Generally, data on biofuels and waste are reported in non-specified prior to 1989.

Australia

Source
Department of Environment and Energy, Canberra.

General notes
• All data refer to the fiscal year (e.g. July 2015 to June 2016 for 2016).
• Starting with the 2013 edition and following, data for Australia were revised back to 2003 due to the adoption of the National Greenhouse and Energy...
Reporting (NGER) as the main energy consumption data source for the Australian Energy Statistics. As a result, there are breaks in the time series for many data between 2002 and 2003. The revisions have also introduced some methodological issues, including identifying inputs and outputs to certain transformation processes such as gas works plants, electricity plants and CHP plants. Energy industry own use and inputs to the transformation processes are sometimes not reported separately in the correct categories. More detail is given in the notes below.

- In the 2015 edition, increases of production and consumption of other bituminous coal for 2013 are due to both new mine capacity and improved classification data. In the 2016 edition, these revisions were extended back to 2010. Apparent switching between sub-bituminous coal and other bituminous coal between 2009 and 2010 suggests that some other bituminous coal was reported as sub-bituminous coal prior to this, across several flows.

- **Hard coal** data prior to 1978 may include sub-bituminous coal.

- In the 2016 edition, several combustible fuel electricity production time series as well as some electricity consumption time series were revised by the Australian administration back to 2010 in order to limit the use of estimated data and are causing some breaks.

- From 1992 onwards, heat data are not available.

### Supply

- Data for production of electricity from wind are available from 1994.

- Data for electricity production from solar photovoltaic start in 1992 and from solar thermal in 2003.

### Transformation

- Fuels used for generation by autoproducers represent single fuel-fired units only. The use of fuel in multi-fired units operated by autoproducers is included in industry consumption.

- 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.

- In the 2017 edition, following an extended review of past data, the Australian administration revised electricity outputs of blast furnace gas autoproducer electricity plants for the period 2003-2004 and of autoproducer CHP plants fuelled by other oil products for 2009, resulting in more realistic efficiency rates for these plants.

- In 2002, the Australian administration started to use a new survey methodology and reclassified the types of plants between main activity producers and autoproducers.

- Prior to 1995, electricity production from biogases is included in natural gas.

- Prior to 1986, inputs and outputs from autoproducer CHP plants are not available.

### Consumption

- The opening of large-scale production at Australia’s new east coast LNG plants led to significant growth in electricity consumption in the oil and gas sector in 2016.

- Prior to 2006, electricity consumption in mining and quarrying includes consumption in liquefaction/regasification plants.

- From 1990 to 2008, electricity consumption in wood and wood products is included together with paper, pulp and printing.

- The direct use of solar heat (mostly domestic solar panels) is available from 1974.

- Electricity consumption in coke ovens has been estimated by the Australian administration from 1974 to 1999.

- Prior to 1974, the breakdown of electricity consumption in industry and energy sub-sectors is not available and energy industry consumption is included in industry.

- Electricity consumption in the non-specified transport sector represents support services for transport for mining operations.
• Prior to 1971 electricity consumption in the commercial and public services sector is included in industry.
• Reported electricity consumption in the oil and gas extraction section may include some consumption in LNG/regasification plants.

Capacity
• Capacity refers to net maximum capacity on 30 June.

Austria

Source
Bundesanstalt Statistik Österreich, Vienna.

General note
• Starting with the 2016 edition and following, widespread data revisions were received due to enhanced reporting from 2005 onwards as a consequence of improved Austrian Final Energy Consumption surveys. 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.

Supply
• Amounts for both net electricity production and plant own use are calculated by the Austrian administration by applying a fixed percentage multiplier to the gross production of all plants in the public grid, regardless of plant type or fuel.

Transformation
• Between 1995 and 1996 there is a break in time series for autoproducer electricity and CHP plants due to the availability of more detailed data.
• 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.
• In 2009, inputs of other oil products to autoproducer CHP plants were reclassified as refinery gas and natural gas.
• 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.
• Heat from chemical processes used for electricity production is available from 2004.
• Electricity generation from geothermal started in 2002.
• Prior to 2002, data for biogases only include plants of 1 MW or larger.
• Prior to 1981, inputs to main activity producer electricity plants include inputs to CHP plants. All electricity production by CHP plants is included in electricity plants, and only production from combustible fuel sources is taken into account. Autoproducer CHP heat production is included in main activity producer CHP plants. For heat, own use is included in distribution losses.

Consumption
• Electricity consumption in oil refineries includes consumption in gas works plants prior to 1991.
• From 1990 to 2009, small amounts of electricity used in heat pumps have been included in the residential sector.
• Starting in 1990, consumption of electricity in the field of electricity supply, district heating and water supply are included in other energy industry own use, prior to that it was included in commercial/public services.
• Prior to 1991, electricity consumption in the iron and steel industry includes consumption in coke ovens and blast furnaces.

Trade
• Exports of electricity to non-specified/others are to Liechtenstein.

Capacity
• Only gross maximum electrical capacity is available.
• The breakdown of capacity by type of generation and fuel for autoproducer plants is not available for 1988 and 1989.

Belgium

Source
Observatoire de l’Énergie, Brussels.

General notes
• Data for anthracite prior to 2014 may include a small portion of other bituminous coal.
• Hard coal data prior to 1978 may include sub-bituminous coal.

Supply
• The electricity production under other sources represents mainly production at a gas expansion station with heat recovery and at a hydraulic turbine in a waste water treatment plant.
• From 2013 onwards, reported heat distribution losses decreased due to a more precise estimation method.
• The production of electricity from wind is available from 1987.
• Since 2009, natural gas trade in Belgium includes imported LNG which is regasified and subsequently exported to other countries.
• Supply-side data are obtained through surveying questionnaires instead of customs data.
• Conventional production of other bituminous coal ceased on 31 August 1992.

Transformation
• In 2015, the decrease of coke oven gas inputs to autoproducer CHP plants is due to a power plant closure in 2015.
• In 2014, the decrease of other bituminous coal inputs to main activity producer electricity plants is due to a power plant closure in 2014.
• Between 2008 and 2009, there is a break in efficiency of natural gas autoproducer CHP plants due to a change in methodology regarding the reporting of unsold heat.
• Langerlo, Belgium’s last coal-fired main activity electricity producer closed permanently in March 2016.

Heat production from chemical processes used for electricity production is available from 2005.
• In 2012, heat production from chemical sources has been estimated by the IEA Secretariat.
• Prior to 2009 some unsold heat was reported in natural gas autoproducer CHP plants, together with the associated natural gas input. This causes the drop in efficiency in 2009.
• In 2007 data, no information was available on heat production in main activity CHP plants for industrial waste.
• 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 main activity producer CHP plants with annual heat output below 0.5 TJ is reported with main activity producer electricity only plants.
• Prior to 1982, electricity production in main activity producer CHP plants is included in production from electricity plants. Also, inputs of fuels for electricity generation in main activity producer electricity plants include inputs for heat production in CHP plants.

Consumption
• For 2012, electricity consumption in the mining and quarrying sector has been estimated by the IEA Secretariat.
• For 2012, oil refineries electricity consumption has been estimated by the IEA Secretariat based on refinery activity data. Part of the estimated amount has been removed from consumption in the chemical and petrochemical sector.
• Breaks in time series may exist between 2007 and 2008 due to revisions of the Classification of the Economic Activities in the European Community (NACE) classifications.
• There is no heat consumption starting in 2007 in the iron and steel industry because the installation concerned became an autoproducer in July 2006 and the heat is no longer sold.
Capacity

- **Combustible fuels** electricity capacity by type of generation has been revised, accordingly to a new methodology adopted by the Belgian authorities, back to 2008 leading to breaks in the time series between 2007 and 2008.
- After 2006 for main activity producers and 2005 for autoproducers, data on combustible fuels electrical capacity by fuel type are not available.
- Prior to 1982, data on electrical capacity by type of generation are not available.

Canada

Source

Natural Resources Canada, Ottawa.

General notes

- In the 2018 edition, data for Canada were revised back to 2005 following a ten year revision of the Report on Energy Supply and Demand (RESD), the main set of Canadian annual data. The revision standardises the methodology used for the IEA data submission and has mainly affected the demand side. Additional details are given under each fuel.
- The 2018 edition includes numerous time series revisions for the years 2005-2016. This is due to the 10 year revision of the Report on Energy Supply and Demand, which is the main set of Canadian annual data. The majority of these revisions were applied to the demand side.
- The Canadian administration has undertaken revisions of many parts of the electricity time series back to 2005, based on the results of the Report on Energy Supply and Demand in Canada (RESD). In particular, revisions were made on the inputs and outputs of power plants fuelled by combustible fuels and on the breakdown of final electricity consumption, resulting in possible breaks in time series.

Supply

- Due to confidentiality constraints, from 2014 the breakdown of production by type of coal is estimated by the Canadian administration, while stock changes and statistical differences are estimated since 2001.
- In the 2018 edition, revisions were made to electricity production from wind back to 2013.
- Starting in 2009, a new source has been used 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.
- **Heat** production includes heat produced by nuclear power stations for distribution to other consumers up to 1997.

Transformation

- For 2000, the increase in main activity producer electricity is due to new generation plants in Alberta and Ontario.
- Before 1978, lignite inputs to main activity producer heat plants are included in final consumption. Starting in 1979, these inputs are included in main activity producer electricity plants.
- 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.
- For autoproducers generating electricity with process steam produced from biofuels and waste, the energy required to produce the initial steam is not taken into account by the Canadian administration and as a result the efficiencies are overstated.
- The breakdown of electricity and heat generation between natural gas and oil products in main activity producer CHP plants has been estimated by the Canadian administration starting in 1990. This may cause breaks in the time series between 1989 and 1990.
- Net electricity production by autoproducers prior to 1990 includes production from combustible fuel sources only.
- Inputs of fuels to heat plants are not available for 1979 to 1987.

Consumption

- **Non-specified (Other sectors)** is being partly treated as a residual under the new methodology introduced
in the 2018 Edition. Data submitted by Canada for 2015 were for negative -19,998 GWh, which is not possible, so this has been revised to zero by the IEA Secretariat, with the increased consumption being removed from Statistical differences.

- **Electricity** transmission and distribution losses could include statistical difference for certain years.
- Consumption of **electricity** in oil and gas extraction is not available prior to 1987.
- Consumption of **electricity** in coal mines is not available between 1982 and 1986.

### Capacity
- Only gross maximum electrical capacity is available.
- Prior to 1981, data on electrical capacity by type of generation are not available.

### Chile

#### Source


#### General notes

- Data are available starting in 1971.
- In the 2017 edition, data for 2014 and 2015 were revised to replace figures previously estimated by the Secretariat.
- From 1990, consumption in paper and pulp includes forestry and consumption in agriculture is included in non-specified industry. In general, a new methodology has been applied for data since 1990, leading to other breaks in time series between 1989 and 1990.
- Other bituminous coal data includes sub-bituminous coal for all years, if present.

#### Supply

- Electricity production from geothermal started at Cerro Pabellón in 2017.
- In 2014, the Chilean administration applied a new methodology in the reporting of electricity generation from solar PV and wind, resulting in breaks in time series between 2013 and 2014. Revisions for previous years are pending.
- The majority of electricity generation from other sources is from a conveyor belt transporting crushed rock from high altitude to lower altitude in a mine. A small amount from waste heat is also included.
- Solar thermal heat production has been estimated by the IEA Secretariat using data published by Chilean ministry of energy.

### Transformation

- For 2009 and 2010, inputs of natural gas to autoproducer CHP plants were estimated by the Chilean administration. For other years, these inputs are included in autoproducer electricity consumption.
- In 2014, data inputs to transformation processes were taken from the published energy balance, and the output was estimated based on the efficiency reported in previous years.
- Electricity production from other bituminous coal includes sub-bituminous coal.
- Production of chemical heat used for electricity generation started in 2013. Besides chemical heat, data for heat production in CHP and heat plants are not available.
- Increases in electricity from natural gas in 2010 are due to the openings of new LNG terminals.
- The split of electricity generation by main activity and autoproducer by fuel was estimated by the Chilean administration for the period 1990 to 2003.

### Consumption

- Increases in electricity consumption in the road transport sector from 2014 onwards are the result of a new estimation methodology, while electric vehicles used for the transportation of ores are reported as consumption within the mining and quarrying industry.
- Solar thermal consumption data are not available so all consumption data are allocated to the non-specified other sector.
- Prior to 2009, statistical differences are included in distribution losses.

### Trade

- Imports of electricity from non-specified/others are from Argentina.
Capacity
- Installed capacity by type of technology is not available prior to 2011.
- Data for peak load is available from 1998.

Czech Republic

Sources
- Czech Statistical Office, Prague.
- Ministry of Industry and Trade, Prague.

General notes
- Due to ongoing review of energy data for 2010-2014, revisions were made in the 2017 edition. Full details are given under each fuel.
- Data are available starting in 1971.
- The restructuring of the Czech electricity market leads to breaks in the time series in all sectors between 1998 and 1999.
- In the 2017 edition, data for the Czech Republic were revised back to 2010 due to the acquisition of new administrative data, allowing access to more accurate and detailed data sources. As a result, there are breaks in several time series between 2009 and 2010.
- Data from 1990 onwards have been officially submitted by the Czech administration. This may lead to breaks in time series between 1989 and 1990.
- Electricity statistics from 1971 to 1989 have been estimated by the IEA Secretariat except for final consumption and trade which were submitted by the Czech administration.

Supply
- The amount of heat reported under other sources is primarily waste heat from the glass industry until 2009.
- From 1999 onwards, small amounts of heat have been exported to Slovak Republic.

Transformation
- In 2016, a main activity producer CHP incineration plant fired by municipal waste was in test operation at Chotíkov.
- Electricity generated from waste heat in CHP plants is included with the total production from combustible fuels.
- In the 2017 edition, a revision of the methodology for reporting the production of autoproducer plants running on combustible fuels causes multiple breaks in time series between 2009 and 2010 for CHP and electricity-only plants.
- Data on heat own use and heat imports start in 2010 and 2009 respectively, following extensive revisions by the Czech administration in the 2017 edition due to the acquisition of new administrative data. Prior to this period, data are not available due to lack of sources.
- The production of electricity reported in the category other fuel sources refers to electricity produced from turbines driven by the mixture of air, ammonia and other non-coal gases derived from the petrochemical industry.
- From 2014, some autoproducer heat plants production figures became too small to appear in data collected.
- From 2012 data, new autoproducer heat plants were added to the data collection, causing a break in time series.
- In 2012, a main activity producer electricity plant using solid biofuels started to produce also heat and was reclassified as main activity CHP plant.
- A different reporting methodology used by the Czech administration for biofuels and waste causes some breaks in time series between 2002 and 2003.
- In 1999 and 2000, various large enterprises were divided, sold and merged. This causes breaks in the time series of all types of plants.
- Industrial waste use in main activity producer electricity plants is included with solid biofuels from 1996.
- Data on biogases and waste used in main activity producer CHP and autoproducer heat plants start in 1993.
- Prior to 1990, electricity production in main activity producer CHP and autoproducer CHP plants is included in main activity producer electricity plants.
- Prior to 1990, heat production excludes heat sold by industry. In addition, heat production prior to 1990 is reported under main activity heat plants because the breakdown by producer and plant type is not available before then.
- The breakdown of net electricity production by source is not available prior to 1990.
• Data on **heat** production, and the corresponding fuel inputs, have been estimated from 1980 to 1989 based on consumption in residential and commercial/public services. Prior to that, inputs are included in industry.

**Consumption**

• Data for direct use of **solar energy** are available from 2003.

• Prior to 2000, the split of **rail transport** and **non-specified transport** is not available.

**Trade**

• From 1999 onwards, small amounts of **heat** have been exported to Slovak Republic.

**Capacity**

• Starting in 2000, the peak load data reported in main activity producers includes the autoproducer’s value which is no longer reported in its own right.

• The breakdown of generating capacity is not available prior to 1990.

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**Denmark**

**Source**

Danish Energy Agency, Copenhagen.

**General notes**

• In the 2004 edition, major revisions were made by the Danish administration for the 1990 to 2001 data, which may cause breaks in time series between 1989 and 1990.

• **Heat** data are not available prior to 1976.

• Between 1995 and 2004, **other hydrocarbon** imports and inputs to main activity producer CHP plants represent orimulsion.

• From 1990 onwards, Greenland and the Danish Faroes are not included in the oil data.

**Supply**

• For 2017, the decline in **electricity** and **heat** output from **other bituminous coal** and the corresponding increases in output from **solid biofuels** are attributable to fuel switching in co-fired plants.

• A large increase of **steam coal** imports in 2003 was related to a drought in Scandinavia. Thermal power plants were operated more intensively to replace **hydro**-generated electricity that was consumed in the country. Additionally, more coal-generated electricity was exported to other countries in the region. Significant fluctuations in demand are also evident for other years for similar reasons, including 2006 and 2013, but exist to a lesser extent.

• Declines in stocks of **steam coal** stem from extensive deployment of renewable generation technologies and policy to further reduce Denmark’s utilisation of coal-fired power and implement co-firing with **renewable fuels** as a part of their **Energy Strategy 2050**.

• The amount of **heat** reported under **other sources** is heat recovered from industrial processes and sold for district heating.

• **Heat** produced for sale by heat pumps starts in 1994.

• **Geothermal** and **solar heat** production for sale is available from 1989.

• From 1984 onwards, small amounts of **heat** have been imported from Germany.

• The production of electricity from **wind** is available from 1978.

**Transformation**

• Due to improved survey methods, inputs to **electricity** and **heat** generation have been reclassified, causing a break in time series between 1993 and 1994. The **oil** inputs used in industrial sub-sectors for producing surplus heat, which is delivered to district heating networks, are allocated to these industrial sub-sectors.

• In 1994, the marked increase in inputs to CHP production is due to increased **electricity** exports to Norway.

• From 1974 to 1979, consumption of **fuel oil** for the CHP production by autoproducers has been estimated.

• Fish oil used in main activity producer heat plants is included with **solid biofuels**.

• 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. The efficiency decline evident in 2016 was due to two less efficient plants switching to biofuels.

• For some years, heat plants for **natural gas**, municipal waste and **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.

- **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 back to 1994.

### Consumption

- In the 2016 edition, the Danish administration revised **electricity** and **heat** consumption in the industry sector from 1990.
- For 2015 and 2016 data, the breakdown of **electricity** and **heat** total final consumption is estimated by the Danish administration based on 2014 data and will be revised in the following reporting cycle once their new industry survey results are released.
- The direct use of **solar thermal** energy is available from 1978.
- **Electricity** consumption in **non-specified industry** includes consumption in district heating plants and for the distribution of electricity.

### Trade

- From 1984 onwards, small amounts of **heat** have been imported from Germany.

### Capacity

- Prior to 1981 for main activity producers and to 1994 for autoproducers, data on electrical capacity by type of generation are not available.

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**Estonia**

**Source**


**General notes**

- Data for Estonia are available starting in 1990. Prior to that, they are included in Former Soviet Union in the *World Energy Statistics* publication.

### Transformation

- Fuels reported as **coke oven coke** and **gas works gas** are the solid and gaseous by-products of **oil shale** liquefaction, and main activity heat and electricity generation from these fuels is tightly associated with liquefaction plants.
- Inputs of **fuel oil** and **gas works gas** to transformation processes include **shale oil**.
- 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.
- From 1990 to 1999, some of the **electricity** and **heat** production are reported under **other oil products** while the inputs are reported under the individual fuels.

### Consumption

- **Electricity** consumption in the **non-specified energy** sector includes consumption in the Classification of the Economic Activities in the European Community (NACE) 3512 and 3513 categories.

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**Finland**

**Source**

Statistics Finland, Helsinki.

**General notes**

- In 2014, 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.
- A large increase of **steam coal** imports in 2003 is related to a drought in Scandinavia. Thermal power plants were operated more intensively to replace **hydro**-generated electricity that is consumed in the country. Additionally, more coal-generated electricity was exported to other countries in the region.
- The increase of **other bituminous coal** inputs into main activity producer electricity plants from 1993 to 1994 was due to coal replacing imported **electricity** and **hydro** power.
- Hard coal data prior to 1978 may include **sub-bituminous coal**.
Supply

- **Electricity** production in Finland is affected by the connection to the Nord Pool. During periods of high rainfall, importing electricity from other Nordic countries is more economic than producing it. This can cause breaks in the time series.
- **Other sources** includes hydrogen and purchased steam.
- The increasing heat production from **heat** pumps in 2007 and 2008 is due to the opening of the Katri Vala district heating and cooling plant.
- **Heat from chemical processes** and associated electricity generation are available from 2000.

Transformation

- In the 2017 edition, fuel inputs and heat production from **peat** main activity heat plants have been revised from 2000 as a result of new data access for smaller peat heat plant units.
- The significant increases and decreases of **other bituminous coal** inputs into main activity producer electricity plants from year to year are due to coal replacing imported electricity and hydro power.
- Likewise, **peat** production is highly dependent upon favourable weather conditions and the pricing of other fuels. The decrease in **peat** and **other bituminous coal** usage in main activity electricity plants in 2008 was due to record electricity generation from hydro plants. A similar circumstance occurred in 2012.
- **Electricity** plants data may include some CHP plants operating in electricity-only mode. Likewise, **heat** plants data may include some CHP plants operating in heat-only mode.
- In the 2017 edition, fuel inputs and heat production from **peat** main activity heat plants have been revised since 2000 as new data became available for small peat heat plant units.
- In the 2016 edition, the allocation of **solar photovoltaic** between main activity and autoproducer plants was revised.
- From 2014 data, an autoproducer in the field of iron and steel industry running on **coke oven gases** and **blast furnace gases** was sold and is now reported as main-activity producer.
- The increase in heat production from **municipal waste** in 2014 is due to the opening of a new plant.
- In 2014, the new consumption of **other liquid biofuels** in main activity electricity plant corresponds to biopyrolysis oil made from wood chips.
- Data on **peat products** electricity and heat generation are available since 2008. Prior to that, they are included in **peat**.
- **Heat** output from autoproducer CHP plants is available starting in 1996 and from autoproducer heat plants starting in 2000; corresponding inputs may be under-reported.
- Before 1999, all electricity production from autoproducers running on **fuelwood** is allocated to CHP plants.
- **Electricity and heat** production from **biogases** are available from 1996.
- 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.
- **Inputs of liquid fuels** and **natural gas** to CHP plants are included with the inputs of these fuels to main activity producer electricity-only and heat-only plants prior to 1978.
- **Electricity production from biofuels and waste** is not available between 1974 and 1976.

Consumption

- For 2016 data, the production of **heat** from oil refineries in autoproducer plants ceased, following the change of ownership of these plants and their reclassification to main activity producers. This result in the consumption of (sold) heat under the **oil refineries** sub-sector to jump as most heat formerly produced by oil and gas autoproducers are now purchased.
- In the 2017 edition and following, an extended review of NACE sector encoding by the Finnish administration resulted in the revision of the sectoral **heat** consumption time series back to 2007, leading to breaks in time series between 2006 and 2007 in some heat consumption sectors.
- A new survey of the agriculture and forestry sector leads to breaks in the **electricity** consumption between 2007 and 2008.
- The split of **heat** consumption in the different industry sectors is available starting from 2007. Prior to that, it is aggregated in **non-specified industry**.
- Prior to 2000, consumption of **heat** in **residential** includes consumption in **agriculture/forestry and commercial/public services**.
Consumption of electricity in the industry sub-sector machinery includes consumption in transport equipment prior to 1995.

**Capacity**

- Prior to 2000, capacity reported in autoproducers steam generation includes all types of generation.
- Net maximum electrical capacity data are not available prior to 1974.

**France**

**Source**

Ministère de la Transition Écologique et Solidaire, Paris.

**General notes**

- In the 2018 edition, data for France were revised back to 2011 following changes in methodology and procedures used by the energy statistics sub-department (SDSE) within the Ministry for the ecological and inclusive transition. As a result, the revisions, to bring the reporting more in line with the international standards, impacted all fuels. Additional details are given under each fuel.
- From 2012, the energy consumption is more detailed due to a more precise national survey.
- For 1989 to 1998, the IEA Secretariat has estimated industry consumption based on Consommations d’Énergie dans l’Industrie, SESSI.
- Hard coal data prior to 1978 may include sub-bituminous coal.
- 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.

**Supply**

- All photovoltaic plants with capacity above 100 kWp are considered as main activity producers, while all plants with capacity below that value are considered autoproducers.
- Heat production from heat pumps is available starting from 2013.
- Electricity production from other sources is available starting from 2007, representing production of electricity from purchased steam. The input is shown under non-specified transformation.
- Data on electricity production from wind are available from 1990.

**Transformation**

- Revisions for heat production in all plant types were received and accepted for many fuels from 2007 onwards, with the exception of natural gas, where the planned revisions for 2007 and 2008 are still pending implementation by the Secretariat. Electricity production from hydro was revised back to the year 2000, in some cases only amounting to plant reclassification, in the 2018 edition.
- In 2016 the company that consumed blast furnace gas for electricity and heat generation ceased its activity.
- Electricity production from geothermal started in 2011 and stopped in 2012 due to the maintenance of the only plant. This production restarted in 2016.
- Starting in 2012, separate data on main activity heat plants inputs are available for oil products.
- Heat not sold in autoproducer plants is included in total heat production up to 2007.
- In 2005, autoproducer CHP efficiencies for biogases drop due to the opening of a larger, less efficient plant.
- From 2000 several plants have been reclassified from electricity-only to CHP plants. This causes breaks in the time series between 1999 and 2000.
- Prior to 2000, inputs and outputs of oil products are not available separately and are reported together under other oil products. From 2000 to 2008, there are further classification problems for inputs and outputs of electricity and heat from oil products. The French administration is working to reconcile their data collection methods for the inputs and the outputs for electricity generation.
- A new method of survey and a reclassification between main activity producer electricity plants and autoproducer electricity plants may cause breaks in the time series for other bituminous coal between 1998 and 1999.
There was reclassification on autoproducer plants using municipal waste in 1995, which leads to a break in the time series.

Net electricity production by autoproducer CHP plants is available from 1989.

Net electricity production by autoproducers prior to 1983 includes production from combustible fuel sources only.

Consumption

In the 2018 edition, revisions for 2011 onwards were received for all electricity consumption flows, based on an improved survey. This has led to breaks in time series between 2010 and 2011. Similarly, heat consumption from 2007 onwards was revised to account for autoproducer own use heat generation in its correct economic activity.

In the 2017 edition, the French administration undertook comprehensive revisions on sectoral electricity consumption time series, for some sectors revising back to 1990. Electricity consumption at railway and bus stations, shipping piers and airports is no longer included in the transport sector but in the commercial and public services sector. Road electricity consumption has also been revised back to 1990, following an extended review of NACE sector encoding by the administration. These revisions created breaks in time series for several sectors, which the administration anticipates to address in subsequent reporting cycles.

For the 2014 edition of this publication, the French administration revised electricity consumption data in the agriculture/forestry sector back to 2004, resulting in breaks in time series.

Consumption of electricity in uranium treatment plants is confidential for the period 2003 through 2010, and unavailable prior to 1980.

Data on heat distribution losses are available only starting from 2007. Prior to that, they were included in final consumption.

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.

Consumption of electricity for oil and gas extraction includes that used in oil refineries from 1988 to 2000.

Non-specified other consumption includes exports to Monaco prior to 1992 and defence-related activities, among others.

The industry classifications used by the French administration were changed in 1986.

There are major breaks in the time series in 1965 when more detailed breakdown of data on electricity consumption became available.

Capacity

The main activity plants peak load includes also the peak load of autoproducers plants.

Prior to 1981 and after 1999, data on electrical capacity by type of generation and fuel are not available.

Germany

Source

General notes

Data starts in 1960. German data include the new federal states of Germany from 1970 onwards.

The German administration has changed the methodology for reporting heat over time:

Starting in 2007, more information is available on main activity heat plants and additional inputs started to be reported for this category. This causes breaks in time series between 2006 and 2007.

Between 2003 and 2006, autoproducer heat output was provided, but no inputs.

Between 2002 and 2003 and between 2003 and 2004, breaks in time series occur, due to the implementation of the Energy Statistics Act, collection concerning heat produced in heat plants and district heating plants became more efficient and more complete.

Comprehensive official data are only collected for the aggregate of hard coal. Due to the unavailability of detailed data, the split into anthracite, coking coal and other bituminous coal is partly estimated by the national administration.

In the 2014 edition, significant revisions were submitted for all primary coal types, derived products and manufactured gases for the period 2003 to
2011 as previous estimations were updated with more accurate information. Revisions primarily affected consumption, including industry and other sectors; but also supply, statistical differences and weighted calorific values.

- Prior to 1970, heat production and consumption have been estimated by the Secretariat based on Energiebilanz für die Bundesrepublik für das Jahr 1990 provided by the German Institute for Economic Research.

Supply

- In some instances, electricity generation from nuclear, hydro, solar, wind and biogases in autoproducer electricity plants is confidential or not available and therefore is included in main activity producer electricity plants.
- Since 2011, due to a reclassification of wind energy and solar photovoltaic in the official data of the German Federal Statistical Office, the production is now only reported under main activity producer plants.
- Electricity production from other sources is available starting in 2003. This refers to the production of electricity from turbines which are located at pressure drops in fluid transport and from purchased waste heat.
- Prior to 1991, electricity trade data includes only trade of the Former Federal Republic of Germany.
- Data on electricity production from wind and solar are available from 1986 and 1990, respectively.
- Starting in 1984, small amounts of heat have been exported to Denmark.

Transformation

- Detailed data by fuel are not available for total heat production. The non-allocated part is reported as heat production from non-specified combustible fuels.
- Weather conditions were not favourable for wind and solar generation in 2016.
- In 2015, a reclassification of some main activity producer electricity and CHP plants to autoproducer CHP plants powered by coke oven gas results in a break in time series for this period. Similarly, a reclassification of blast furnace gas main activity electricity plants into autoproducer plants results in a break in time series for the same period.
- From 2003 onwards, all heat production in autoproducers is considered as non-sold (i.e. for self-use) and, therefore, not reported. Inputs for this heat production are no longer reported in the transformation sector.
- For 2002 and 2003, the German administration did not submit the breakdown of electricity and heat production from combustible fuels. The data were estimated as follows: renewables and waste were taken from the Renewables and Waste Questionnaire and the other combustible fuels were estimated pro rata based on 2001 estimates.
- Prior to 2003, electricity production in electricity plants includes production from CHP plants and heat production in CHP plants includes production from heat plants.
- Due to the implementation of the Energy Statistics Act, collection concerning heat produced in heat plants and district heating plants became more efficient and more complete. This leads to breaks in time series between 2002 and 2003 and between 2003 and 2004.
- A new survey for the renewable products can cause breaks in the time series between 1998 and 1999.
- Prior to 1995, inputs of natural gas for main activity producer heat plants are included with main activity producer CHP plants.
- Prior to 1993, all heat production from BKB/peat briquettes is included in main activity producer CHP plants.

Consumption

- Breaks in time series appear between 2015 and 2016 in the road transport sector electricity consumption following the introduction of a new model for this consumption sector. The German Administration plans to revise the historical series in subsequent cycles.
- Increases in 2016 electricity generation by autoproducers within the transport equipment manufacture industrial sector are due to reclassification from main activity generation, rather than development of new plant.
- More information on district heat became available, causing breaks in the time series between 2006 and 2007.
- Data on geothermal heat production and direct consumption are only available starting in 2003.
- From 2002, electricity consumption in the commercial and public services sector includes the construction sector, and the fishing, agriculture and forestry sectors for the whole time series.
- In 2000, revisions from the German administration to the electricity consumption data may cause breaks in the time series.
- In 1995, the German Federal Statistics Office reclassified some industrial branches which may cause a break in time series in industry sub-sectors.
- Between 1971 and 1980 electricity consumption in coal mines includes consumption in coke ovens and BKB plants.

**Trade**

- Prior to 1991, electricity trade data includes only trade of the Former Federal Republic of Germany.
- Starting in 1984, small amounts of heat have been exported to Denmark.

**Capacity**

- Electricity generating capacity before 1991 covers the Former Federal Republic of Germany, and excludes the absorbed states of the Former German Democratic Republic.
- Prior to 1974 and after 2001, data on electrical capacity by type of generation are not available.

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**Greece**

**Source**

Ministry for Environment and Energy, Athens.

**Supply**

- For 2016, gross electricity generation from combustible fuels in main activity electricity and autoproducer CHP units was estimated by the IEA Secretariat, based upon the gross to net ratio for combustible fuels for these plant types in 2015. This increase in production was assigned to lignite-fired and natural gas-fired plant.
- No production of solar heat is reported.

**Transformation**

- In 2008 a new plant using refinery gas started operating in an experimental phase, causing a low efficiency.
- Production and consumption of distributed heat (heat sold) that is produced from lignite is available from 1997.
- The big increase in delivery of industrial waste to autoproducer CHP plant in 2010 is mainly due to the opening of a new plant.
- Industrial waste used in autoproducer CHP plants decreased substantially in 2006 because a plant closed.
- Data for biofuels and waste input and output to transformation are available from 1992.

**Consumption**

- Electricity consumption in road is available from 2013.
- Direct use of geothermal heat in residential is available starting in 2004.
- Electricity consumption in iron and steel and in the non-ferrous metals industry prior to 1971 has been estimated by the Secretariat.

**Capacity**

- Prior to 1981, data on electrical capacity by type of generation are not available.

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**Hungary**

**Source**

Hungarian Energy and Public Utility Regulatory Authority, Budapest.

**General notes**

- Data are available starting in 1965.
- The Hungarian administration submitted questionnaires to the IEA Secretariat for the first time with 1993 data.
- From 1992, the production of sub-bituminous coal has been included with lignite due to the low quality of the coal. For 1990 to 1999, the use of this domestic coal in main activity producer electricity and CHP plants has also been included with lignite.

**Supply**

- In 2017, a main activity producer CHP plant was reclassified as an autoproducer. As a result, declines are observed in heat production from other bituminous coal and industrial waste, as heat previously sold may now be used onsite.
- Other sources electricity and heat production is available from 2013 and represents generation from residual tail gases from the manufacturing of soot as well as from hydrogen.
• **Geothermal** heat production from main activity producer heat plants is available from 1995.

• **Nuclear** electricity production in main activity producer electricity plants is available from 1983.

**Transformation**

• Heat and electricity consumption by military services is reported under Other sectors - non-specified for the first time in 2015. The change is due to the recent authorisation to disseminate these data. Previously they were included under Commercial and public services.

• From 2014 data onwards, more data suppliers were involved in submitting energy data to the national administration, causing new autoproducer time series to appear for geothermal and industrial waste plants.

• In 2014 data, some CHP plants running on solid biofuels produced only heat and were reclassified as heat plants.

• The Hungarian administration reclassified some of their plants between 1996 and 2000, which may lead to breaks in the time series.

• Prior to 2000, electricity output from sub-bituminous coal is included with lignite.

• Autoproducer heat and power plants using coke oven gas and blast furnace gas were reclassified in 1998 as main activity power plants.

• Since 1997 two autoproducer heat plants have been reclassified to main activity producer heat plants.

• Data on electricity and heat production from solid biofuels in autoproducer CHP plants are available from 1995.

• Autoproducer electricity, CHP, and heat plants using coke oven gas and blast furnace gas were reclassified as main activity power plants in 1998.

**Consumption**

• Data for direct use of solar thermal heat are available from 2001 and from 1990 for geothermal heat.

**General notes**

• Iceland was unable to provide data for 2017p. These data have been estimated by the IEA Secretariat.

• Prior to 1970, final consumption includes inputs and outputs to heat production.

• The industrial classifications used by the Icelandic administration were changed in 1987.

**Supply**

• The increase in hydro and geothermal electricity production from 2007 is due to the expansion of the aluminium industry.

**Transformation**

• For 2016, access to improved data revealed considerably better heat plant efficiencies than previously inferred, with increases in heat production seen during this period. The Icelandic administration plans to revise previous years’ figures in succeeding editions.

• From 2013 data, the Hellisheidi geothermal power plant, previously reported under main activity electricity plant, was categorised as main activity CHP plant.

• Heat production from municipal waste is available from 1993 and stops in 2010.

• 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 decreased compared to 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**

• Gross heat production from geothermal sources increased by 30% in 2016 from 2015. 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.

• In the 2015 edition, the heat consumption breakdown by sector for the years 1990 onwards has become available following reviews by the Icelandic administration.

**Iceland**

**Source**

National Energy Authority, Reykjavik.
administration. In addition, heat consumption was revised significantly upwards as more information became available. This has caused large breaks in time series across the heat balance between 1989 and 1990.

- Revisions in direct use of geothermal heat starting in 2013 create breaks in time series between 2012 and 2013.
- Direct use geothermal consumption in the industrial sector is reported under non-specified industry, as the Icelandic administration decided not to estimate the allocation amongst the sub-sectors of industry.
- Electricity consumption in non-specified transport includes consumption for ferries and cruise lines.
- Non-specified consumption of electricity within the energy sector refers mainly to the use of electricity by the geothermal industry to pump hot water from underground sources, and from 1991, also includes electricity used for the transport by pipeline of hot water from Nesjavellir to Reykjavik.
- The increase of electricity consumption in the construction sector from 2004 to 2007 is due to the drilling of tunnels for the Kárahnjúkar power plant.
- The consumption of electricity reported in non-specified other corresponds to a NATO base at Keflavik airport which closed in 2005.
- Prior to 1990, all heat for space heating was reported in residential.
- The residential sector includes agriculture prior to 1983.
- Prior to 1970, total final consumption includes inputs to and outputs from heat production and non-energy use. After 1970, data on inputs and outputs in CHP plants and in main activity producer heat plants (district heat plants) and for non-energy use are separately specified.

**Ireland**

**Sources**

- Department of Communications, Energy and Natural Resources, Dublin.
- Sustainable Energy Authority of Ireland, Cork.

**General note**

- Data for solid biofuels and biogases are available from 1990.

**Supply**

- Electricity production from wind begins in 1992 and from biogases in 1996.
- Rainfall in 2012 led to the lowest peat harvest since IEA records began in 1960, requiring large stock drawdown and increased use of biofuels for electricity generation. In 2013, production targets were met before the end of the year however production continued in order to further build stocks to alleviate the potential impacts of future weather events.
- Low production of peat in 1985 was due to a poor “harvest”, due to an unusually wet summer.
- Production data for peat products (briquettes) are available from 1975.

**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 the 2016 edition, revisions were introduced in the electricity generation by fuel from 2010 due to improved data available from the transmission system operator.
- In 2015, a new combined cycle gas turbine plant began commercial operations at Great Island power station, replacing the existing heavy fuel oil power plant.
- In 2012, a new main activity electricity plant burning municipal waste (the Meath plant) started operation.
- In 2011, very little electricity was produced from pumped hydro as Turlough Hill, Ireland’s pumped storage station, was taken offline from late 2010 until February 2012. The 2011 values appear as zero due to rounding.
- Since 2006, a different methodology for allocating unsold steam from autoproducer CHP is used.
- Other bituminous coal inputs to main activity producer electricity plants increased from 1986 due to three new generating units at Moneypoint coming online.
- From 1984 to 1989, inputs of hard coal in autoproducer CHP plants have been estimated by the Secretariat.

**Consumption**

- In 2004, the increase of electricity consumption is due to the new light rail transit system in Dublin.
The decrease of electricity consumption in the iron and steel sector from 2001 onwards is due to Ireland’s main steel plant ceasing production.

Prior to 1990, electricity consumption in agriculture is included with residential.

Electricity consumption in the iron and steel industry includes consumption in the non-ferrous metals industry prior to 1990.

Data for direct use of geothermal heat and solar thermal heat are available from 1989 and 1990, respectively.

Capacity

- Capacity reported under other sources corresponds to cross-border transmission capacity with Northern Ireland.
- Prior to 1981, data on electrical capacity by type of generation are not available for main activity producers.

Israel

Source

Israel Central Bureau of Statistics, Jerusalem.

General notes

- Data are available starting in 1971.
- 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.
- Due to the unavailability of data for certain fuels, IEA estimations are also present in Israel data. In particular this is valid for oil data in 2014 and 2015, natural gas data from 2012 onwards, renewables and waste data in 2013.

Supply

- Due to confidentiality constraints, imports of other bituminous coal have been estimated by the IEA Secretariat for 2016.
- Autoproducer electricity generation from chemical heat (production of sulphuric acid) occurs, but is not reported separately or included elsewhere in national totals.

Transformation

- The 2016 data for natural gas inputs to electricity production were estimated by the IEA Secretariat.
- For 2016 data, due to confidentiality reasons, electricity production reported under solar PV autoproducer electricity plants includes hydro and wind electricity generation.
- For 2013 and 2014, other oil products inputs to autoproducer electricity plants were estimated by the IEA Secretariat.

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.
- For 2013, 2015 and 2016, the split of electricity consumption in industry is estimated by the IEA Secretariat.
- Electricity own use, as well as transmission and distribution losses were estimated by the IEA Secretariat from 2010 to 2012.

Capacity

- In the 2014 edition, main activity plants net electricity capacities by type of generation have been revised back to 2008 by the Israeli administration and capacities by fuel have been estimated by the IEA Secretariat for the same period. This leads to breaks between 2007 and 2008.
- From 2013 onwards, the split of combustible fuels autoproducer electrical capacity by fuel type is unavailable.

Italy

Sources

- Ministry of Economic Development, Rome.
- Terna, Rome.

General notes

- A change in methodology lead to breaks in time series for industry and transformation between 2003 and 2004.
Supply

- The production of electricity reported in the category other fuel sources refers to electricity produced from turbines which are located at pressure drops in fluid transport.
- The methodology of data collection for photovoltaic electricity production changed in 2009 and the distinction between main activity and autoproducer plants could not be determined, causing a break in the time series.
- Electricity trade with Malta commenced in 2015, following the opening of the Malta-Sicily interconnector submarine power cable in the same year.

Transformation

- In 2016, the decline in autoproducer electricity generation and sold heat production by oil refineries is partly due to the activities of these units being split off and reclassified as main activity enterprises.
- Breaks in the time series between 2014 and 2015 for coke oven gas, blast furnace gas and other recovered gases are due to a reclassification of main activity producers and autoproducers.
- The methodology of data collection for the geothermal sector changed in 2010, causing a break in time series between 2009 and 2010.
- Prior to 2009, sub-bituminous coal used in main activity electricity plants was included under other bituminous coal.
- With the introduction of a new survey in 2008, amounts of naphtha and other kerosene that were previously included in other oil products have been reported separately in autoproducer CHP plants.
- Prior to 2004, electricity production from orimulsion is confidential and is included with fuel oil.
- Heat production is reported starting in 2004 and includes self-generation in industry.
- For data since 2001, calorific values for imports of other bituminous coal and sub-bituminous coal are derived from inputs to main activity electricity generation.
- From 2000 onwards, the Italian administration defines electricity and heat production from autoproducers 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.
- The breakdown of renewables and waste inputs into electricity, heat and CHP plants is available from 1989 only. Prior to that year, the total of the different fuels involved is reported as non-specified renewables.
- Prior to 1984, net electricity production by autoproducers includes production from combustible fuel sources only.

Consumption

- Non-specified energy industry own use includes electricity consumption for blast furnaces. From 2000, it also includes consumption for the distribution of gas and prior to 1989 consumption for uranium extraction.
- The breakdown of heat consumption by sector is estimated by the Italian administration.
- Revisions of the final consumption of heat by the Italian administration led to breaks between 2010 and 2011.
- From 1981, consumption of electricity in transport includes electricity used for pumping in oil pipelines.

Trade

- Electricity trade with Malta started in 2015, following the opening of the Malta-Sicily interconnector submarine power cable in the same year.

Capacity

- Prior to 1981, data on electrical capacity by type of generation are not available.

Japan

Source
The Institute of Energy Economics Japan, Tokyo.

General notes

- In the 2018 edition, data for Japan were revised back to 1990 based on new methodology. Additional details are given under each fuel.
- From 1990, data are reported on a fiscal year basis (e.g. April 2015 to March 2016 for 2015).
- In the 2018 edition, Japan revised their data back to 1990 based on new methodology in all questionnaires.
• Consumption data for commercial and public services may include consumption in small and medium-sized industries. The Japanese administration expects that this shortcoming will be corrected in the near future.

• Other bituminous coal includes sub-bituminous coal.

• The net calorific values for coal and coal products have been recalculated by the IEA Secretariat based upon gross values submitted by Japan.

• In the 2018 edition, imports of other bituminous coal and coking coal by partner country - have been estimated by the IEA Secretariat for data from 1990 to 2016, based on customs data and total imports by coal type.

• Hard coal data prior to 1978 may include sub-bituminous coal.

Supply

• Generation of electricity and heat from combustible fuels is calculated by removing electricity and heat generation from other sources, such as wind, solar and nuclear, making it a residual item. Splits between combustible fuel types and consumption flows are also calculated.

• For 2017, electricity production from wind has been estimated by the IEA Secretariat.

• For 2016, large increases in main activity electricity generation from solar photovoltaic and wind in 2016 are due to the reclassification of autoproducers following the liberalisation of the Japanese power market in April 2016.

• Due to the events related to the March 2011 tsunami, the Japanese administration decided to scale back the level of their nuclear programme. As a consequence, there was no nuclear electricity generation in 2014. The nuclear electricity generation started again at a greatly reduced scale in 2015, while a significant increase was observed in 2017, with generation resuming at four facilities (Takahama 3 and 4, Ooi 3, and Genkai 3).

• Other sources electricity represents electricity generated with purchased steam. Other sources heat represents heat derived from waste.

• Net and Gross electricity generation from autoproducers equal, as no information is collected concerning autoproducer own use.

• Production of electricity from solar photovoltaic and wind in autoproducer electricity plants is understated as it covers only plants with capacity higher than 1000 kW.

• The Japanese administration estimate the electricity input of electric boilers based on 100% efficiency.


• Data on electricity production from wind began in 1992.

• Heat produced for sale in main activity producer heat plants from waste heat and from electric boilers is available from 1977 and 1983, respectively.

Transformation

• Electricity production from pumped storage includes production from both mixed hydro and pure pumped storage.

• Data on heat produced for sale by autoproducer heat plants are not available.

• From 1998, inputs of coke oven gas, blast furnace gas and other recovered gases into autoproducer electricity plants include the amount used to produce electricity with TRT technology (Top pressure Recovery Turbines) which was previously included in industry.

• Inputs of manufactured gases (coke oven gas, blast furnace gas and other recovered gases) to main activity electricity and heat plants are calculated based on outputs and using efficiencies of main activity producers from other fuels. For autoproducers, the specific inputs are known, however the specific electricity production by each gas is estimated based on a pro-rata of the total electricity generation from all gas types.

• Fuels used and corresponding 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, leading to some plant efficiency figures not to be accurately calculated.

• Inputs of biofuels and waste for electricity production and related outputs are available from 1982.

• Net electricity production by autoproducers prior to 1982 includes production from combustible fuel sources only.

• Between 1972 and 1976, the use of combustible fuels in main activity producer heat plants is included in non-specified.
Consumption

- Consumption of electricity in non-specified industry includes wood and wood products and construction prior to 1982.

Capacity

- Electricity generation capacity for nuclear power increased in 1997 due to the commissioning of two nuclear plants.
- Prior to 1981, data on electrical capacity by type of generation are not available for main activity producer plants.
- Prior to 1974, data on electrical capacity by type of fuel are not available for autoproducer plants.

Korea

Sources

- Korea Energy Economics Institute, Ulsan.
- Korea National Oil Corporation, Ulsan.

General notes

- Data are available starting in 1971.
- Data for 2002 onwards have been reported on a different basis, causing breaks in time 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 time series as time and resources allow.
- Data for coal and coal products from 1971 to 2001 are based on information provided by the Korean administration, as well as information from the Yearbook of Energy Statistics 2002, the Yearbook of Coal Statistics 2001 (both from the Ministry of Commerce, Industry and Energy), and Statistics of Electric Power in Korea 2001 (from the Korea Electric Power Corporation). During this period, import data by coal type were estimated by the IEA Secretariat, based on statistics of the exporting countries.
- Hard coal data prior to 1978 may include sub-bituminous coal.
- Due to the change of reporting methodology, breaks in time series for biofuels and waste may occur between 2013-2014 and 2014-2015.
- 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.
- Heat data are available starting in 1993.

Supply

- The own use of heat in heat plants is very irregular due to a lack of data.
- Electricity generation reported under other sources is from fuel cells.
- Production of tidal electricity began in 2013.
- Data for heat from chemical processes that is sold is available from 2008.
- Data for electricity production using heat from chemical processes in copper and zinc plants is available from 2005. The corresponding heat inputs were estimated until 2013 data. In 2014 the corresponding company switched to gas/diesel oil for electricity generation.

Transformation

- Some data discrepancies currently exist for residual fuel oil, between the oil databases and the electricity and heat databases. The Korean administration envisages remedying this situation next year.
- 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.
- Prior to 2009, autoproducer heat production includes amounts of unsold heat.
- 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.
- Data for electricity and heat production by autoproducers using natural gas and liquid fuels are available from 2000.
- In 2000, the Korean administration started to report heat statistics for some heat plants which were not reported before.
- Between 1993 and 1999, the breakdown of heat output by type of fuel was estimated by the IEA Secretariat.
Before 1994, electricity production from main activity producer CHP plants is included with main activity producer electricity-only plants.

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.
- Heat consumption by subsector was reclassified in 2010 due to new information available on heat sales from autoproducers to end-users by sector.
- Prior to 2008, sales of electricity by Korea’s main electricity distributor, KEPCO, to the non-ferrous metals sector are included in iron and steel consumption.
- Data on production and consumption of electricity and heat in oil refineries and LNG liquefaction/regasification plants are included in the industry sector. From 2007, oil refinery electricity and heat production and consumption started to be reported under the correct energy sector.
- Data for heat consumption by sector are available from 2000.
- Data for electricity consumption in the transport equipment sector are included in machinery from 1994 to 1999.

Capacity

- The breakdown of generating capacity by fuel is not available prior to 1994.

Luxembourg

Source

STATEC, Institut national de la statistique et des études économiques du Grand-Duché du Luxembourg, Luxembourg.

General notes

- Data for solar thermal are available starting in 2001 and for solar PV starting in 2000.
- A revision in the classification of power plants by type and the production and consumption data for both electricity and heat back to 2000 causes breaks in the time series.

Supply

- Most of the hydro production shown for Luxembourg is from the Vianden pumped storage plant and is exported directly to Germany.
- Starting in 2005, data for electricity transmission and distribution losses were obtained from the network operator. Prior to that, they were estimated by the Luxembourgian administration.
- In the 2017 edition, following plant reclassification, heat production by main activity plants were revised from 2011 onwards.

Transformation

- Luxembourg’s natural gas-fired, main activity electricity plant closed for the majority of 2016 for economic reasons.
- The production of electricity from solid biofuels from 2013 corresponds to the opening of a new plant burning wood wastes.
- Data on electricity production from biogases are available from 1998 and heat production from 2010.

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 World Energy Statistics publication.

Transformation

- Due to a reclassification in 2004, there was break in the time series of electricity production from autoproducer electricity plant fuelled by biogas between 2003 and 2004.
- 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.
• In 2002, the increase in electricity production is due to a new natural gas combined cycle power plant.
• At the end of 1997, the iron and steel industry stopped production of electricity.
• Electricity data for natural gas autoproducer CHP plants are available starting in 1995, and for main activity CHP plants starting in 1996.
• Prior to 1990, net electricity production by autoproducers includes production from combustible fuel sources only.

Consumption
• In 2015, the observed declines in the heat used in the textiles and leather sector and the chemical and petrochemical sector are due to the closure of two industrial main CHP plants. The heating needs of these sectors were met through direct purchase of natural gas, due in part to attractive pricing during this period.
• In 2015, following the procurement of new information, data for heat distribution losses and heat consumption in industry and energy sectors were revised from 2000 onwards.
• A change in the data source caused some breaks in the industry electricity consumption time series between 2010 and 2011.
• The breakdown of electricity consumption in industry is not available from 1990 to 1999.

Capacity
• Production of electricity in the iron and steel industry ceased at the end of 1997. Therefore, autoproducer electrical capacity for combustible fuels declined.
• Prior to 1995, data on electrical capacity by type of generation are not available for autoproducers.

Mexico

Source
Secretaría de Energía, Mexico City.

General notes
• Data are available starting in 1971.
• 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.
• In the 2016 edition, the Mexican administration completed a major work on revisions of the time series back to 1990. More revisions to historical data are pending.
• The Mexican administration is currently undertaking revisions of the electricity time series back to 1996. Revisions include changes on inputs and outputs on power plants fuelled mainly by combustible fuels and the reclassification of main electricity plants previously reporting sub-bituminous coal as fuel to other bituminous coal for the period 2003-2015.
• The time series for blast furnace gas and inputs of coke oven coke to blast furnaces start in 1991.
• Hard coal data prior to 1978 may include sub-bituminous coal.

IEA estimations
• For 2016, imports of other bituminous coal and coking coal by country of origin have been estimated by the IEA Secretariat based on partner data.
• For coking coal, amounts reported for consumption in main activity electricity generation and associated imports for the years 2003 to 2016 have been reallocated to other bituminous coal by the IEA Secretariat.

Supply
• Production of main activity producer electricity plants from wind is available from 1994.
• Electricity production from wind and solar photovoltaic is available from 1990.

Transformation
• New autoproducer electricity plants fuelled with coke oven gases were put on-line in 1999.
• Electricity production from solid biofuels and biogases data are available respectively from 1991 and 1997.
• Data for solid biofuels used in autoproducer electricity plants from 1991 to 2005 have been estimated by the Mexican administration.
• Data for fuel oil and gas/diesel inputs to autoproducer CHP generation are available from 1999.
Consumption

- Some electricity consumption in energy industry is included in the industry sub-sector where it was generated (e.g. the chemical industry, as well as in non-specified industry).
- Direct use of solar thermal heat is available from 1990.

Capacity

- In 2012, nuclear capacity increased due to the replacement of the turbines in the only nuclear plant.
- The capacity factor for wind appears high for 2011 as the capacity of plants on test was not reported.
- The breakdown of generating capacity for main activity producer electricity plants by combustible fuels is not available prior to 1982.
- Net maximum electrical capacity for autoproducers is not available prior to 1974.

Supply

- The decrease of electricity produced from nuclear in 2013 is due to maintenance (two and a half months) on one nuclear power plant.
- Electricity from other sources represents generation from expansion gases and chemical waste gases (the latter up to 2007).
- The large increase in electricity trade in 1999 is due to the liberalisation of the Dutch electricity market. Until 2003, trade data are based on contracted quantities instead of physical flows.
- The decrease of electricity produced from nuclear in 1997 is due to the closure for five months of one nuclear power plant.
- The increase of heat produced in main heat plants in 1995 is due to a change in ownership of one large installation, resulting in its reclassification from an autoproducer to a main activity plant.
- Electricity production from solar photovoltaic is available from 1990.

Transformation

- At the end of 2015 three low-efficiency plants running on bituminous coal input closed down. These closures were part of the Agreement on Energy for Sustainable Growth in the Netherlands (https://www.energieakkoordser.nl/doen/engels.aspx) agreed upon by the Social and Economic Council of the Netherlands (SER) and more than forty representative organisations and stakeholders.
- Heat used for electricity production represents waste heat bought from other industries that was generated from combustible fuels.
- Autoproducer heat plants using refinery gases are included with autoproducer CHP plants because data are considered confidential for 1990.
- Heat production in commercial and public services includes production in agriculture.
- All municipal waste autoproducer electricity and heat only plants have been reclassified by Statistics Netherlands as autoproducer CHP from 2012, causing breaks in the time series.
- The 2009 increase in input of natural gas to main activity electricity consumption is due to the opening of a new plant in the second half of 2008.
- Prior to 2008, a few small autoproducer electricity plants using solid biofuels were included with main activity plants for reasons of confidentiality.

Netherlands

Source


General notes

- The Netherlands Central Bureau of Statistics 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 harmonisation 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.
- In the 2017 edition, following an extended review of old national publications, data for the Netherlands were revised for the years 1990-1994 to follow on the revisions entered in the previous edition, covering period 1995-2013. This revision endeavours to maintain data comparability throughout the entire time series. As part of these revisions, most of the time series for the consumption sectors in both electricity and heat were revised using newly obtained data from grid operators’ client files by the Dutch administration.
In 2006, some municipal waste plants changed ownership and were reclassified from electricity-only to CHP plants as they started heat projects.

A new main activity producer CHP plant fuelled by refinery gas started up in 1999 and there was a fuel reclassification in 2000.

For natural gas, all electricity production prior to 1998 is included in CHP plants.

For biofuels and waste, all electricity and heat produced prior to 1995 is included in CHP plants.

Data for heat produced from biofuels and waste are available from 1990.

Prior to 1990, all electricity and heat produced from coal is included in CHP plants.

Inputs of hard coal for electricity production from 1981 to 1989 in terajoules (TJ) are estimated by the Secretariat based on data submitted in kilotonnes (kt) by the Dutch administration.

Net electricity production by autoproducers prior to 1988 includes production from combustible fuel sources only.

Data for heat production by fuel in heat plants prior to 1987 are estimated by the Secretariat based on fuel inputs submitted by the Dutch administration.

Data for heat production from main activity producer CHP plants and heat plants are available from 1982.

Prior to 1982, electricity production from and inputs to main activity producer CHP plants are included with main activity producer electricity plants.

For 1970 to 1973, electricity output from autoproducer CHP plants has been included with main activity producer CHP plants.

Increasing electricity consumption in agriculture/forestry is due to expansion of greenhouse farming.

Direct use of geothermal heat in agriculture/forestry starting in 2008 is due to a new project extracting deep geothermal heat.

Prior to 1979, electricity consumption in agriculture is included in commercial and public services.

Prior to 1981 for main activity producer plants and 1982 for autoproducers, data on electrical capacity by type of generation are not available.

New Zealand

Source
Ministry of Business, Innovation and Employment, Wellington.

General notes
- There are several breaks in the time series between 1987 and 1988 due to a reorganisation of government departments during 1987.

Supply
- Heat outputs from main activity and autoproducer CHP plants are not available.

Transformation
- Electricity and heat production from other sources represents waste heat recovered and used for electricity production.
- In 1999, a reclassification of autoproducer plants causes some breaks in the time series.
- Data for geothermal electricity production by autoproducers 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.
- Data for heat from chemical processes used for electricity production are available from 1990 and corresponds to acid plants in the fertiliser industry where sulphur is the main input.
- 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.
- The large 1998 increase in natural gas input to autoproducer CHP plants is due to two new autoproducer CHP plants.
- Electricity production by autoproducers from natural gas and from oil has been estimated by the Secretariat from 1970 to 1973.
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.
- A new survey starting with the 2013 data can cause breaks in data for final consumption of electricity.
- The consumption of electricity by the transport sector is collected under the Australian and New Zealand Standard Industrial Classification (ANZSIC) 2006 system’s “Transport, Postal and Warehousing” category. As this covers commercial services as well as transport, MBIE estimates the amount of this that can be allocated to transport. At present this data does not allow for the disaggregation by transport sub-sector.
- Beginning in 2013, the falling electricity consumption in the pulp, paper and printing sector follows with the permanent closure of a paper machine in one of New Zealand’s larger energy users, following decreased demand for newsprint.
- Data on direct use of geothermal heat are available from 1990 and direct use of solar thermal heat from 2002.
- From 1974 to 1993 distribution losses include the statistical differences.
- The classifications used by the administration of New Zealand were changed in 1991.
- Electricity consumption in paper, pulp and printing is included in wood and wood products prior to 1990.

Capacity

- Generating capacity for autoproducers is available from 1994.
- Prior to 1981, data on electrical capacity by type of generation are not available.

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”.

Supply

- No data on electricity production from solar energy are submitted to the IEA by the Norwegian administration.
- The electricity generated from other sources represents electricity from waste heat.
- Heat produced by autoproducer heat plants from chemical processes and from other sources and used for electricity production has been estimated by the IEA Secretariat for the period 1990 to 2006.
- Electricity production from wind is available from 1993.
- Data for heat production from heat pumps and electric boilers (including the electricity used for this production) are available from 1989.
- Data for heat production are not available prior to 1983.

Transformation

- In the 2016 edition, Norway corrected the industrial waste consumption in heat plants, and reclassified some of the corresponding heat output under other sources.
- Starting in 2007, data for natural gas electricity and CHP plants are aggregated in autoproducer electricity plants for confidentiality reasons. The revisions received for the 2018 edition partially altered these data for the period 2010 to 2016, but no explanations were given.
- 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.
• Data for heat production from biogases are available from 1995.
• Prior to 1991, net electricity production by autoproducers by industry sub-sector was estimated by the Secretariat based on data submitted by the Norwegian administration.
• Data on inputs and outputs in heat plants are not available prior to 1983 for main activity heat plants and prior to 1988 for autoproducer heat plants.

Consumption
• Consumption of electricity for pipeline transport is included in oil and gas extraction.
• The breakdown of heat consumption by the industry sub-sector was expanded in 1992, reclassified in 1994 and collected by a new reporting system in 1997.

Trade
• Electricity trade with the Netherlands begins in 2008 with the operation of a cross-sea cable interconnection between the two countries.

Capacity
• The increase in gas-fired generating capacity and the associated production of electricity in 2007 is due to the opening of a new plant at Kårstø in late 2007.
• Net maximum electrical capacity of pumped storage plants is not available from 1970 to 1972.

Poland

Source
Central Statistical Office, Warsaw.

General note
• 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.

Supply
• Electricity and heat from chemical heat and other sources are available from 2011. Prior to that, these amounts could be included under different categories.
• Heat distribution losses are available from 2010 and prior to that they are included in consumption.
• Heat production from heat pumps is available from 2009.

Transformation
• In the past two editions, the Central Statistical Office has revised their methodology which accounts for sold heat produced from autoproducer heat plants using coking coal and other bituminous coal, resulting in lower, but more accurate data for 2007 onwards.
• Starting with 2017 edition and following, the Polish administration revised electricity production data from power plants run by combustible fuels, reclassifying those that were previously reported as main activity CHP as main activity electricity plants. These revisions mainly affected coal-fired power plants and created breaks in time series from 2004 onwards.
• State support for biomass co-firing was reduced in 2016, resulting in electricity production from solid biofuels falling during this period (2016p).
• Due to a reclassification of plant types, there is a break in time series in 2015 for the generation of heat in autoproducer CHP plants in the iron and steel sector.
• In 2008 and 2014, a number of CHP plants were reclassified from autoproducer to main activity producer due to an industry re-organisation.
• In 2013 and 2014 some CHP plants were used as backup reserve plants, resulting in a decrease in consumption under main activity producers CHP plants.
• In 2004 and 2005 small amounts of gas were used to start up main activity electricity plants.
• Data for electricity production in autoproducer electricity plants are available from 1986.

Consumption
• Heat consumption in energy industry own use includes process heat not sold before 1995.
• 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.
• In the 2017 edition, the Polish administration reclassified some amounts of electricity consumption from the chemical and petrochemical sector to oil refineries, following access to improved survey methods.
Portugal

Source
Direcção-Geral de Energia e Geologia, Lisbon.

Supply
- Data for production of electricity from solar photovoltaic and wind are available from 1989.
- For 2017 data, solar photovoltaic includes own-use.
- The large decrease in electricity output from hydro for 2017 is due to decreased rainfall.

Transformation
- For 2016 data onwards, heat and electricity production from chemical sources have been reclassified as autoproducer CHP production from industrial waste, causing cessation of the heat and electricity generated from heat from chemical processes time series, and causing breaks in the industrial waste time series between 2015 and 2016.
- Electricity production from other oil products refers to methanol.
- In the 2017 edition, the data for production of electricity by autoproducer hydro plants were revised between 1990 and 1999, according to a new national methodology.
- In 2007, some power plants that were previously reported as main activity CHP have been reclassified as autoproducer CHP.
- In 2007, the power station that burns industrial waste started to work as a CHP plant, whereas previously it was only producing electricity.
- New plants fuelled by solid biofuels and by municipal waste started in 1999.
- Prior to 2001, the data reported as industrial waste include biogases and municipal waste.
- Data for solar photovoltaic are available from 2010.

Slovak Republic

Source

General notes
- Data are available starting in 1971.
- In 2002 the gross calorific value (GCV) of natural gas production increased significantly as extraction from a field with a low GCV ended.
- Prior to 2001, the data reported as industrial waste include biogases and municipal waste.
- Data for solar photovoltaic are available from 2010.

Transformation
- In 2014, the decrease in natural gas autoproducer CHP plants consumption was due to a plant closure.
- Between 2008 and 2009, one of the companies changed its status from autoproducer CHP plant to main activity producer CHP plant, resulting in a decrease in fuel oil consumption for autoproducer CHP.
- Electricity and heat production from combustible fuels from 1990 to 2003 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

- The low electricity consumption in oil refineries in 2003 and 2004 is due to a change in ownership and work carried out on a refinery.
- Data for direct use of geothermal heat are available from 2001 and direct use of solar thermal heat from 2005.

Trade

- The breakdown of trade by origin and destination is available from 1993.

Capacity

- The breakdown of installed capacity by type of generation/fuel is available from 2001.
- Peak load data for main activity producer plants have been estimated by the IEA Secretariat based on the SEPS annual reports and include data for autoproducer plants. Data are available back to 2000.
- Data for main activity generating capacity are not available prior to 1995, and for autoproducers prior to 2001.

Slovenia

Source

Statistical Office of the Republic of Slovenia, Ljubljana.

General notes

- A new energy data collection system was implemented in January 2001, causing some breaks in time series between 1999 and 2000.
- Data for Slovenia are available starting in 1990. Prior to that, they are included in Former Yugoslavia.

Transformation

- In 2015, one of the main activity electricity plants burning lignite ceased its operations.

Consumption

- Direct use of solar thermal and geothermal heat is available from 2009.
- Surveys for data on heat consumption are available from 2003 onwards for the residential, industry and energy sectors. Prior to 2003, the data have been estimated by the Slovenian administration.

Spain

Source

Ministerio de Energía, Turismo y Agenda Digital, Madrid.

General notes

- Spain is currently working on improving its data collection system. Therefore, breaks in time series are present in the data and historical revisions are expected in the future editions.
- The calorific values for sub-bituminous coal are correct on an as received basis, and comply with definitions of sub-bituminous coal on a moist, but ash-free basis.
- Spain has implemented a new tool in data collection, so there are currently breaks in the time series for 2014 and 2015 in transformation and industry respectively.

Supply

- Electricity reported under other sources is from waste heat.
- Transmission and distribution losses are estimated by the Spanish administration.
- Data for electricity from solar thermal plants are available from 2007.
- Starting in 2006, a new method was used to estimate the losses from final consumption, resulting in a break in time series between 2005 and 2006.
- From 2005, residential rooftop solar photovoltaic electricity production data, previously reported under autoproducer, are included in main activity electricity plants according to the Spanish administration classification.
- Electricity production from wind and solar are reported from 1989 when data became available.

Transformation

- In 2018 edition, a reclassification of plants from autoproducer to main activity has led to breaks between 2015 and 2016.
In the 2017 edition, a change in reporting methodology resulting in reclassification of plants from autoproducer electricity to autoproducer CHP has led to breaks in electricity production in aut-electricity plants between 2012 and 2013 and 2014 and 2015. The administration anticipates further revisions to the time series in subsequent cycles.

Due to the implementation of an updated tool for gathering information on electricity generation plants in 2013 many autoproducer electricity plants were reclassified as autoproducer CHP plants.

The National Energy Commission reclassified plants that consume biogases, leading to breaks in time series between 2007 and 2008.

In 2000 and 2006, many plants were reclassified from main activity producer to autoproducer or vice versa.

For 2004 and 2005, electricity production from gas/diesel oil is included with fuel oil.

The large increase in electricity output from main activity producer electricity plants fuelled by natural gas in 1997 is due to the opening of a new plant.

Between 1993 and 1994 there is a break in time series in autoproducer CHP plants consumption, since a new survey revealed a large number of CHP autoproducers that were previously included in industry consumption.

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.

Prior to 1987, electricity production in main activity producer CHP plants is included with production from main activity producer electricity plants.

From 1983, net electricity production by autoproducers has been estimated by the Spanish administration, and includes production from combustible fuel sources only and net electricity production by autoproducer CHP plants is included in electricity plants.

Data for direct use of solar thermal heat are available from 1994.

Data for direct use of geothermal heat are available from 1990.

Electricity consumption under the non-specified industry category includes the consumption for the manufacture of rubber and plastic products, furniture, repair and installation of machinery and equipment (except repair and maintenance of ships and boats) and other manufacturing. This aligns with the Classification of the Economic Activities in the European Community (NACE) group code 22 and 31 to 33 (excluding class 33.15).

**Capacity**

- From 2004, capacity of autoproducers is included with main activity producers.
- Prior to 1980, data on electrical capacity by type of generation are not available and from 2003 no breakdown of capacity by type of fuel and generation type is available.

**Sweden**

**Sources**

- Statistics Sweden, Örebro.
- Swedish Energy Agency (Energimyndigheten), Eskilstuna.

**Supply**

- Heat data for 2017 are based on a quarterly survey which does not have the same coverage as the annual survey. Therefore, data are provisional and subject to revision.
- Inputs to heat pumps include heat recovered from industry and from ambient sources (including sewage and seawater).
- Ambient heat is shown as the indigenous production of heat.
- Information on heat for sale produced in heat pumps and electric boilers is available starting in 1992.

**Transformation**

- Autoproducer inputs to waste-heat production that are sold are reported in the respective end-use sectors and not in the transformation sector.
In Sweden, heat produced in heat pumps is sold to third parties (as district heat) and is therefore included in transformation.

The electricity used to drive heat pumps is considered to be transformed and appears as output in transformation rather than as electricity used in energy industry own use.

Heat production from solid biofuels in autoproducer CHP includes waste heat and chemical heat.

For 2012 and 2013, small quantities of biomethanol used to produce electricity are included in other liquid biofuels, under production, as well as input and output of autoproducer CHP.

For 1997 and 1998, heat production from liquid fuels in main activity producer CHP plants includes heat recovered from flue-gas condensing.

Prior to 1987, the breakdown of net electricity production by industry for autoproducer electricity plants is available.

Prior to 1987, net electricity production by autoproducer plants includes data for CHP plants only.

Prior to 1980, heat produced in main activity producer heat plants is not available.

Prior to 1974, heat produced in main activity producer CHP plants is not available.

Consumption

Consumption of electricity for distribution of district heat is included with other energy industry own use.

Fuel inputs to the heat that is recovered by the heat pump are reported in the appropriate industry sub-sector (i.e. chemical, and paper, pulp and printing).

In 2014, consumption of electricity in the mining and quarrying and the pulp, paper and printing sectors are confidential and were incorporated under the non-specified industry sector.

Data on direct use of solar thermal are available from 1989.

Consumption of heat in industry and other sectors is available from 1984.

Capacity

In the 2017 edition, following improved access to generating companies’ information on hydroelectric plants, Sweden’s pure pump hydroelectric capacities were reclassified to mixed plant hydroelectricity from 1990 onwards.

The breakdown of generating capacity of main activity producer and autoproducer electricity plants by fuel is not available from 1990 to 2003 and from 2006 to 2013 and is confidential from 2014 onwards.

Peak load data for main activity producer plants includes data for autoproducer plants from 1992.

Generating capacity of main activity producer electricity plants includes autoproducer plants prior to 1984.

Prior to 1981, data on electrical capacity by type of generation are not available for main activity producer plants.

Switzerland

Sources

Swiss Federal Office of Energy (SFOE), Ittigen.

Carbura – Swiss Organisation for the Compulsory Stockpiling of Oil Products, Zurich.

General note

From 1999, data on consumption result from a new survey and are not comparable with data for previous years.

Supply

Heat production includes heat produced by nuclear power stations and distributed to other consumers.

Data for electricity production from wind are available from 1996.

Data for solar electricity production by autoproducers are available from 1990.

Transformation

Gas/diesel oil non-specified transformation (in the oil databases) represents inputs to mobile and stationary power generators, of which the electricity output is unknown at this stage.
• In 2016, two new pumped hydroelectric plants went into operation.
• For 2015, the large decline in electricity and heat production from industrial waste is due to one large main activity CHP plant significantly reduces their activity. This plant eventually closed in 2016, further lowering electricity and heat generation for this fuel.
• Since 2013 there are fluctuations in natural gas inputs to main activity producers CHP plants due to the fuel flexibility of a plant.
• 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 decrease in the use of natural gas in main activity CHP plants in 2007 is caused by the reduced operation of one plant after the start-up of a new waste-incineration plant and the closure of another plant. Use increases again in 2008 due to the re-starting of a district heating plant.
• The autoproducer heat plant that produced heat for sale using municipal waste was closed in 2006.
• In 1996, the increase of gas input to main activity CHP plants is due to more complete accounting for all producing entities.
• The breakdown of electricity and heat generation from autoproducers by sector is not available after 1990.
• Prior to 1978, data for heat output from CHP plants are not available.
• The allocation of electricity production in main activity producer electricity-only and CHP plants between 1967 and 1973, and in main activity producer CHP and autoproducer CHP plants in 1974 are Secretariat estimates.
• 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.

Consumption

• Electricity consumption in the transport equipment industry is included with machinery.
• Geothermal direct use is overstated as it refers to heat production by geothermal heat pumps, which include inputs from electricity and/or gas in the transformation process.

• The breakdown of final consumption of electricity in the industry sector from 2000 to 2001 was estimated by the Secretariat.
• Data for direct use of geothermal heat and solar thermal heat are available from 1990.

Trade

• Electricity trade to and from non-specified/others represents trade with Liechtenstein.

Capacity

• For 1990 to 2005, the split of hydro and pumped hydro capacity between main activity producers and autoproducers is estimated based on the split of capacity at peak load.
• Electricity generating capacity for liquid fuels in main activity producer plants includes all combustible fuels prior to 1990.

Turkey

Sources

• Ministry of Energy and Natural Resources (Enerji ve Tabii Kaynaklar Bakanlığı), Ankara.
• Petrol İşleri Genel Müdürlüğü, Ankara.

General notes

• In the 2018 edition, revisions were conducted by the Turkish administration back to 1990 impacting the transformation and industrial sector. The revisions in the transformation sector were the result of new data submitted by the Turkish Electricity Transmission Company (TECT).
• 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. Although the licences of these plants changed, the Administration decided to restore the affected plants’ classification back to autoproducer in 2017 to harmonise with plant definitions in the IEA questionnaire.
• Calorific values for fuels used for electricity, CHP and heat plants are obtained from data submitted to the Ministry of Energy and Natural Resources (MENR) by the Turkish Electricity Transmission Company, and these values may differ significantly from production and import values provided by MENR, causing imbalances for some years.
Supply

- **Other sources heat** production represent purchased steam (waste heat) from the industry, mainly from cement and glass manufacturing, while **other sources electricity** is the proportion of generation by plant obtained from this heat.
- Electricity production from **wind** is available starting in 1998.

Transformation

- In the 2018 edition, Turkish administration revised 2014 and 2015 data, as some **natural gas** fired main activity producing plants in Turkey were reclassified as autoproducers.
- 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.
- A new **gas**-fired main activity producer CHP plant was put into operation in 1999 and a new auto-producer electricity plant fuelled with **cooking coal** started in 2000.
- Data for **blast furnace gas** for electricity and heat generation are available from 1995.
- Data on electricity generated from **biofuels** are available from 1991.

Consumption

- Consumption data in the **machinery** sector includes transport equipment.
- Comprehensive data on **electricity** consumption are available from 1973. This causes a break in the time series between 1972 and 1973.

Trade

- Exports and imports of **electricity** to non-specified/others are respectively to Iraq and from Iran.
- Trades of **electricity** with Albania and Romania are not physical quantities, but contracted quantities.

Capacity

- Generating capacity reported in other type of generation corresponds to **gas** engines.
- Net **electricity** generating capacity by type of generation for both main activity producers and autoproducers is not available prior to 1999.

**United Kingdom**

Source

Department for Business, Energy and Industrial Strategy (BEIS), London.

General notes

- For the United Kingdom, it is necessary to combine figures for main activity producers and autoproducers in order to prevent the disclosure of information relating to less than three **electricity** generating companies, since this information is considered confidential. For this reason, data for main activity producer CHP plants have been included with autoproducer CHP plants from 1988. Prior to 1988, electricity output from CHP plants was included with autoproducer electricity plants.
- The re-organisation and subsequent privatisation of the **electricity** supply industry in 1990 has resulted in some breaks in time series.

Supply

- Large declines in **electricity** generation from coal-fired power since 2013 are due to concrete plans to phase out **coal** use for electricity generation entirely by 2025. Alternative generation has been supplied by increases from other sources, including **biomass**, **natural gas**, **nuclear**, **solar** and **wind** generation, and increases in imports through undersea HVDC interconnectors.
- Electricity production data for **solar PV** are available from 1999.
- 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.
- In 1996, the break in electricity production from **nuclear** is due to a reclassification of plants from autoproducer to main activity producer plants.
- Data on electricity production from **wind** is available from 1989.

Transformation

- The consumption of **solid biofuels** increased in 2015, as the largest power station in the UK converted a further unit from **coal** to **biomass** mid-year, and the previously converted unit had a full year of operation in 2015 rather than just the last few months of 2014.
Underground production of other bituminous coal in 2016 decreased due to the closure of Hatfield, Thoresby and Kellingley mines.

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 market decline in use of other bituminous coal from 2013 onwards for autoproducer electricity generation was due to a plant being sold to a dedicated main-activity electricity producer.

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.

In 2007, outputs of electricity from petroleum coke are included in fuel oil.

Prior to 2003, all outputs of electricity and heat from oil products are reported in the other oil products category.

Heat production from autoproducers is available starting in 1999.

Inputs and output from natural gas for main activity producer electricity production are included in autoproducer electricity for 1990 (for reasons of confidentiality).

Consumption

Consumption in gas works includes electricity use in the transmission/distribution of public supply gas.

Consumption in the non-metallic mineral products sector includes mining and quarrying.

Electricity consumption in coal mines includes consumption in patent fuel plants.

Data for electricity consumption in transport was classified by sub-sector only starting from 2004 resulting in a break in time series between 2003 and 2004. Prior to 2004, non-specified transport includes consumption for traction by urban rails and road vehicles, and consumption for non-traction by railways and bus stations and airports. From 2004 onwards, road vehicles consumption is included under road transport. Prior to 2004, electricity consumption in rail refers to industrial rail only. From 2004 onwards it includes both industrial and urban rail.

Consumption in the machinery sub-sector includes that of the transport equipment industry before 1996.

Starting in 1990, small amounts of electricity used in heat pumps have been included in residential.

From 1984 onwards, the electricity consumption in the non-specified industry sector includes that of the wood and wood products sub-sector and unallocated consumption. The unallocated consumption comes from data reported as ‘Other industries’ by companies and includes Standard Industrial Classification (SIC) codes 7, 22, 31, 32, 33.19, 36, 38.3.

Electricity consumption in the energy non-specified sub-sector is primarily made up of ‘gas and electricity supply’ and includes Standard Industrial Classification (SIC) codes 24.46 and 35.

Capacity

Prior to 1981 for main activity producer plants and prior to 1983 for autoproducers, data on electrical capacity by type of generation are not available.

United States

Source
US Energy Information Administration, Washington D.C.

General notes
End-use energy consumption data for the United States present a break in time series with historical data due to a change in methodology in 2014. The break in time series occurs between 2011 and 2012 for oil; and between 2001 and 2002 for electricity and natural gas. The new methodology is based on the last historical year of the most recent Annual Energy Outlook (AEO) publication. Changes occur primarily in reported end-use energy consumption in the industrial sector and its subsectors, including the non-manufacturing industries of mining, construction and agriculture. Historical revisions are pending. Due to other changes in reporting methodologies, there are numerous breaks in time series for the US data, particularly in 1992, 1999, 2001, 2002 and 2013. 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.

- **Geothermal** supply and transformation data are estimated by the IEA Secretariat starting in 2009 because of efficiency discrepancies.
- Between 2001 and 2002, there are breaks in time series concerning the total production of **electricity** and **heat** in the United States. Comprehensive data on electricity and heat production and consumption in main activity producer electricity, CHP and heat plants and autoproducer electricity and CHP plants are not available for all years.
- The EIA collects generation and consumption data from all plants 1 MW or more in capacity.

### Supply
- The IEA Secretariat estimated US **solar 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. The corresponding consumption of electricity has been included under **non-specified other**.
- Data for electricity absorbed by pumping and electricity production from **pumped storage** plants became available starting in 1987.

### Transformation
- Beginning with 2016 data, the calculation for **heat** production in CHP plants has changed, resulting in breaks in time series. The United States administration is currently unable to apply this methodology to historic years, so will only cover heat data for 2016 onwards. As a result of this methodology change, several **combustible fuel** power plants have their overall efficiency values increased, recording increased heat production. The previous methodology existed for the years 2006 to 2015, so further breaks exist between 2005 and 2006.
- In 2016, **electricity** and **heat** generation from some types of **coal**, for some plant types were estimated by the IEA Secretariat, based on an initial submission from the US Administration and subsequent reclassification of portions of this coal between coal types.
- Accurate accounting of **coke oven gas** and **refinery gas** inputs is not always possible, which can lead to efficiencies of over 100% in main activity producer CHP plants.
- **Other sources electricity** production represents purchased steam and waste heat from industries.
- The low efficiencies from 2011 for **other bituminous coal** autoproducer electricity plants are due to the fact that one unit; the Albany Brewery Power Plant only produces unsold heat, and is reported in the wrong category of plant.
- From 2007 to 2009, heat from **industrial waste** includes recovered heat from industrial processes. From 2010, the **electricity** produced from recovered heat is reported under **other sources**.
- The decline in **patent fuel** used for electricity production in 2008 and subsequent cessation in 2009 is a result of the termination of the “synthetic fuel from coal” tax credit in 2008, which had been in the order of USD 20 to USD 25 per tonne, and while intended to deal with coal liquefaction and similar technologies, it had spawned an industry of cosmetic upgrading as a tax minimisation vehicle.
- From 2004 to 2013, the EIA reported electricity and heat production from **anthracite** under **other bituminous coal**. The Secretariat estimated the split of generation output by fuel type based on the assumption that the plant efficiencies of the aggregate are equal to that of each part.
- Starting in 2002, autoproducer electricity output for **oil** includes generation from **refinery gases** with a low average calorific value. Prior to 2002, this output was not accounted for.
- Prior to 2001, some data on plants consuming **sub-bituminous coal** and **lignite** have been estimated by the Secretariat using information provided in the EIA’s Annual Electricity Generator Report – Utility.
- Data for **peat** are confidential between 1994 and 1998 and from 2000 are not reported.
- Prior to 2000, autoproducers include small and independent power producers which under IEA definitions are considered as main activity producers. Production from these small and independent power producers accounts for about 25% of reported production of **electricity** by autoproducers in the United States. This reclassification causes breaks between 1999 and 2000.
- In the 2003 edition, the United States administration reclassified some plants to autoproducers.
This reclassification causes more breaks between 1998 and 1999.

- From 1999 onwards, the fuel used in heat production by autoproducers is included in final consumption because the US administration cannot distinguish between the heat used directly on-site and the heat sold. Therefore, this may underestimate the heat sold to third parties.
- 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.
- Prior to 1991, some of the fuel inputs to electricity and heat production reported for autoproducer plants are reported as final consumption in the particular economic sector in which the autoproducer is operating.
- Since 1989 for natural gas, consumption by autoproducer CHP plants is available, while consumption by autoproducer electricity and main activity producer CHP plants is available since 1991. Prior to these years, these consumptions are included with industry and commerce/public services.
- Prior to 1989, there are no generation data available from autoproducers.
- Sub-bituminous coal inputs for electricity and heat production are included in hard coal before 1983.

Consumption

- Consumption breakdown data for electricity are modelled based on data obtained from the Annual Energy Outlook and conversion factors. These data are based on fiscal values rather than physical tonnage, so if commodity prices increase or decrease between AEO versions and the conversion factors are not updated, derived changes in consumption may appear that are not supported by physical changes in production, or actual changes in consumption. For example in 2016, production of steel in electric arc furnaces increased by 6%, however consumption of electricity in the iron and steel industry was reported as declining by 17%.
- For the 2017 edition, the breakdown of final electricity consumption for 2015 was based on the results of the Annual Energy Outlook (AEO) of 2016. Breaks in time series appear in the mining and agricultural electricity consumption sectors as a result of introduction of individual industry benchmarking for 2015 results. Changes in iron and steel, and pulp and paper data from 2014 to 2015 are the result of fundamental revisions of the iron and steel and pulp and paper models between AEO2014 and AEO2016 as well as the use of individual industry benchmarking for AEO2016. These changes are a few notable examples of series changes, and any series can change between AEO releases because of data updates and methodology changes.
- Prior to 1991, total consumption of heat sold referred to consumption in commercial/public services.
- No data are available for heat sold that is consumed in the residential and agriculture/forestry sectors for any years.
- Data for direct use of solar thermal heat in residential are available from 1999.
- Since 1995, heat consumption data by sector are no longer collected, and have been estimated by the Secretariat, resulting in breaks in time series between 1994 and 1995, and 1999 and 2000.
- Data for consumption of heat sold in industry are available from 1991 and in energy industry own use from 1992.

Capacity

- Capacity is net summer capacity.
- In the 2015 edition, revised data for hydroelectricity, pumped hydro and mixed plants capacity have been submitted back to 1995 data. This can cause breaks in the time series between 1994 and 1995.
- Data on electrical capacity for autoproducers are available from 1989.
- The breakdown of capacity by fuel type for 1989 is a Secretariat estimate.
- Capacity by type of generation is not reported prior to 1981.
7. UNITS AND CONVERSIONS

Conversions (to toe)

All units in this publication are metric units. Most IEA/OECD publications showing inter-fuel relations and projections present such information in a common energy unit, the tonne of oil equivalent (toe). A tonne of oil equivalent is defined as $10^7$ kcal (41.868 GJ), a convenient measure because it is approximately the net heat content of one tonne of average crude oil. This unit is used by the IEA/OECD in its energy balances. Note also that totals may not be the sum of their components due to independent rounding.

The change from using the original unit to tonne 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.

The main objection to this method is that it results in distortions since there is a wide spread in calorific values between types of coal and individual coal products, and between calorific values of these fuels in different countries.

The Secretariat has therefore adopted specific calorific factors supplied by the national administrations for the main categories of each quality of coal and individual coal products, and for crude oil, specific factors have been used based on consultations with experts from the national administrations, while for petroleum products regional conversion factors have been used.

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 vapourisation of the water produced during combustion of the fuel. For coal and oil, net calorific value is usually around 5% less than gross, for most forms of natural and manufactured gas the difference is 9-10%, while for electricity there is no difference as the concept has no meaning in this case. The use of the 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:

\[ 1 \text{ TWh} = 0.086 \text{ Mtoe}. \]

Complete listings of net calorific values to convert energy sources from basic units to tonne of oil equivalent are reported in section IV and can be found at the end of this Chapter.

Electricity

All electricity data are reported to the IEA in GWh (for generation) or MW (for capacity).

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).

Hydro-electricity 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 ÷ 0.33) ktoe.
For geothermal and solar thermal, if no country-specific information is reported, the primary energy equivalent is calculated as follows:

- 10% for geothermal electricity
  
  \[1 \text{TWh} = (86 \div 0.1) \text{ktoe}\]

- 33% for solar thermal electricity
  
  \[1 \text{TWh} = (86 \div 0.33) \text{ktoe}\]

**Heat**

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

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

- 50% for geothermal heat
  
  \[1 \text{TJ} = (0.02388 \div 0.5) \text{ktoe}\]

- 100% for solar

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

**Natural gas**

In this publication, natural gas excludes natural gas liquids. For the net heat content of a natural gas, its gross heat content is multiplied by 0.9.

**Oil**

The IEA applies regional conversion factors (in conjunction with Eurostat for the European countries) for the petroleum products:

### Regional net calorific values for petroleum products

<table>
<thead>
<tr>
<th>Petroleum products</th>
<th>Europe</th>
<th>Americas</th>
<th>Asia Oceania</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>kJ/kg</td>
<td>kJ/kg</td>
<td>kJ/kg</td>
</tr>
<tr>
<td>Refinery gas</td>
<td>49 500</td>
<td>48 100</td>
<td>48 100</td>
</tr>
<tr>
<td>Ethane</td>
<td>49 500</td>
<td>49 400</td>
<td>49 400</td>
</tr>
<tr>
<td>Liquefied petroleum gases</td>
<td>46 000</td>
<td>47 300</td>
<td>47 700</td>
</tr>
<tr>
<td>Motor gasoline</td>
<td>44 000</td>
<td>44 800</td>
<td>44 600</td>
</tr>
<tr>
<td>Aviation gasoline</td>
<td>44 000</td>
<td>44 800</td>
<td>44 600</td>
</tr>
<tr>
<td>Gasoline type jet fuel</td>
<td>43 000</td>
<td>44 800</td>
<td>44 600</td>
</tr>
<tr>
<td>Kerosene type jet fuel</td>
<td>43 000</td>
<td>44 600</td>
<td>44 500</td>
</tr>
<tr>
<td>Kerosene</td>
<td>43 000</td>
<td>43 800</td>
<td>42 900</td>
</tr>
<tr>
<td>Gas/diesel oil</td>
<td></td>
<td></td>
<td>42 600</td>
</tr>
<tr>
<td>Residual fuel oil</td>
<td>40 000</td>
<td>40 200</td>
<td>42 600</td>
</tr>
<tr>
<td>Naphtha</td>
<td>44 000</td>
<td>45 000</td>
<td>43 200</td>
</tr>
<tr>
<td>White spirit</td>
<td>43 600</td>
<td>43 000</td>
<td>43 000</td>
</tr>
<tr>
<td>Lubricants</td>
<td>42 000</td>
<td>42 000</td>
<td>42 900</td>
</tr>
<tr>
<td>Bitumen</td>
<td>39 000</td>
<td>40 000</td>
<td>38 800</td>
</tr>
<tr>
<td>Paraffin waxes</td>
<td></td>
<td></td>
<td>40 000</td>
</tr>
<tr>
<td>Petroleum coke</td>
<td>32 000</td>
<td>32 000</td>
<td>33 800</td>
</tr>
<tr>
<td>Non-specified petroleum products</td>
<td>40 000</td>
<td></td>
<td></td>
</tr>
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</table>
### General conversion factors for energy

<table>
<thead>
<tr>
<th>To:</th>
<th>TJ</th>
<th>Gcal</th>
<th>Mtoe</th>
<th>MBtu</th>
<th>GWh</th>
</tr>
</thead>
<tbody>
<tr>
<td>From:</td>
<td>multiply by:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Terajoule (TJ)</td>
<td>1</td>
<td>2.388x10²</td>
<td>2.388x10⁻³</td>
<td>9.478x10²</td>
<td>2.778x10⁻¹</td>
</tr>
<tr>
<td>Gigacalorie (Gcal)</td>
<td>4.187x10⁻³</td>
<td>1</td>
<td>1.000x10⁻⁷</td>
<td>3.968</td>
<td>1.163x10⁻³</td>
</tr>
<tr>
<td>Million tonnes of oil equivalent (Mtoe)</td>
<td>4.187x10⁴</td>
<td>1.000x10⁷</td>
<td>1</td>
<td>3.968x10⁷</td>
<td>1.163x10⁴</td>
</tr>
<tr>
<td>Million British thermal units (MBtu)</td>
<td>1.055x10⁻³</td>
<td>2.520x10⁻¹</td>
<td>2.520x10⁻⁸</td>
<td>1</td>
<td>2.931x10⁻⁴</td>
</tr>
<tr>
<td>Gigawatt hour (GWh)</td>
<td>3.600</td>
<td>8.598x10²</td>
<td>8.598x10⁻⁵</td>
<td>3.412x10³</td>
<td>1</td>
</tr>
</tbody>
</table>

### Conversion factors for mass

<table>
<thead>
<tr>
<th>To:</th>
<th>kg</th>
<th>t</th>
<th>lt</th>
<th>st</th>
<th>lb</th>
</tr>
</thead>
<tbody>
<tr>
<td>From:</td>
<td>multiply by:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kilogramme (kg)</td>
<td>1</td>
<td>1.000x10⁻³</td>
<td>9.842x10⁻³</td>
<td>1.102x10⁻³</td>
<td>2.205</td>
</tr>
<tr>
<td>Tonne (t)</td>
<td>1.000x10³</td>
<td>1</td>
<td>9.842x10⁻¹</td>
<td>1.102</td>
<td>2.205x10³</td>
</tr>
<tr>
<td>Long ton (lt)</td>
<td>1.016x10³</td>
<td>1.016</td>
<td>1</td>
<td>1.120</td>
<td>2.240x10³</td>
</tr>
<tr>
<td>Short ton (st)</td>
<td>9.072x10²</td>
<td>9.072x10⁻¹</td>
<td>8.929x10⁻¹</td>
<td>1</td>
<td>2.000x10³</td>
</tr>
<tr>
<td>Pound (lb)</td>
<td>4.536x10⁻¹</td>
<td>4.536x10⁻⁴</td>
<td>4.464x10⁻⁴</td>
<td>5.000x10⁻⁴</td>
<td>1</td>
</tr>
</tbody>
</table>

### Conversion factors for volume

<table>
<thead>
<tr>
<th>To:</th>
<th>gal US</th>
<th>gal UK</th>
<th>bbl</th>
<th>ft³</th>
<th>l</th>
<th>m³</th>
</tr>
</thead>
<tbody>
<tr>
<td>From:</td>
<td>multiply by:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>US gallon (gal US)</td>
<td>1</td>
<td>8.327x10⁻¹</td>
<td>2.381x10⁻²</td>
<td>1.337x10⁻¹</td>
<td>3.785</td>
<td>3.785x10⁻³</td>
</tr>
<tr>
<td>UK gallon (gal UK)</td>
<td>1.201</td>
<td>1</td>
<td>2.859x10⁻²</td>
<td>1.605x10⁻¹</td>
<td>4.546</td>
<td>4.546x10⁻³</td>
</tr>
<tr>
<td>Barrel (bbl)</td>
<td>4.200x10¹</td>
<td>3.497x10¹</td>
<td>1</td>
<td>5.615</td>
<td>1.590x10²</td>
<td>1.590x10⁻¹</td>
</tr>
<tr>
<td>Cubic foot (ft³)</td>
<td>7.481</td>
<td>6.229</td>
<td>1.781x10⁻¹</td>
<td>1</td>
<td>2.832x10¹</td>
<td>2.832x10⁻²</td>
</tr>
<tr>
<td>Litre (l)</td>
<td>2.642x10⁻¹</td>
<td>2.200x10⁻¹</td>
<td>6.290</td>
<td>3.531x10⁻³</td>
<td>1</td>
<td>1.000x10⁻³</td>
</tr>
<tr>
<td>Cubic metre (m³)</td>
<td>2.642x10⁻²</td>
<td>2.200x10⁻²</td>
<td>6.290</td>
<td>3.531x10⁻¹</td>
<td>1</td>
<td>1.000x10⁻³</td>
</tr>
</tbody>
</table>

### Decimal prefixes

| 0³   | deca (da) | 10⁻¹  | deci (d) |
| 10²  | hecto (h) | 10⁻²  | centi (c) |
| 10³  | kilo (k)  | 10⁻³  | mili (m) |
| 10⁶  | mega (M)  | 10⁻⁶  | micro (µ) |
| 10⁹  | giga (G)  | 10⁻⁹  | nano (n) |
| 10¹² | tera (T)  | 10⁻¹² | pico (p) |
| 10¹⁵ | peta (P)  | 10⁻¹⁵ | femto (f) |
| 10¹⁸ | exa (E)   | 10⁻¹⁸ | atto (a) |
8. ABBREVIATIONS

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>GJ</td>
<td>gigajoule (10^9 joules)</td>
</tr>
<tr>
<td>GW</td>
<td>gigawatt</td>
</tr>
<tr>
<td>GWh</td>
<td>gigawatt hour = 3.6 Terajoules</td>
</tr>
<tr>
<td>kW</td>
<td>kilowatt</td>
</tr>
<tr>
<td>kWh</td>
<td>kilowatt hour</td>
</tr>
<tr>
<td>MW_e</td>
<td>megawatt (electric)</td>
</tr>
<tr>
<td>MWh</td>
<td>megawatt hour</td>
</tr>
<tr>
<td>MW_th</td>
<td>megawatt thermal</td>
</tr>
<tr>
<td>m²</td>
<td>metre squared</td>
</tr>
<tr>
<td>t</td>
<td>metric ton = tonne</td>
</tr>
<tr>
<td>TJ</td>
<td>terajoule (10^{12} joules)</td>
</tr>
<tr>
<td>1 toe</td>
<td>tonne of oil equivalent = 41.868 GJ = 10^7 kcal</td>
</tr>
<tr>
<td>TWh</td>
<td>terawatt hour</td>
</tr>
<tr>
<td>GDP</td>
<td>gross domestic product</td>
</tr>
<tr>
<td>RES</td>
<td>renewable energy sources</td>
</tr>
<tr>
<td>TPES</td>
<td>total primary energy supply</td>
</tr>
<tr>
<td>0 or 0.0</td>
<td>negligible</td>
</tr>
<tr>
<td>c</td>
<td>confidential data</td>
</tr>
<tr>
<td>e</td>
<td>estimated data</td>
</tr>
<tr>
<td>..</td>
<td>not available</td>
</tr>
<tr>
<td>x</td>
<td>not applicable</td>
</tr>
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</table>