Database documentation

ELECTRICITY INFORMATION
2021 EDITION

International Energy Agency

INTERNATIONAL ENERGY AGENCY

The IEA examines the full spectrum of energy issues including oil, gas and coal supply and demand, renewable energy technologies, electricity markets, energy efficiency, access to energy, demand side management and much more. Through its work, the IEA advocates policies that will enhance the reliability, affordability and sustainability of energy in its 30 member countries, 8 association countries and beyond.

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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.

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1. CHANGES FROM LAST EDITION

The OECD-focused IVT files (ELEAUTO, ELECAP, ELEEXP, ELEHEATBAL_OECD, ELEHEATGEN and ELEIMP) now include 14 European non-OECD countries submitting the joint annual electricity questionnaire to the IEA. These countries are Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus[1], Republic of North Macedonia, Georgia, Kosovo, Malta, Republic of Moldova, Montenegro, Romania, Serbia and Ukraine. Please refer to the IEA World Energy Statistics online documentation for their country notes and data sources, which can be found at http://wds.iea.org/wds/pdf/worldbes_documentation.pdf.

Electricity supply data for 2020 are now available for Argentina, Benin, Brazil, Ghana, Hong Kong (China), Mauritius, Chinese Taipei, and Uruguay.

A number of OECD countries have provisional sectoral demand data available for 2020 in EleHeatBal_OECD. These data were collected for the first time during the 2019/2020 data cycle. There may be breaks in the time series, in particular for energy use in *Not elsewhere specified - other* sector as data have been allocated to this flow in cases where only partial demand data are available.

Geographical coverage

Colombia became an OECD Member in April 2020. Accordingly, starting with this edition, Colombia appears in the list of OECD Members for data starting in 1971.

Costa Rica joined the OECD in May 2021. However, data for Costa Rica are not included in the OECD aggregates for this edition.

Chile, Colombia, Israel, and Lithuania are currently seeking accession to full IEA membership (Accession country), therefore they are included in the IEA and Accession/Association countries aggregate (IEA family) in the EleHeatBal.IVT file for data starting in 1971 (Chile, Colombia, and Israel) / 1990 (Lithuania).

The IEA continues to expand the coverage of its statistics reports and encourages more countries to collaborate on data exchange. As detailed data have become consistently available for Niger before 2000 and for Guyana for the entire time series, the associated time series are now shown explicitly in the main list of countries in the EleHeatBal.IVT file for all years, and have been removed from the Other Africa and Other non-OECD Americas regions, respectively.

[1] Please refer to the section on Geographical coverage.

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In this edition, country coverage has been expanded to include additional countries in all files:

All files other than EleHeatBal			
Old longname	**New longname**	**Shortname**	**Old shortname (if changed)**
	Albania	ALBANIA	
	Bosnia and Herzegovina	BOSNIAHERZ	
	Bulgaria	BULGARIA	
	Colombia	COLOMBIA	
	Croatia	CROATIA	
	Cyprus	CYPRUS	
	Georgia	GEORGIA	
	Kosovo	KOSOVO	
	Malta	MALTA	
	Republic of Moldova	MOLDOVA	
	Montenegro	MONTENEGRO	
	Republic of North Macedonia	NORTHMACED	
	Romania	ROMANIA	
	Serbia	SERBIA	
	Ukraine	UKRAINE	

EleHeatBal			
Old longname	**New longname**	**Shortname**	**Old shortname (if changed)**
	Guyana	GUYANA	

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Products and flows

In this edition, the list of countries included in the trade tables has been amended to include additional trade flows reported for the first time.

EleImp			
Old longname	**New longname**	**Shortname**	**Old shortname (if changed)**
	Andorra	ANDORRA	
	Armenia	ARMENIA	
	Ecuador	ECUADOR	
	Guatemala	GUATEMALA	
	Kosovo	KOSOVO	
	Republic of Moldova	MOLDOVA	
	Montenegro	MONTENEGRO	

EleExp			
Old longname	**New longname**	**Shortname**	**Old shortname (if changed)**
	Armenia	ARMENIA	
	Belize	BELIZE	
	Ecuador	ECUADOR	
	Guatemala	GUATEMALA	
	Montenegro	MONTENEGRO	
	Kosovo	KOSOVO	
	Moldova	MOLDOVA	
	Bolivarian Republic of Venezuela	VENEZUELA	

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2. DATABASE STRUCTURE

The database *Electricity Information* includes:

Annual data for:

- countries: 172 countries and regional aggregates (see section *Geographical coverage*);
- years: 1960-2019 (OECD countries and regions unless otherwise specified);
  1960-2019 (OECD imports and exports to partner countries);
  1971-2019 (non-OECD countries and regions; world unless otherwise specified);
  2020 (provisional energy supply and partial demand data)

Monthly data for:

- countries: 34 countries and regional aggregates (refer to the Monthly Electricity Statistics online files for notes, sources and revisions[2]);
- years: January 2000-December 2020 (OECD countries and regions unless otherwise specified);

OECD and selected countries files (updated July 2021):

EleHeatBal_OECD.IVT — **OECD and selected countries, Electricity and Heat Supply and Consumption (GWh, TJ)**
Electricity and heat balance (37 OECD countries + 5 OECD aggregates + 14 non-OECD countries; 54 flows; 2 products).

EleHeatGen.IVT — **OECD and selected countries, Electricity and Heat Generation (GWh, TJ, kt)**
Gross electricity and heat production by fuel and plant types (37 OECD countries + 5 OECD aggregates + 14 non-OECD countries; 6 flows; 64 products; 7 plant types).

EleAuto.IVT — **OECD and selected countries, Net Electricity and Heat Production by Auto-producers (GWh, TJ)**
Net electricity and heat production by autoproducers in all plants, by sector (37 OECD countries + 5 OECD aggregates + 14 non-OECD countries; 41 sectors; 2 products; 4 plant types).

EleImp.IVT — **OECD and selected countries, Electricity Imports by Origin (GWh)**
Electricity imports by origin (37 countries + 5 OECD aggregates + 14 non-OECD countries; 55 countries of origin).

2. Available at https://www.iea.org/data-and-statistics/data-product/monthly-electricity-statistics.

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EleExp.IVT **OECD and selected countries, Electricity Exports by Destination (GWh)**
Electricity exports by destination (37 countries + 5 OECD aggregates + 14 non-OECD countries; 57 destinations).

EleCap.IVT **OECD and selected countries, Net Electrical Capacity (MW_e)**
Net electrical capacity by type of energy (37 countries + 5 OECD aggregates + 14 non-OECD countries 26 sources + 2 indicators + 9 factors; 3 plant types).

EleMonthly.IVT **OECD, Monthly Net Electricity Supply (GWh)**
Monthly net electricity production from main sources and trades from January 2000 to December 2020 (35 OECD countries + 5 OECD aggregates; 21 flows).

Data for 2020 are based on the official mini-questionnaire submissions of countries. However, some data have been estimated by the IEA Secretariat.

World files (updated July 2021):

EleHeatBal.IVT **World, Electricity and Heat Supply and Consumption (GWh, TJ)**
Reduced electricity and heat balance (148 countries + 22 aggregates; 8 flows).

Data for 2020 are based on the official mini-questionnaire submissions of countries. However, some data have been estimated by the IEA Secretariat.

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3. FLOW DEFINITIONS

Supply		
Flow	**Short name**	**Definition**
Gross production	GROSPROD	This is the total gross electricity or heat production.
Own use	OWNUSE	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, work-shops and administrative buildings directly associated with the power station during both on-load and off-load periods.
Net production	NETPROD	This is the total net electricity or heat production.
Imports	TOTIMPSB	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.
Exports	TOTEXPSB	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.
Used for heat pumps	EHEAT	This is the electricity used in heat pumps (as defined previously).
Used for electric boilers	EBOILER	This is the electricity used in electric boilers.
Used for pumped Storage	EPUMPST	This is the electricity consumed by pumping in hydro-electric power plants.
Used for electricity production	EELE	Heat from chemical processes used as a primary energy form, and purchased secondary waste heat consumed as input to electricity generation.

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Supply		
Flow	**Short name**	**Definition**
Energy supplied	SUPPLY	For ***electricity***, 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 ***heat***, 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.
Transmission and distribution Losses	DISTLOSS	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.
Total consumption (calculated)	TFCCALC	This equals the Energy Supplied minus Transmission and Distribution Losses.
Statistical difference	STATDIFF	This equals the Total Consumption (calculated) – Total Consumption (observed).
Total consumption (observed)	TFCOBS	This is the amount actually recorded in surveys of end-use sectors. It should, in principle, correspond to the total consumption (calculated).

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Energy Industry		
Flow	**Short name**	**Definition**
Total energy industry	TOTENGY	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.
Coal mines	EMINES	Electricity and purchased heat consumed to support the extraction and preparation of coal within the coal mining industry.
Oil and gas extraction	EOILGASEX	Electricity and purchased heat consumed to support the operation of oil and gas extraction facilities.
Patent fuel plants	EPATFUEL	Electricity and purchased heat consumed at patent fuel plants.
Coke ovens	ECOKEOVS	Electricity and purchased heat consumed at coke ovens.
Gas works	EGASWKS	Electricity and purchased heat consumed at gas works plants and coal gasification plants.
Blast furnaces	EBLASTFUR	Electricity and purchased heat consumed at blast furnaces operations.
Gasification plants for biogas	EBIOGAS	Electricity and purchased heat consumed at biogas gasification plants.
BKB/PB plants	EBKB	Electricity and purchased heat consumed at briquetting plants.
Oil refineries	EREFINER	Electricity and purchased heat consumed at oil refineries.
Coal liquefaction plants	ECOALLIQ	Electricity and purchased heat consumed at coal liquefaction plants.
Liquefaction (LNG) / regasification plants	ELNG	Electricity and purchased heat consumed at natural gas liquefaction and regasification plants.
Gas-to-liquids (GTL) plants	EGTL	Electricity and purchased heat consumed at gas-to-liquids plants.
Nuclear industry	ENUC	Electricity and purchased heat consumed at nuclear power plants.
Charcoal production plants	ECHARCOAL	Electricity and purchased heat consumed at charcoal production plants.
Not elsewhere specified (energy)	ENONSPEC	Electricity and purchased heat consumed for other purposes not reported above.

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Final Consumption		
Flow	**Short name**	**Definition**
Total industry	TOTIND	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):
Mining and quarrying	MINING	[ISIC Divisions 07 and 08 + Group 099 (NACE Divisions 07 and 08 + Group 09.9)] Mining (excluding fuels) and quarrying.
Construction	CONSTRUC	[ISIC and NACE Divisions 41, 42 and 43].
Manufacturing	MANUFACT	Manufacturing refers to the sum of the following industrial sub-sectors: • Iron and Steel: • Chemical and petrochemical: • Non-ferrous metals • Non-metallic minerals • Transport equipment • Machinery • Food and tobacco • Paper, pulp and print • Wood and wood products • Textile and leather Definitions of the sub-sectors themselves can be found under the listing for each respective sub-sector below.
Iron and Steel	IRONSTL	[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.
Chemical and petrochemical	CHEMICAL	[ISIC and NACE Divisions 20 and 21]
Non-ferrous metals	NONFERR	[ISIC Group 242 + Class 2432 (NACE Group 24.4, Classes 24.53 and 24.54)] Basic industries.
Non-metallic minerals	NONMET	[ISIC and NACE Division 23] Such as glass, ceramic, cement, and other building materials industries.
Transport equipment	TRANSEQ	[ISIC and NACE Divisions 29 and 30]
Machinery	MACHINE	[ISIC and NACE Divisions 25, 26, 27 and 28] Fabricated metal products, machinery and equipment other than transport equipment.
Food and tobacco	FOODPRO	[ISIC and NACE Divisions 10, 11 and 12].
Paper, pulp and print	PAPERPRO	[ISIC and NACE Divisions 17 and 18].
Wood and wood products	WOODPRO	[ISIC and NACE Division 16] Wood and wood products other than pulp and paper.

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Final Consumption		
Flow	**Short name**	**Definition**
Textile and leather	TEXTILES	[ISIC and NACE Divisions 13, 14 and 15].
Not elsewhere specified - industry	INONSPEC	[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.
Total transport	TOTTRANS	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.
Rail	RAIL	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.
Pipeline transport	PIPELINE	Electricity consumption in support of the operations of both submarine 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.
Road	ROAD	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.
Not elsewhere specified - transport	TRNONSPE	Electricity use for transport activities not included elsewhere.
Residential sector	RESIDENT	[ISIC and NACE Divisions 97 and 98] Includes consumption by households, excluding fuels used for transport. Includes households with employed persons.

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Final Consumption		
Flow	**Short name**	**Definition**
Commercial and public services	COMMPUB	[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.
Agriculture/forestry	AGRICULT	[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).
Fishing	FISHING	[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.
Non elsewhere specified - other	ONONSPEC	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.

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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.		
Product	**Short name**	**Definition**
Electricity	ELECTR	***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. ***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 (Own use). Production in hydro stations includes production from pumped storage plants.
Heat	HEAT	***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, as well as heat from chemical processes used as a primary energy form. 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 will be equal to net heat production. ***Net heat production*** is the heat supplied to the distribution system as determined from measurements of the outgoing and return flows.

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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.

Product	Short name	Definition
Nuclear	NUCLEAR	Energy released by nuclear fission or nuclear fusion.
Hydro	HYDRO	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.
Pumped hydro production	HYDTPUMP	Electricity produced in hydroelectric power stations from water pumped above the station.
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.
Solar	SOLAR	Solar radiation exploited for hot water production and electricity/heat generation. 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).
Tidal, 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.

Product	Short name	Definition
Combustible fuels	COMBFUEL	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.

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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.

Product	Short name	Definition
Hard coal and patent fuel	HARDCOAL	Prior to 1990, hard coal includes anthracite, coking coal, other bituminous coal, patent fuel, coke oven coke and gas coke.
Brown coal and BKB	BROWN	Prior to 1990, brown coal includes sub-bituminous coal, lignite, coal tar and BKB.
Coal gases	MANGAS	Prior to 1990, coal gases include coke oven gas, blast furnace gas oxygen steel furnace gas.
Anthracite	ANTCOAL	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.
Coking coal	COKCOAL	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.
Other bituminous coal	BITCOAL	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.
Sub-bituminous coal	SUBCOAL	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.
Lignite	LIGNITE	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.
Patent fuel	PATFUEL	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.
Coke Oven Coke and Lignite Coke	OVENCOKE	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.
Gas coke	GASCOKE	By-product of hard coal used for the production of town gas in gas works. Gas coke is used for heating purposes.

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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.

Product	Short name	Definition
Coal tar	COALTAR	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.
BKB (Brown coal briquettes)	BKB	A composition fuel manufactured from lignite coal, or subbituminous coal, produced by briquetting under high pressure without the addition of a binding agent. These figures include dried lignite fines and dust.
Gas works gas	GASWKSGS	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.
Coke oven gas	COKEOVGS	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.
Blast furnace gas	BLFURGS	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.
Other recovered gases	OGASES	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.
Peat	PEAT	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.
Peat products	PEATPROD	Products such as peat briquettes derived directly or indirectly from sod peat and milled peat.

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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.

Product	Short name	Definition
Oil shale and oil sands	OILSHALE	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".

Crude, NGL and Petroleum Products

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

Product	Short name	Definition
Liquid Fuels and Refinery Gas	LIQFUELS	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.
Crude oil	CRUDEOIL	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.
Natural gas liquids	NGL	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).
Refinery gas	REFINGAS	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.
Liquefied petroleum gases	LPG	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.

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Crude, NGL and Petroleum Products

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

Product	Short name	Definition
Naphtha	NAPHTHA	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.
Kerosene type jet fuel	JETKERO	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).
Kerosene	OTHKERO	Kerosene comprises refined petroleum distillate and is used in sectors other than aircraft transport. It distils between 150°C and 300°C.
Gas/diesel oil	GASDIES	A medium distillate distilling between 180°C and 380°C. It is comprised of road diesel, heating and other gasoil.
Fuel oil	RESFUEL	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.
Bitumen	BITUMEN	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.
Petroleum coke	PETCOKE	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 "green coke" and "calcinated coke". This category also includes "catalyst coke" deposited on the catalyst during refining processes; this coke is not recoverable and is usually burned as refinery fuel.
Non-specified petroleum products	OPRODS	All products not specifically mentioned above, for example: tar, sulphur, and shale oil. Oil products not specifically mentioned above.

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Gas

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

Product	Short name	Definition
Natural gas and gas works gas	GAS	Prior to 1990, this aggregate includes natural gas and gas works gas.
Natural gas	NATGAS	Consists mainly of methane occurring naturally in underground deposits. This includes colliery gas. The quantity of fuel used is reported on a **gross** calorific value basis.

Biofuels and Wastes

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

Product	Short name	Definition
Municipal waste	MUNWASTE	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.
Industrial waste	INDWASTE	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 **net** calorific value basis.
Municipal waste (renewable)	MUNWASTER	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 **net** calorific value basis.
Municipal waste (non-renewable)	MUNWASTEN	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 **net** calorific value basis.

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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.

Product	Short name	Definition
Solid biofuels	SBIOFUELS	Covers organic, non-fossil material of biological origin which may be used as fuel for heat production or electricity generation. It comprises: • **Charcoal:** covers the solid residue of the destructive distillation and pyrolysis of wood and other vegetal material. • **Fuelwood, wood residues and by-products:** 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. • **Black liquor**: Energy from the alkaline-spent liquor obtained from the digesters during the production of sulphate or soda pulp required for paper manufacture. • **Bagasse**: Fuel obtained from the fibre which remains after juice extraction in sugar cane processing. • **Animal waste**: 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. • **Other vegetal materials and residuals**: 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.
Biogas	BIOGASES	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**.
Landfill gas	LANDFILL	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.
Sewage sludge gas	SLUDGEGS	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.
Other biogases	OBIOGAS	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.

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Biofuels and Wastes

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

Product	Short name	Definition
Biodiesel	BIODIESEL	This category includes biodiesel (a methyl-ester produced from vegetable or animal oil, of diesel quality), biodimethylether (di-methylether produced from biomass), Fischer-Tropsch (Fisch-er-Tropsch produced from biomass), cold pressed bio-oil (oil pro-duced from oil seed through mechanical processing only) ***used*** straight as road diesel or for electricity and heat generation.
Biogasoline	BIOGASOL	Biogasoline includes bioethanol (ethanol produced from biomass and/or the biodegradable fraction of waste), biomethanol (metha-nol produced from biomass and/or the biodegradable fraction of waste), bioETBE (ethyl-tertio-butyl-ether produced on the basis of bioethanol; the percentage by volume of bioETBE that is calculat-ed as biofuel is 47%) and bioMTBE (methyl-tertio-butyl-ether produced on the basis of biomethanol: the percentage by volume of bioMTBE that is calculated as biofuel is 36%). Biogasoline includes the amounts that are blended into the gasoline - it does not include the total volume of gasoline into which the biogasoline is blended.
Liquid biofuels	OBIOLIQ	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.
Non-specified comb. renew. and waste	RENEWNS	This item is used when the detailed breakdown for primary bio-fuels and waste is not available.

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Other Generation Sources Electricity is expressed in gigawatt hours and heat is expressed in terajoules.		
Product	**Short name**	**Definition**
Heat pumps	HEATPUMP	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).
Electric boilers	BOILER	Heat from electric boilers where the output is sold to third parties.
Heat from Chemical Sources	CHEMHEAT	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.
Other sources	OTHER	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.
Heat output from non-specified comb fuels	HEATNS	This item is only used if the detailed breakdown is not available.
Total Sources	TOTAL	This item represents the sum of all the sources of electricity and heat generation.

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Electricity and Heat Generation Flows		
Flow	**Short name**	**Definition**
Fuel input (kt)	INPUTTON	This is the quantity of fuel used to produce electricity and heat measured in thousand metric tons.
Fuel input (TJ)	INPUTTJ	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.
Gross electricity production	GELEPROD	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.
Net electricity production	NELEPROD	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.
Gross heat production	GHEATPRO	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. 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.
Net heat production	NHEATPRO	Net Heat Production is the heat supplied to the distribution system as determined from measurements of the outgoing and return flows.

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Plant Type		
Flow	**Short name**	**Definition**
Main activity producer electricity plants	MAINELEC	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.
Main activity producer CHP plants	MAINCHP	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.
Main activity producer heat plants	MAINHEAT	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.
Auto-producer electricity plants	AUTOELEC	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.
Auto-producer CHP plants	AUTOCHP	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 autoproducers' establishments 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.

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Plant Type		
Flow	**Short name**	**Definition**
Auto-producer heat plants	AUTOHEAT	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.
Total main activity producer plants	MAINTOT	This refers to inputs to and outputs from all main activity producer plants.
Total autoproducer plants	AUTOTOT	This refers to inputs to and outputs from all autoproducer plants.
Total plants	TOTAL	This refers to inputs to and outputs from all plants.

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Electricity Capacity		
Flow	**Short name**	**Definition**
Total capacity	TOTCAP	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 "Other fuel sources". 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). ***Mixed (hydro) plants*** 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. ***Pure pumped storage plants*** are plants with no natural inflow, producing electricity only from water previously pumped uphill.
Solid/liquid	SOLLIQ	Refers to units capable of generating electricity using solid and liquid fuel.
Solid/natural gas	SOLGAS	Refers to units capable of generating electricity using solid fuel and natural gas.
Liquid/natural gas	LIQGAS	Refers to units capable of generating electricity using liquid fuels and natural gas.
Solid/liquid/gas	SOLIGAS	Refers to units capable of generating electricity using solid, liquid fuels and natural gas.
Steam	STEAM	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.

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Electricity Capacity		
Flow	**Short name**	**Definition**
Internal combustion	INTCOMB	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.
Gas turbine	GASTURB	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.
Combined cycle	COMBINED	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.
Other Type of Generation	OTHGEN	This refers to electric generating capacity not included elsewhere.
Peak load	PEAKLOAD	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.
Capacity at peak	PEAKCAP	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.

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5. GEOGRAPHICAL COVERAGE

Countries and regions

Countries and Regions		
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Long name	**Short name**	**Definition**
Australia	AUSTRALI	Excludes the overseas territories. Data are reported on a fiscal year basis. By convention data for the fiscal year that starts on 1 July Y-1 and ends on 30 June Y are labelled as year Y.
Austria	AUSTRIA	
Belgium	BELGIUM	
Canada	CANADA	
Chile	CHILE	Data start in 1971.
Colombia	COLOMBIA	Data start in 1971.
Czech Republic	CZECH	Data start in 1971.
Denmark	DENMARK	Excludes Greenland and the Faroe Islands, except prior to 1990, where data on oil for Greenland were included with the Danish statistics.
Estonia	ESTONIA	
Finland	FINLAND	

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Long name	Short name	Definition
France	FRANCE	From 2011 data onwards, France includes Monaco, and the following overseas departments (Guadeloupe; French Guiana; Martinique; Mayotte; and Réunion); and excludes the overseas collectivities (New Caledonia; French Polynesia; Saint Barthélemy; Saint Martin; Saint Pierre and Miquelon; and Wallis and Futuna). Prior to 2011, France includes Monaco and excludes the following overseas departments and collectivities: Guadeloupe; French Guiana; Martinique; Mayotte and Réunion; New Caledonia; French Polynesia; Saint Barthélemy; Saint Martin; Saint Pierre and Miquelon; and Wallis and Futuna.
Germany	GERMANY	Includes the new federal states of Germany from 1970 onwards
Greece	GREECE	
Hungary	HUNGARY	Data start in 1965.
Iceland	ICELAND	
Ireland	IRELAND	
Israel	ISRAEL	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.
Italy	ITALY	Includes San Marino and the Holy See.
Japan	JAPAN	Includes Okinawa. Starting in 1990, data are reported on a fiscal year basis. By convention data for the fiscal year that starts on 1 April Y and ends on 31 March Y+1 are labelled as year Y
Korea	KOREA	Data start in 1971.
Latvia	LATVIA	Data start in 1990. Prior to that, they are included in Former Soviet Union.
Lithuania	LITHUANIA	Data start in 1990. Prior to that, they are included in Former Soviet Union.

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Long name	Short name	Definition
Luxembourg	LUXEMBOU	
Mexico	MEXICO	Data start in 1971.
Netherlands	NETHLAND	Excludes Suriname, Aruba and the other former Netherlands Antilles (Bonaire, Curaçao, Saba, Saint Eustatius and Sint Maarten).
New Zealand	NZ	
Norway	NORWAY	
Poland	POLAND	
Portugal	PORTUGAL	Includes the Azores and Madeira.
Slovak Republic	SLOVAKIA	Data start in 1971.
Slovenia	SLOVENIA	Data start in 1990. Prior to that, they are included within Former Yugoslavia. .
Spain	SPAIN	Includes the Canary Islands.
Sweden	SWEDEN	
Switzerland	SWITLAND	Does not include Liechtenstein.
Turkey	TURKEY	
United Kingdom	UK	Does not include the Channel Islands or the Isle of Man.

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Long name	Short name	Definition
United States	USA	For 2017 onwards, includes the 50 states, the District of Columbia, and Puerto Rico. Prior to 2017, includes the 50 states and the District of Columbia.
OECD Total	OECDTOT	Includes Australia, Austria, Belgium, Canada, Chile, Colombia[1], the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel[2], Italy, Japan, Korea, Latvia[3], Lithuania[4], Luxembourg, Mexico, the Netherlands, New Zealand, Norway, Poland, Portugal, the Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey, the United Kingdom and the United States.[5] Estonia, Latvia, Lithuania and Slovenia are included starting in 1990. Prior to 1990, data for Estonia. Latvia and Lithuania are included in Former Soviet Union, and data for Slovenia in Former Yugoslavia.
OECD Americas	OECDAM	Includes Canada, Chile, Colombia[1], Mexico and the United States.[5]
OECD Asia Oceania	OECDAO	Includes Australia, Israel[2], Japan, Korea and New Zealand.
OECD Europe	OECDEUR	Includes Austria, Belgium, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia[3], Lithanuia[4], Luxembourg, the Netherlands, Norway, Poland, Portugal, the Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom. Estonia, Latvia, Lithuania and Slovenia are included starting in 1990. Prior to 1990, data for Estonia, Latvia and Lithuania are included in Former Soviet Union, and data for Slovenia in Former Yugoslavia.

1. Colombia became an OECD member in April 2020. Accordingly, Colombia appears in the list of OECD Members and regional aggregates, starting with the 2021 edition.
2. 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.
3. Latvia is included starting in 1990. Prior to 1990, data for Latvia are included in Former Soviet Union.
4. Lithuania is included starting in 1990. Prior to 1990, data for Lithuania are included in Former Soviet Union.
5. Costa Rica joined the OECD in May 2021. However, Costa Rica has not been included in the OECD aggregates for this edition.

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Long name	Short name	Definition
IEA Total	IEATOT	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, Poland, 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.
The IEA and Accession/Association countries	IEAFAMILY	Includes: IEA member countries: Australia, Austria, Belgium, Canada, the Czech Republic, Denmark, Estonia[6], 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, Colombia, Israel, Lithuania; Association countries: Brazil, the People's Republic of China; India; Indonesia; Morocco; Singapore; South Africa; Thailand.
Argentina	ARGENTINA	
Bolivia	BOLIVIA	
Brazil	BRAZIL	
Costa Rica	COSTARICA	
Cuba	CUBA	
Netherlands Antilles/ Curaçao	CURACAO	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.
Dominican Republic	DOMINICANR	
Ecuador	ECUADOR	

6. Estonia is included starting in 1990. Prior to 1990, data for Estonia are included in Former Soviet Union.

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Long name	Short name	Definition
El Salvador	ELSALVADOR	
Guatemala	GUATEMALA	
Guyana	GUYANA	
Haiti	HAITI	
Honduras	HONDURAS	
Jamaica	JAMAICA	
Nicaragua	NICARAGUA	
Panama	PANAMA	
Paraguay	PARAGUAY	
Peru	PERU	
Suriname	SURINAME	Data for Suriname are available starting in 2000. Prior to that, they are included in Other non-OECD Americas.
Trinidad and Tobago	TRINIDAD	
Uruguay	URUGUAY	
Venezuela	VENEZUELA	
Other non-OECD Americas	OTHERLATIN	Includes Anguilla, Antigua and Barbuda; Aruba; the Bahamas; Barbados; Belize; Bermuda; Bonaire (from 2012); the British Virgin Islands; the Cayman Islands; Dominica; the Falkland Islands (Malvinas); French Guiana (until 2010); Grenada; Guadeloupe (until 2010); Martinique (until 2010); Montserrat; Puerto Rico (for natural gas and – up to 2016 data, 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.
Non-OECD Americas	LATINAMERI	Includes Argentina; Plurinational State of Bolivia (Bolivia); Brazil;; Costa Rica[7]; Cuba; Curaçao; the Dominican Republic; Ecuador; El Salvador; Guatemala; Guyana; Haiti; Honduras; Jamaica; Nicaragua; Panama; Paraguay; Peru; Suriname; Trinidad and Tobago; Uruguay; Bolivarian Republic of Venezuela (Venezuela) and Other non-OECD Americas.

7. Costa Rica joined the OECD in May 2021. However, data for Costa Rica are not included in the OECD aggregate for this edition, and are thus included in Non-OECD Americas.

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Countries and Regions

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Long name	Short name	Definition
Albania	ALBANIA	
Bosnia and Herzegovina	BOSNIAHERZ	Data for Bosnia and Herzegovina are available starting in 1990. Prior to that, they are included in Former Yugoslavia.
Bulgaria	BULGARIA	
Croatia	CROATIA	Data for Croatia are available starting in 1990. Prior to that, they are included in Former Yugoslavia.
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.*
Gibraltar	GIBRALTAR	
Kosovo	KOSOVO	Data for Kosovo are available starting in 2000. Between 1990 and 1999, data for Kosovo are included in Serbia[8]. 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.[8] Prior to 1990, they are included in Former Yugoslavia.

8. Serbia includes Montenegro until 2004 and Kosovo until 1999.

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Long name	Short name	Definition
Romania	ROMANIA	
Republic of North Macedonia	NORTHMACED	Data for the Republic of North Macedonia are available starting in 1990. Prior to that, they are included in Former Yugoslavia.
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[9] until 1999.
Former Yugoslavia (if no detail)	YUGOND	Before 1990, includes Bosnia and Herzegovina; Croatia; Kosovo; Montenegro; the Republic of North Macedonia; Slovenia and Serbia.
Non-OECD Europe and Eurasia	EURASIA	Includes Albania; Armenia; Azerbaijan; Belarus; Bosnia and Herzegovina; Bulgaria; Croatia; Cyprus[10]; Georgia; Gibraltar; Kazakhstan; Kosovo; Kyrgyzstan; Lithuania; Malta; Republic of Moldova (Moldova); Montenegro; Republic of North Macedonia; Romania; Russian Federation; Serbia[8]; Tajikistan; Turkmenistan; Ukraine; Uzbekistan; Former Soviet Union (prior to 1990) and Former Yugoslavia (prior to 1990).
Armenia	ARMENIA	Data for Armenia are available starting in 1990. Prior to that, they are included in Former Soviet Union.
Azerbaijan	AZERBAIJAN	Data for Azerbaijan are available starting in 1990. Prior to that, they are included in Former Soviet Union.
Belarus	BELARUS	Data for Belarus are available starting in 1990. Prior to that, they are included in Former Soviet Union.
Georgia	GEORGIA	Data for Georgia are available starting in 1990. Prior to that, they are included in Former Soviet Union.
Kazakhstan	KAZAKHSTAN	Data for Kazakhstan are available starting in 1990. Prior to that, they are included in Former Soviet Union.
Kyrgyzstan	KYRGYZSTAN	Data for Kyrgyzstan are available starting in 1990. Prior to that, they are included in Former Soviet Union.

9. 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.

10. **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".
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Long name	Short name	Definition
Republic of Moldova	MOLDOVA	Data for Moldova are available starting in 1990. Prior to that, they are included in Former Soviet Union. Official figures on natural gas imports, natural gas inputs to power plants, electricity production, foreign trade and consumption are modified by the IEA Secretariat to include estimates for supply and demand for the districts from the left side of the river Nistru and municipality Bender. Other energy production or consumption from these districts is not included in the Moldovan data. This may lead to breaks in the time series for some products. Due to the inclusion of estimated data in the Moldova energy balance, indicators for per capita energy consumption or energy intensity may appear inconsistent with expected trends.
Russian Federation	RUSSIA	Data for Russia are available starting in 1990. Prior to that, they are included in Former Soviet Union.
Tajikistan	TAJIKISTAN	Data for Tajikistan are available starting in 1990. Prior to that, they are included in Former Soviet Union.
Turkmenistan	TURKMENIST	Data for Turkmenistan are available starting in 1990. Prior to that, they are included in Former Soviet Union.
Ukraine	UKRAINE	Data for Ukraine are available starting in 1990. Prior to that, they are included in Former Soviet Union.
Uzbekistan	UZBEKISTAN	Data for Uzbekistan are available starting in 1990. Prior to that, they are included in Former Soviet Union.
Former Soviet Union (if no detail)	FSUND	Before 1990, includes Armenia; Azerbaijan; Belarus; Estonia; Georgia; Kazakhstan; Kyrgyzstan; Latvia; Lithuania; Republic of Moldova; Russian Federation; Tajikistan; Turkmenistan; Ukraine and Uzbekistan.
Algeria	ALGERIA	
Angola	ANGOLA	
Benin	BENIN	
Botswana	BOTSWANA	
Cameroon	CAMEROON	
Congo	CONGO	
Democratic Republic of the Congo	CONGOREP	
Côte d'Ivoire	COTEIVOIRE	

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Long name	Short name	Definition
Egypt	EGYPT	Data for Egypt are reported on a fiscal year basis. By convention, data for the fiscal year that starts on 1 July Y and ends on 30 June Y+1 are labelled as year Y.
Equatorial Guinea	EQGUINEA	
Eritrea	ERITREA	Data for Eritrea are available from 1992. Prior to that, they are included in Ethiopia.
Ethiopia	ETHIOPIA	Ethiopia includes Eritrea prior to 1992. Data are reported on a fiscal year basis. By convention, data for the fiscal year that starts on 1 July Y and ends on 30 June Y+1 are labelled as year Y.
Gabon	GABON	
Ghana	GHANA	
Kenya	KENYA	Electricity data are reported on a fiscal year basis. By convention, data for the fiscal year that starts on 1 July Y and ends on 30 June Y+1 are labelled as year Y.
Libya	LIBYA	
Mauritius	MAURITIUS	
Morocco	MOROCCO	
Mozambique	MOZAMBIQUE	
Namibia	NAMIBIA	Data for Namibia are available starting in 1991. Prior to that, data are included in Other Africa. Electricity data are reported on a fiscal year basis. By convention data for the fiscal year that starts on 1 July Y and ends on 31 June Y+1 are labelled as year Y.
Niger	NIGER	
Nigeria	NIGERIA	
Senegal	SENEGAL	
South Africa	SOUTHAFRIC	Nuclear and Hydro electricity generation data are reported on a fiscal year basis, beginning on the 1 July Y and ending on the 30 June Y+1.
South Sudan	SSUDAN	Data for South Sudan are available from 2012. Prior to 2012, they are included in Sudan.

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Long name	Short name	Definition
Sudan	SUDAN	South Sudan became an independent country on 9 July 2011. From 2012, data for South Sudan are reported separately.
United Republic of Tanzania	TANZANIA	Oil data are reported on a fiscal year basis, beginning on the 1 July Y and ending on the 30 June Y+1.
Togo	TOGO	
Tunisia	TUNISIA	
Zambia	ZAMBIA	
Zimbabwe	ZIMBABWE	
Other Africa	OTHERAFRIC	Includes Burkina Faso; Burundi; Cabo Verde; Central African Republic; Chad; Comoros; Djibouti; the Kingdom of Eswatini; Gambia; Guinea; Guinea-Bissau; Lesotho; Liberia; Madagascar; Malawi; Mali; Mauritania; Namibia (until 1990); Réunion (until 2010); Rwanda; Sao Tome and Principe; Seychelles; Sierra Leone; Somalia; Uganda and Western Sahara (from 1990).
Africa	AFRICA	Includes Algeria; Angola; Benin; Botswana; Cameroon; Republic of Congo (Congo); Côte d'Ivoire; Democratic Republic of Congo; Egypt; Equatorial Guinea; Eritrea; Ethiopia; Gabon; Ghana; Kenya; Libya; Mauritius; Morocco; Mozambique; Namibia (from 1991); Niger; Nigeria; Senegal; South Africa; South Sudan; Sudan, United Republic of Tanzania (Tanzania); Togo; Tunisia; Zambia; Zimbabwe and Other Africa. Note that Africa is identical to Memo: Africa (UN).
Bahrain	BAHRAIN	
Islamic Republic of Iran	IRAN	Data are reported according to the Iranian calendar year. By convention data for the year that starts on 20 March Y and ends on 19 March Y+1 are labelled as year Y.
Iraq	IRAQ	
Jordan	JORDAN	
Kuwait	KUWAIT	
Lebanon	LEBANON	
Oman	OMAN	

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Long name	Short name	Definition
Qatar	QATAR	
Saudi Arabia	SAUDIARABI	
Syrian Arab Republic	SYRIA	
United Arab Emirates	UAE	
Yemen	YEMEN	
Middle East	MIDDLEEAST	Includes Bahrain, Islamic Republic of Iran, Iraq, Jordan, Kuwait, Lebanon, Oman, Qatar, Saudi Arabia, Syrian Arab Republic, United Arab Emirates and Yemen.
Bangladesh	BANGLADESH	Data are reported on a fiscal year basis. By convention data for the fiscal year that starts on 1 July Y-1 and ends on 30 June Y are labelled as year Y.
Brunei	BRUNEI	
Cambodia	CAMBODIA	Data for Cambodia are available starting in 1995. Prior to that, they are included in Other Asia.
India	INDIA	Data are reported on a fiscal year basis. By convention data for the fiscal year that starts on 1 April Y and ends on 31 March Y+1 are labelled as year Y. This convention is different from the one used by Government of India, whereby fiscal year that starts on 1 April Y and ends on 31 March Y+1 are labelled as year Y+1.
Indonesia	INDONESIA	
Democratic People's Republic of Korea	KOREADPR	
Lao People's Democratic Republic	LAO	Data for the Lao People's Democratic Republic are available starting in 1992. Prior to that, they are included in Other Asia.
Malaysia	MALAYSIA	
Mongolia	MONGOLIA	Data for Mongolia are available starting in 1985. Prior to that, they are included in Other Asia.
Myanmar	MYANMAR	Data were reported on a fiscal year basis until 2015 data. By convention data for the fiscal year that starts on 1 April Y and ends on 31 March Y+1 are labelled as year Y.

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Long name	Short name	Definition
Nepal	NEPAL	Data are reported on a fiscal year basis. By convention data for the fiscal year that starts on 1 July Y and ends on 30 June Y+1 are labelled as year Y.
Pakistan	PAKISTAN	Data are reported on a fiscal year basis. By convention fiscal year Y/Y+1 is labelled as year Y.
Philippines	PHILIPPINE	
Singapore	SINGAPORE	
Sri Lanka	SRILANKA	
Chinese Taipei	TAIPEI	
Thailand	THAILAND	
Vietnam	VIETNAM	
Other non-OECD Asia	OTHERASIA	Includes Afghanistan; Bhutan; Cambodia (until 1994); Cook Islands; Fiji; French Polynesia; Kiribati; the Lao People's Democratic Republic (until 1999);; Macau, China; Maldives; Mongolia (until 1984); New Caledonia; Palau (from 1994); Papua New Guinea; Samoa; the Solomon Islands; Timor-Leste; Tonga and Vanuatu.
Non-OECD Asia excluding China	ASIA	Includes Bangladesh; Brunei Darussalam; Cambodia (from 1995); India; Indonesia; the Democratic People's Republic of Korea; Malaysia; Mongolia (from 1985); Myanmar; Nepal; Pakistan; the Philippines; Singapore; Sri Lanka; Chinese Taipei; Thailand; Viet Nam; Other non-OECD Asia.
People's Republic of China	CHINA	
Hong Kong, China	HONGKONG	
China Region	CHINAREG	Includes the People's Republic of China and Hong Kong, China.
Non-OECD Total	NONOECDTOT	Includes Africa; Asia (excluding China); China (People's Republic of China and Hong Kong, China); Non-OECD Americas[11]; Middle East and Non-OECD Europe and Eurasia.

[11] Costa Rica joined the OECD in May 2021. However, data for Costa Rica are not included in the OECD aggregate for this edition, and are thus included in Non-OECD Americas.

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Countries and Regions

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Long name	Short name	Definition
World	WORLD	Includes OECD Total; Africa; Non-OECD Americas; Non-OECD Asia (excluding China); China (People's Republic of China and Hong Kong, China); Non-OECD Europe and Eurasia; Middle East; World aviation bunkers and World marine bunkers. It is also the sum of Africa, Americas, Asia, Europe, Oceania, World aviation bunkers and World marine bunkers.
Africa (UN)	AFRICATOT	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; the Kingdom of Eswatini; Ethiopia; Gabon; Gambia; Ghana; Guinea; Guinea-Bissau; Kenya; Lesotho; Liberia; Libya; Madagascar; Malawi; Mali; Mauritania; Mauritius; Morocco; Mozambique; Namibia; Niger; Nigeria; Réunion (until 2010); Rwanda; Sao Tome and Principe; Senegal; the Seychelles; Sierra Leone; Somalia; South Africa; South Sudan (from 2012); Sudan; the United Republic of Tanzania (Tanzania); Togo; Tunisia; Uganda; Zambia; Zimbabwe. Note that Memo: Africa (UN) is identical to Africa.
Americas (UN)	AMERICAS	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; Curaçao; Dominica; the Dominican Republic; Ecuador; El Salvador; the Falkland Islands (Malvinas); Guatemala; French Guiana (until 2010); Grenada; Guadeloupe (until 2010); Guyana; Haiti; Honduras; Jamaica; Martinique (until 2010); 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).

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Long name	Short name	Definition
Asia (UN)	ASIATOT	Includes Afghanistan; Armenia; Azerbaijan; Bahrain; Bangladesh; Bhutan; Brunei Darussalam; Cambodia; the People's Republic of China; Cyprus[10]; 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.
Europe (UN)	EUROPE	Includes Albania; Austria; Belarus; Belgium; Bosnia and Herzegovina; Bulgaria; Croatia; the Czech Republic; Denmark; Estonia; Finland; France[12]; Germany; Gibraltar; Greece; Hungary; Iceland; Ireland; Italy; Kosovo[13]; Latvia; Lithuania; Luxembourg; Malta; the Republic of Moldova (Moldova); Montenegro; the Netherlands; the Republic of North Macedonia; Norway; Poland; Portugal; Romania; the Russian Federation; Serbia[14]; the Slovak Republic; Slovenia; Spain; Sweden; Switzerland; Ukraine; the United Kingdom.
Oceania (UN)	OCEANIA	Includes Australia; New Zealand; Cook Islands; Fiji; French Polynesia; Kiribati; New Caledonia; Palau; Papua New Guinea; Samoa; the Solomon Islands; Tonga; Vanuatu.

12. Data for the French overseas departments are included in Europe from 2011, and in other regions as appropriate (Americas or Africa) before 2011.
13. 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.
14. Serbia includes Montenegro until 2004 and Kosovo until 1999.

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Countries and Regions

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Long name	Short name	Definition

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 (until 2010); 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.

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Fiscal years

Fiscal years

This table lists the countries for which data are reported on a non-calendar year basis.

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Country/Region	Short name	Definition
Australia	AUSTRALI	Data are reported on a fiscal year basis. By convention, data for the fiscal year that starts on 1 July Y-1 and ends on 30 June Y are labelled as year Y.
Bangladesh	BANGLADESH	Data are reported on a fiscal year basis. By convention data for the fiscal year that starts on 1 July Y-1 and ends on 30 June Y are labelled as year Y.
Egypt	EGYPT	Data are reported on a fiscal year basis. By convention, data for the fiscal year that starts on 1 July Y and ends on 30 June Y+1 are labelled as year Y.
Ethiopia	ETHIOPIA	Data are reported on a fiscal year basis. By convention, data for the fiscal year that starts on 1 July Y and ends on 30 June Y+1 are labelled as year Y.
India	INDIA	Data are reported on a fiscal year basis. By convention, data for the fiscal year that starts on 1 April Y and ends on 31 March Y+1 are labelled as year Y. This convention is different from the one used by Government of India, whereby fiscal year starts on 1 April Y and ends on 31 March Y+1 are labelled as year Y+1.
Islamic Republic of Iran	IRAN	Data are reported according to the Iranian calendar year. By convention data for the year that starts on 20 March Y and ends on 19 March Y+1 are labelled as year Y.
Japan	JAPAN	Starting in 1990, data are reported on a fiscal year basis. By convention, data for the fiscal year that starts on 1 April Y and ends on 31 March Y+1 are labelled as year Y.
Kenya	KENYA	Electricity data are reported on a fiscal year basis, beginning on the 1 July Y and ending on the 30 June of Y+1.
Myanmar	MYANMAR	Data are reported on a fiscal year basis. By convention data for the fiscal year that starts on 1 April Y and ends on 31 March Y+1 are labelled as year Y.
Namibia	NAMIBIA	Electricity data are reported on a fiscal year basis. By convention data for the fiscal year that starts on 1 July Y and ends on 31 June Y+1 are labelled as year Y.

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Fiscal years

This table lists the countries for which data are reported on a non-calendar year basis.

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Country/Region	Short name	Definition
Nepal	NEPAL	Data are reported on a fiscal year basis. By convention data for the fiscal year that starts on 1 July Y and ends on 30 June Y+1 are labelled as year Y.
Pakistan	PAKISTAN	Data are reported on a fiscal year basis. By convention fiscal year Y/Y+1 is labelled as year Y.
South Africa	SOUTHAFRIC	Nuclear and Hydro electricity generation data are reported on a fiscal year basis, beginning on the 1 July Y and ending on the 30 June Y+1.
United Republic of Tanzania	TANZANIA	Oil data are reported on a fiscal year basis, beginning on the 1 July Y and ending on the 30 June Y+1.

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6. COUNTRY NOTES AND SOURCES

GENERAL NOTES APPLICABLE TO ALL COUNTRIES

These notes refer to data from 1960 to 2020p.

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.

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 Industry, Science, Energy and Resources, Canberra.

General notes

- Data are reported on a fiscal year basis. By convention data for the fiscal year that starts on 1 July Y-1 and ends on 30 June Y are labelled as year Y.
- 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

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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

- In 2018, electricity output from **lignite** declined due to the closure of the Hazelwood power plant. In addition, there was no output from **BKB** due to the closure of both Hazelwood power plant, and the only briquette manufacturer in Australia.
- 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

- In the 2021 edition, the Australian administration revised consumption data back to 2009 to incorporate a change of methodology. This also affected *transmission and distribution losses* which act as a balancing item. Breaks may occur between 2008 and 2009.
- The significant growth in **electricity** consumption at *LNG/regasification plants* in 2016 and 2017, is due to the commencement of large-scale production at Australia's new east coast LNG plants.
- Prior to 2006, **electricity** consumption in *mining and quarrying* includes consumption in *liquefaction/regasification plants*.

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- 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 transport support services, including those for air and water transport, and 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* sector may include some consumption in *LNG/regasification plants*.

Capacity

- For the 2020 edition, **solar PV** capacities were revised back to 2016, to align data to fiscal year reporting. Therefore, breaks occur between 2015 and 2016.
- Due to data availability issues, **hydro** capacities for 1990-2005 have been set at 2005 levels.
- A **geothermal** plant closed in 2017.
- 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. For more details on the methodologies in the revisions in the energy balance, there is more information here: http://www.statistik.at/wcm/idc/idcplg?IdcService=GET_PDF_FILE&RevisionSelectionMethod=LatestReleased&dDocName=036412. For more details on the methodologies related to consumption in households, there is more information here: http://www.statistik.at/wcm/idc/idcplg?IdcService=GET_PDF_FILE&RevisionSelectionMethod=LatestReleased&dDocName=078265

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.
- Electricity production from **geothermal** main electricity plants only refers to electricity that is fed into the grid. Total production is not known as these plants are below the reporting threshold.
- Reported **heat** production by autoproducer plant category tends to vary. This is because Austria calculates output from autoproducer heat-only plants as a residual, by subtracting reported production by autoproducer CHP plants from total reported autoproducer heat production.

Transformation

- For 2020, the decrease in electricity and heat output from **other bituminous coal** was in part due to the closure of a power plant.
- 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. In addition, fuel inputs to and electricity outputs from CHP plants are re-allocated from CHP to electricity-only plants if the implied CHP efficiency would fall below 75%.
- 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.

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- 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

- In the 2020 edition, Austria revised consumption data back to 2013 based on a new methodology for disaggregating consumption across sectors.
- In the 2020 edition, a large portion of electricity consumption in *blast furnaces* was reallocated to *iron and steel* sector from 1990 to 2004. This creates breaks in-series in these time series between 2004 and 2005. Revisions to data for 2005 onwards are expected in a future edition.
- Electricity consumption in *road* includes trams, trolleybuses, subways, cableways, chair- and drag-lifts, as well as 100% electric vehicles.
- In the 2019 edition, Austria revised data back to 2005 in order to present international reporting as consistent as possible with the national energy balances. In addition, consumption figures were revised based on more recent surveys of energy consumption in small and medium-sized enterprises. Outliers and the extrapolation methodology will be revised following the results of the next survey.
- **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.

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

- In the 2021 and 2020 editions, Belgium revised data back to 2010 and 2014 respectively.
- 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

- In 2019, the increase in electricity exports is mainly due to the opening of the NEMO-Link interconnector between Belgium and the United Kingdom.
- Electricity production from **other sources** mainly comprises production at a gas expansion station with heat recovery and at a hydraulic turbine in a wastewater treatment plant.
- From 2013 onwards, reported **heat** distribution losses decreased due to a more precise estimation method.

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- The production of electricity from **wind** is available from 1987. The first year of offshore **wind** production in Belgium was 2009. Data are available from 2010.

Transformation

- In 2020 and 2018, electricity output from **nuclear** decreased due to outages at a number of reactors.
- 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

- In the 2019 edition, revisions were implemented for the direct use of solar thermal in other sectors back to 2010 due to improved data availability.
- In 2018, the methodology use to allocating heat consumption between the *residential*, *commercial and public services*, and *agriculture and forestry* sectors by one data provider was changed, resulting in some breaks in-series.
- Electricity consumption in *road* includes some consumption by electricity vehicles (EVs), based on vehicles numbers distances travelled. However, coverage of hybrid vehicles varies across regions. In addition, not all charging is included. Therefore, some consumption by EVs is still included under *residential*.
- 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.
- Beginning with 2007, **heat** consumption in the *iron and steel* industry ceased to be reported because heat is no longer purchased by facilities in that sector.

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.

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Canada

Source

Natural Resources Canada, Ottawa.

General notes

- In the 2020 edition, the Canadian administration provided revised data back to 2005 based on revised methodologies and sectoral alignments, and to incorporate additional data.
- In previous editions, the Canadian administration also undertook 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

- Autoproducer **solar PV** electricity generation is available from 2016. Prior to 2016, data are included in main activity producers. As a result, a break in series occurs for main activity producer solar generation between 2015 and 2016.
- 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 **tidal**. 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

- In the 2020 edition, data for several sectors were revised back to 2005 to improve accuracy and alignment with ISIC classifications. In particular, data previously reported under "non-specified" sectors were reallocated to specific sectors, and improvements were made to *transmission and distribution losses*. As a result, some breaks may occur between 2004 and 2005.
- In 2017, the decrease in **electricity** consumption in the *chemical (incl. petrochemical)* sector is partially due to a large consumer having been rotated out of the source sample survey used to compile the data.
- Prior to 2005, *transmission and distribution losses* of **electricity** 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.
- Breaks in the time series occur between 1973 and 1974 in *agriculture/forestry*, and between 1987 and 1988 in the industry sector.

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- Electricity consumption in *road* refers to consumption in establishments primarily engaged in truck transport services; the operation of urban, inter-urban and rural transport systems; school buses; charter and sightseeing buses, taxis and limousine services.

Trade

- Discrepancies occur between respective reported figures for **electricity** trade between the US and Canada for 2016 onwards. Work to reconcile trade data is an ongoing aspect of the North America Trilateral.

Capacity

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

Chile

Source

Energía Abierta, Comisión Nacional de Energía, Ministerio de Energía, Santiago.

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.
- Heat production from **solid biofuels** and **biogas** use in Main CHP plants is not available.
- Electricity production by autoproducer **hydro** plants is self-declared, and as such, subject to variation.

Transformation

- For 2019, the increase in electricity output from **natural gas** and the decrease in output from **coal** were due to the closure of some coal-fired power plants, and the resumption of natural gas imports from Argentina.
- 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.
- The variability of electricity output from **oil products** is in part due to the fact that oil-fired power plants are used for backup generation.

Consumption

- Consumption in *agriculture/forestry and construction* are available from 2017. For prior years, data are reported under *Industry (non-specified)*.
- **Electricity** consumption in *mining and quarrying* includes: *coal mining; industry (non-specified)* in-

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cludes *food, beverages, and tobacco*; and *wood and wood products*; *commercial and public services* includes *gas works*.

- 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.
- Disaggregated data on **solar thermal** consumption data are not available so all consumption data are allocated to the *non-specified other* sector.
- Prior to 2009, most statistical differences are included in *transmission and 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.

Colombia

Sources

Source for 2019:

Ministry of Mines and Energy, Bogota.

Sources 1992 to 2018:

- *Energy-Economic Information System (SIEE)*, Latin American Energy Organization (OLADE), Quito, accessed April 2020: http://sier.olade.org/.
- Online statistics, Unidad de Planeación Minero Energética (UPME) Ministerio de Minas y Energía, Bogotá, various editions up to 2018.
- Direct communication with the Ministry of Mines and Energy, Energy Information Department, Bogotá.
- *Statistics 1996-2018*, Sistema de Información Eléctrico Colombiano, Ministry of Mines and Energy, Bogotá, online statistics, various editions up to 2018.
- *Sistema de Información de Petróleo y Gas Colombiano*, Ministry of Mines and Energy, Bogotá, online statistics, various editions up to 2016.
- *Informe de Sostenibilidad 2018*, Refinería de Cartagena S.A.S.
- *Información de mercado*, IncoAsfalto, Cundinamarca, accessed in May 2020: http://www.incoasfaltos.com/
- *Resultados Trimestrales*, Ecopetrol, Bogotá, accessed in April 2020: https://www.ecopetrol.com.co.
- *Informe Estadístico Petrolero*, Asociación Colombiana del Petróleo (ACP), Bogotá, accessed in April 2020: https://acp.com.co/.
- IEA Secretariat estimates.

Sources up to 1991:

- *Boletin Minero-Energético*, Ministerio de Minas y Energía, Bogotá, December 1991.
- *Estadísticas Minero-Energéticas 1940-1990*, Ministerio de Minas y Energía, Bogotá, 1990.
- *Estadísticas Básicas del Sector Carbón*, Carbocol, Oficina de Planeación, Bogotá, various editions from 1980 to 1988.
- *Colombia Estadística 1985*, DANE, Bogotá, 1970 to 1983 and 1987.
- *Informe Anual, Empresa Colombiana de Petróleos*, Bogotá, 1979, 1980, 1981 and 1985.
- *Estadísticas de la Industria Petrolera Colombiana Bogotá 1979-1984*, Empresa Colombiana de Petróleos, Bogotá, 1985.
- *Informe Estadístico Sector Eléctrico Colombiano*, Government of Colombia, Bogotá, 1987 and 1988.
- *La Electrificación en Colombia 1984-1985*, Instituto Colombiano de Energía Eléctrica, Bogotá, 1986.
- *Balances Energéticos 1975-1986*, Ministerio de Minas y Energía, Bogotá, 1987.
- *Energía y Minas Para el Progreso Social 1982-1986*, Ministerio de Minas y Energía, Bogotá, 1987.

General

- Colombia joined the OECD in April 2020. Colombia first submitted questionnaires with data for 2019 only starting with the 2021 edition. Therefore, some breaks in the time series appear

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between 2018 and 2019. Historical revisions are pending.

- Data for Colombia are available starting in 1990.

Supply

- Due to the lack of detailed electricity own use data, net electricity generation and electricity own use by source have been estimated based on the total reported net-to-gross ratio for each year. Revisions are pending.

Transformation

- Prior to 2019, inputs of **residual fuel oil**, **non-bio gas/diesel oil**, and **other kerosene** to electricity generation are reported under the relevant fuel. However, the associated outputs are reported in aggregated format under **other oil products**. Historical revisions are pending.

Czech Republic

Sources

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

General notes

- For 2017, apparent declines in autoproducer **heat** production by the *chemical (incl. petroleum)* sector, and in consumption by *petroleum refineries,* occur due to the incorporation of an oil refinery into a neighbouring petrochemical enterprise.
- Due to ongoing review of energy data for 2010-2014, revisions were made in the 2017 edition.
- 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 the 2020 edition, a revision to the methodology for reporting output from **combustible fuel**-fired autoproducer plants removed multiple breaks in time series occurring between 2009 and 2010 introduced in the 2017 edition.
- For 2017, **heat** production from electric boilers and heat pumps is based on new survey data, whereas, data for prior years have been estimated by the Czech administration. As a result, some breaks in series may occur. Historic revisions are pending.
- 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**.
- Data on imports and own use of **heat** are available from 2009 and 2010 respectively
- 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** caus-

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es 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 on **electricity** consumption by cable cars (reported under *non-specified transport)* are available from 2017.
- Data for direct use of **solar** energy are available from 2003.

Trade

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

Capacity

- Starting in 2000, the peak load data reported under main activity producers includes autoproducers, which is no longer reported in its own right.
- The breakdown of generating capacity is not available prior to 1990.

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 2019, the increase in heat output from **electric boilers** and **heat pumps** was due to the opening of new facilities. This also contributed to an increase in the coefficient of performance for heat pumps between 2018 and 2019.
- 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.

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- **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 fired by **natural gas**, **municipal waste, biogases**, and **other oil products** show efficiencies greater than 100%, on a net calorific value basis, due to the use of condensing boilers and other flue gas condensation technologies 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

- For 2019 data, the breakdown of **electricity** and **heat** total final consumption is estimated by the Danish administration based on 2018 data and will be revised in a future reporting cycle once their new industry survey results are released.
- In the 2016 edition, the Danish administration revised **electricity** and **heat** consumption in the industry sector from 1990.
- *Transmission and distribution losses* of **electricity** are calculated as a residual.
- 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

- In Denmark, **wind** accounts for a large share of installed capacity. Therefore, care should be taken when interpreting figures for available capacity at peak.
- Prior to 1981 for main activity producers and to 1994 for autoproducers, data on electrical capacity by type of generation are not available.

Estonia

Source

Statistics Estonia, Tallinn.

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

- In 2019, electricity output from **oil shale** decreased. This was in part due to higher carbon pricing, and the availability of low cost electricity imports.
- In the 2020 and 2021 editions, reporting methodologies were aligned with the requirements for physical energy flow accounts (PEFA). As a result, some breaks in series occur between 2015 and 2019. In particular, for **renewable municipal waste**, **coke oven gas**, and **industrial waste**.

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- Electricity output from **solar** is available from 2016.
- 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 *road* mainly refers to trolley buses.
- **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.

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 connection to the Nord Pool power exchange. In periods of high rainfall, it is more economic to import electricity from other Nordic countries than to produce it. Therefore, production and trade are subject to variability.
- **Other sources** include hydrogen, purchased steam, and heat recovered from flue gas scrubbers. For 2017, the increase in heat production from other sources is due to the reporting of heat recovered from flue gas scrubbers for the first time.
- 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 2017, the use of **coal** in main activity producer electricity plants decreased considerably following the move of a large plant to the national capacity reserve.
- 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 decreases in **peat** and **other bituminous coal** use in main activity electricity plants in 2008 were 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.

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- 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

- Electricity consumption in *road* is based on estimates by the Finnish VTT research centre, and includes all electricity consumption by electric vehicles, both 100% electric vehicles and plug-in hybrids.
- In 2016, the production of **heat** by autoproducers in the *oil refineries* sector ceased, following a change of ownership of some plants and their reclassification as main activity producers. This reclassification also resulted in an increase in reported heat consumption by oil refineries, as heat previously produced and consumed by *oil refineries* is 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.
- Between 2013 and 2014, **heat** consumption in the *paper, pulp and printing* sector shows an apparent decline because a power plant came under the ownership of a paper and pulp company. 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 *agriculture/forestry* and *commercial/public services* is included under *industry non-specified*.
- Consumption of **electricity** in the industry subsector *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 2019 edition, data for France were revised back to 2011 in include the following overseas departments (Guadeloupe; French Guiana; Martinique; Mayotte; and Réunion).
- In the 2018 edition, data for France were revised back to 2011 following changes in methodology

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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.

- 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 *Consumations 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 auto-producer 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

- In the 2019 edition, **heat** supply and consumption data were revised due to improved information on heat production from renewables.
- All **solar photovoltaic** plants with capacity above 1 MW_p are considered as main activity producers, while all plants with capacity below that value are considered autoproducers.
- **Electricity** production from *other sources* is available starting in 2007, representing production of electricity from purchased steam, and from 2018, hydrogen. The input is shown under non-specified transformation.
- Data on electricity production from **wind** are available from 1990.
- **Electricity** production by autoproducers in the *oil refineries* sector declined between 2016 and 2017 as one plant was reclassified to a different sector.

Transformation

- In the 2021 edition, some main activity producers were reclassified as autoproducers.
- For 2018, inputs and outputs of **coke oven gas**, and **other recovered gases** are included under **blast furnace gas** for confidentially purposes.
- For 2011-2013, the implied efficiencies of **heat pumps** are much lower than expected. This is under investigation by the French Administration, and revisions are expected in future editions.
- The methodology for reporting inputs to CHP plants is under currently under review by the French administration and historical revisions are expected.
- For the 2018 edition, 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.
- For the 2018 edition, electricity production from **hydro** was revised back to the year 2000, in some cases only amounting to plant reclassification.
- In 2016, the company that consumed **blast furnace gas** for electricity and heat generation ceased its activity.
- Electricity production from the *Bouillante* **geothermal** main electricity plant in Guadeloupe is included from 2011 onwards, when data coverage for France is extended to include the overseas departments. Electricity production from autoproducer **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.

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- 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 2021 edition, data were revised back to 2011 by the French administration to replace data from statistical surveys with new administrative data.
- In the 2019 edition, revisions for 2011 onwards were received for all **electricity** consumption flows, based on a correction to a survey. This has introduced a wider statistical difference than previously published, and is under review.
- 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.
- Electricity consumption in *road* includes consumption by 100% electric vehicles. These amounts are estimated by the French Administration based on vehicle numbers, and expected electricity usage. Consumption includes domestic charging - however, these amounts are currently subtracted from non-specified transport, rather than residential consumption.
- Consumption of **electricity** in uranium treatment plants is confidential for the period 2003 through 2010, and unavailable prior to 1980.
- Data on **heat** *transmission and 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.
- **Electricity** consumption in non-specified transport refers to ski lifts.
- Prior to 2011, electricity consumption in (sub)-urban and national rail is based on high-voltage electricity supply to the rail sector. From 2011 onwards, consumption in (sub)-urban rail is based on electricity used for propulsion by the main operator, and estimates for the other operators.
- 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.

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Germany

Source

Federal Ministry for Economic Affairs and Energy, Berlin.

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

- From 2018 onwards, own use of electricity at main electricity **geothermal** plants includes electricity used for pumping.
- 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.
- For 2017 onwards, own-use consumption of **electricity** by **wind** plants is assumed to be 2% at on-shore and 1.5% for off-shore wind farms. For prior years, own-use only included electricity drawn from the grid while the turbines were not in operation.
- 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

- For 2018, the increase in electricity output from **solar PV** was in part due higher than average solar radiation during that year.
- For 2018, the increase in heat output from **biogases** was mainly due to an increase in survey coverage following an amendment to the Energy Statistics Law in 2017.
- **Electricity** inputs to both mixed **hydro** and pure pumped storage pumping plants are reported under inputs to pure pumped storage.
- 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 re-

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classification 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

- In 2016, increases in **electricity** generation by auto-producers within the *transport equipment* industrial sector are due to reclassifications from main activity generation, rather than the 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.
- Data for **electricity** consumption in the *commercial and public* services sector include the *construction* and *agriculture/forestry* sectors (prior to 2010), as well as the fishing sector (all years). 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.
- On 31 Dec 2017, the Gundremmingen B nuclear power plant shut down.

Greece

Source

Ministry for Environment and Energy, Athens.

Supply

- In the 2020 edition, revisions for 1998-2017 of the indigenous production of **solar thermal** are the result of a revision of the latest data on solar thermal efficiency.
- 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.

Transformation

- In 2017, electricity production from **industrial waste** in autoproducer electricity plants was suspended.

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- 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

- In 2019 and 2018, breaks in consumption occur across several sectors due to improved disaggregation. This allowed consumption previously reported under *industry (non-specified)* to be reported in the appropriate subsectors.
- In 2018, the increase in efficiency at **industrial waste**-fired autoproducer CHP plants was due to increased generation of unsold heat.
- Prior to 2018, electricity consumption in the *fishing* sector was included in *agriculture and forestry*, and/*or industry – non-specified*.
- *Transmission and distribution* losses of **electricity** increased from 2013 onwards due to growth in non-technical losses. Reported losses for 2017 deviate from this trend, showing a noticeable decline compared with adjacent year however, data for 2017 are under review.
- Electricity consumption in *road* is available from 2013. This refers to consumption by public transport vehicles (e.g. trolley buses). Electricity consumption by private electric vehicles is insignificant and not included.
- A break in time series exists between 1991 and 1992 for **electricity** consumption in transport.
- 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.

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 2019, there was a reclassification of some sectors under NACE. As a result, some breaks occur in generation by sector.
- In 2019, electricity generation is reported under several sectors for the first time due to the installation of solar panels.
- For 2017 onwards, inputs and outputs from power plants are reported at a unit level, while for prior years, data are reported at a plant level. As a result, breaks in series are observed between 2016 and 2017. In particular, for electricity output from main activity producer CHP and main activity producer **nuclear** power plants, and for heat output from **industrial waste** at autoproducer CHP and autoproducer heat plants.
- 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.

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Transformation

- In 2019, some breaks in series occur for plants fired by **biogas** and **solid biofuels** due to changes in plant classifications, and CHP methodologies.
- In late 2017, a new **geothermal** power plant began operations.
- For 2017, the decline in heat production from **industrial waste** is partly due to the reclassification of a main activity producer as an autoproducer.
- **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.

Iceland

Source

National Energy Authority, Reykjavik.

General notes

- Data for 2020p were 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 rise in **heat** supply in 2018 is due to an increase in the number of residential and commercial connections to new and existing district heating networks.
- The increase in **hydro** and **geothermal** electricity production from 2007 is due to the expansion of the aluminium industry.
- The increase in **geothermal** electricity production in 2018 is due to a new 90 MW power plant, half of which came online in 2017, and half in 2018.
- From 2016 onwards, the decline in electricity production from **wind** is due to a combination of lower wind speeds and lower installed capacity.

Transformation

- From 2017 onwards, due to data quality issues, the reported efficiency of **electric boilers** exceeds 100%. Revisions are pending.
- 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,

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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

- The increase in **electricity** consumption in the *non-metallic minerals* sector from 2017 onwards is due to the opening of a silicon production facility, PCC Bakki. The significant increase in electricity consumption in the *commercial and public services* sector from 2015 onwards is due to the growth of cryptocurrency mining.
- 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. 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. For wind, data for autoproducers are included in main activity producers prior to 2002 for confidentiality reasons.
- 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

- In 2019 and 2018, electricity output from **other bituminous coal** declined due to shutdowns at Moneypoint power station.

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- In 2017, a new **municipal waste**-fired main activity producer electricity plant (Dublin waste-to-energy) began operations.
- 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 **municipal waste**-fired main activity producer electricity plant (Meath waste-to-energy) began operations.
- 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 the 2021 edition, **electricity** consumption data were revised back to 1990 to incorporate the results of the Business Energy Use Survey (BEUS), which provided a level of detail not previously available.
- 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/forestry* 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

- The **natural gas**-fired steam turbine at the Aghada main activity power plant closed in late 2018.
- Capacity for the Edenderry co-fired (**peat** and **solid biomass**) power plant has been reported under single fuel-fired (peat).
- 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, some data for Israel have been estimated by the IEA secretariat. In particular, some **oil** data in 2014 and 2015, **natural gas** data from 2012 onwards, and **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.
- Electricity production from **wind** begins in 2001.
- Autoproducer **electricity** generation from chemical heat (production of sulphuric acid) occurs, but is not reported separately or included elsewhere in national totals, prior to 2017.

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Transformation

- For the 2018 reporting cycle, Israel revised their methodology to better reflect actual plant classifications. As a result, breaks in series occur between 2017 and 2018 for output from all plant types.
- Prior to 2018, inputs to autoproducer CHP plants (then reported under auto electricity plants) included inputs used to generate unsold **heat**. As a result, there is an apparent increase in efficiency for some fuels between 2017 and 2018.
- For 2017 data onwards, due to confidentiality concerns, electricity production reported under auto producer **wind** includes generation from main activity **wind,** total **hydro,** and autoproducer **biogases.** Similarly, for 2016 data, reported auto producer solar PV generation includes total generation from **hydro** and **wind**.
- For 2013 and 2014, **other oil products** inputs to autoproducer electricity plants were estimated by the IEA Secretariat.
- Data on **heat** production from main CHP plants are not available.

Consumption

- **Solar thermal** indigenous production and direct consumption have been estimated by the IEA Secretariat from 2012 to 2017, 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, and 2017 and 2018.
- For 2013 onwards, for reasons of confidentiality, electricity consumption in *non-ferrous metals* is included under *mining and quarrying*, and consumption in *chemical (including petrochemical)* and *construction* is included under *not elsewhere specified (industry)*.
- For 2013, and 2015 onwards, the split of **electricity** consumption in industry has been estimated by the IEA Secretariat. In addition, electricity consumption in *agriculture/forestry* for 2015 onwards has also been 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

- For 2017, more information became available on **fossil fuel** use in heat plants allowing additional inputs to be reported for this category. This causes breaks in time series between 2016 and 2017.
- 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

- For 2018, the decrease in electricity output from **Solar PV** was due to lower than normal solar radiation.
- Prior to 2000, **electricity** used for pumped storage (mixed plants) is included under used for pumped storage (pure hydro pumping plants).

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- 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

- For the 2021 edition, the Italian Administration changed system of reporting used to categorise consumption based on economic activity (from ATECUE95 to ATECO2007). As a result, breaks in series occur between 2018 and 2019. Historical revisions are pending.
- Some breaks in-series for **heat** consumption are observed between 2017 and 2018. This is because some large heat producers reported consumption of heat in 2018 in sectors different to those they had reported in previous years.
- *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 2019 edition, data for Japan were revised back to 1990 based on new methodology.
- From 1990, data are reported on a fiscal year basis. By convention data for the fiscal year that starts on 1 April Y-1 and ends on 31 March Y are labelled as year Y-1.
- 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.

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- **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

- In the 2021 edition, heat supply was revised by the Japanese Administration. As a result, after 1990, own use of **heat** is only available for the period 2004-2013.
- In the 2019 edition, **electricity** data were revised back to 1990 to include additional autoproducer production previously excluded.
- 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.
- Due to the liberalisation of the electricity market in April 2016 some generation previously reported under autoproducer plants is reported as main activity producer from 2016 onwards. As a result, breaks in series occur between 2015 and 2016. In particular, for **solar PV** and **wind**.
- In the 2019 edition, the methodology used to estimate **heat** production from other sources was revised.
- 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 significant increases were observed in 2017 and 2018, with generation resuming at several facilities (2017: Takahama 3 and 4, Ooi 3, and Genkai 3; 2018: Genkai 4, Ikata 3, Ooi 4). In 2020, output decreased due to inspections at some plants.
- **Other sources** electricity represents electricity generated with purchased steam. Other sources heat represents heat derived from waste heat.
- Gross and net **electricity** generation from autoproducers are equal, as no information is collected concerning autoproducer own use.
- Own use at main electricity plants has been constant since 2015, as data are no longer available following liberalisation.
- 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.
- Data for **electric boilers** include **heat pumps**. For this reason, calculated efficiencies exceed 100% for some years.
- 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

- The Japanese Administrations attributes **heat** outputs (with the exception of heat from electric boilers) to individual fuels based on their share of inputs, assuming efficiencies are 100% or less. As a result, fuel-specific transformation efficiencies may not reflect actual efficiencies.
- 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.

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- 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

- In mid-2018, some autoproducer **wind** capacity was reclassified as main activity producer. As a result, a higher utilisation rate is observed for autoproducer wind in 2018.
- Autoproducer **solar photovoltaic** capacity is derived from data from the Japanese administration as well as the IEA Photovoltaic Power Systems Programme (IEA-PVPS) report, "Trends in Photovoltaic Applications" published in 2017.
- **Electricity** generation capacity for **nuclear** power increased in 1997 due to the commissioning of two nuclear plants.
- **Geothermal** capacities do not include autoproducer plants with capacities less than 1 000 MW. Therefore, the capacity factor may exceed 100%.
- From 2010 onwards, the breakdown of combustible fuel-fired electrical capacity by type is no longer available.
- 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 **subbituminous 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.

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- Data for electricity production using **heat from chemical processes** in copper and zinc plants are available from 2005. The corresponding heat inputs were estimated until 2013 data. In 2014, the company concerned switched to **diesel oil** for electricity generation.

Transformation

- For 2020, the increase in electricity output from **nuclear** was due to the 1.4 GW reactor (Singori #4) coming online, as well as higher utilisation rates. For 2018, the decrease in electricity output from nuclear was due to a combination of shutdowns for maintenance, and the closure of the Kori and Wolseong nuclear power plants in June 2017 and June 2018 respectively.
- For 2018, the increase in heat production from **natural gas** was in part due to the commencement and expansion of operations at two CHP plants (Hwaseong Dongtan and Anyang).
- For 2017, the decrease in electricity production from **residual fuel oil** is due to the closure of two main activity producer plants.
- Some discrepancies exist between data reported for **residual fuel oil**, in the oil databases and the electricity and heat databases. The Korean administration hopes to remedy this situation in a coming cycle.
- 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.

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.
- Breaks in the time series appear for inputs to and outputs from electricity generation between 2016 and 2017 due to a change in methodology. This is

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most notable for main activity producer CHP and Heat plants. Data for 2017 onwards are reported on a unit basis, whereas data for previous years are reported on a plant basis.

Supply

- In 2019, the first large-scale main activity **solar thermal** district heating plant opened in Latvia.
- For 2017, higher rainfall resulted in a significant increase in electricity output from **hydro** and a decrease both imports of electricity and output from **combustible fuels**.
- Heat production from *other sources* represents waste heat recovered from industry, and heat produced by condensing economisers.

Transformation

- For 2019, **electricity** and **heat** generation by autoproducers in the *not elsewhere specified (energy)* sector refers to companies involved in peat extraction.
- 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.

Consumption

- Prior to 2020p data, all **electricity** consumption in the *Energy sector* was included in *own use* of electricity in power plants.
- Prior to 2015 data, **electricity** consumed by trams at one of Latvia's three tram operators was included under *road*.
- For 2012, the increase in electricity consumption in the *iron and steel* sector is due to a facility switching from an open hearth furnace to an electric arc furnace.

Lithuania

Source

Statistics Lithuania, Vilnius.

General notes

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

Transformation

- In 2009, the Ignalina nuclear power plant, the only **nuclear** plant in Lithuania, closed down.
- Since the end of 2013, the Fortum Klaipėda CHP plant has produced electricity and heat from **industrial waste**, **municipal waste** and **solid biofuels**. The ratio of fuels used is subject to variation based on cost and availability. In addition, in 2016, the method for calculating the calorific values of the fuels used was changed. As a result, there are fluctuations in absolute and relative fuel inputs, and energy outputs from the aforementioned fuels.
- In March 2017, the *Geoterma* geothermal heat plant, the only **geothermal** heat plant in Lithuania, closed down.
- In 2013, an incinerator combusting **industrial waste (non-renewable)** and **municipal waste** began operations

Luxembourg

Source

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

General notes

- 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.
- There were some repairs on the upper basin of the **pumped storage** site at Vianden in 2019 leading to a reduction in electricity production. The full storage capacity was not available during this period.

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- In the 2017 edition, following plant reclassification, **heat** production by main activity plants were revised from 2011 onwards.
- Starting in 2005, data for *transmission and distribution losses* of **electricity** are obtained from the network operator. Prior to that, they were estimated by the Luxembourgian administration.
- Data for **solar thermal** are available starting in 2001 and for **solar PV** starting in 2000.

Transformation

- A **natural gas**-fired, main activity electricity plant (TGV Twinerg) closed in 2016.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.
- 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

- **Heat** consumption in industry is estimated based on National Accounts. When not available, heat consumption figures for the most recent year reported are estimated based on data for the preceding year.
- 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.
- For the 2021 (July) edition, new data supplied by the Mexican administration for 2018 and 2019 were incorporated in place of previous estimates.
- 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**.

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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

- Electricity generation from **other sources** mainly represents generation from recovered waste heat from industry, and also a small amount of electricity production from regenerative breaking in suburban trains.
- The decrease in electricity produced from **wind** in 2017 data is due to an earthquake which damaged infrastructure in the south of the country.
- Production of main activity producer electricity plants from **wind** is available from 1994.
- Electricity production from **wind** and **solar photovoltaic** is available from 1990.
- Discrepancies occur between respective reported figures for electricity trade between the US and Mexico from 2013 onwards.

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.

Netherlands

Source

The Netherlands Central Bureau of Statistics, The Hague.

General notes

- The Netherlands Central Bureau of Statistics has conducted reviews and revisions of their energy balance on several occasions; including, 2005, 2011, 2015 and 2016. 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. In the 2016 and 2017 editions, data for the years 1990-2013 were revised by the Dutch administration following an extended review of old national publications and new data obtained from grid operators. More details are available here: www.cbs.nl.

Supply

- In 2019, the Dutch administration revised *transmission and distribution losses* of **heat** back to 2015 to incorporate improved data. As a result, there is a break between 2014 and 2015. Historical revisions are pending.
- For 2018, the increase in electricity output from **Solar PV** autoproducer electricity plants is in part due to the inclusion of solar on industry surveys. As a result autoproduction in various industries was captured for the first time.

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- For 2018, the declines in heat generation from **municipal waste**, and heat used for electricity generation, and the increase in electricity output from municipal waste, are due to a change in ownership of a company which sold heat.
- Data on **heat** production from chemical sources are available from 2017.
- The decrease in electricity production from **nuclear** power in 1997, 2013, and 2017 is due to maintenance shutdowns at the Netherlands' only 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 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

- For 2019, the increases in electricity output from **other sources**, and heat output **from chemical heat** are in part due to improved data availability.
- Data on electricity and heat output from **industrial waste** are available from 2019. Historical revisions are pending.
- In mid-2017, two **other bituminous coal**-fired power stations closed, as a result output from other bituminous coal declined in 2018. Another plant closed in-late 2019.
- The efficiency of **blast furnace gas**-fired autoproducer CHP plants increases between 2015 and 2016 due to improved methods for allocating inputs between sold and unsold heat.
- Heat output from **chemical heat**, and **other sources** is available from 2015.
- Electricity output from **other sources** refers to production from expansion gases and recovered heat.
- 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**. The corresponding electricity output is included with that of **natural gas**.
- 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.
- 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.

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- 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.

Consumption

- In 2018, the decrease in **heat** used for electricity generation was due to the closure of a large installation.
- In 2018, there were four new **geothermal** installations producing heat which warmed greenhouses. As in the past, these would be categorised in the *agriculture and forestry* sector.
- For data from 2015 onwards, there is improved data availability for **heat**. This causes breaks in series for *transmission and distribution losses*, and heat consumption in the *non-ferrous metals* sectors.
- 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. The heat produced has been used for heating greenhouses.
- Prior to 1979, **electricity** consumption in agriculture is included in commercial and public services.

Capacity

- 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

- In the 2019 edition, the New Zealand administration submitted extensive revisions back to 1990 following an internal review of systems and methodologies. Additional revisions were submitted for the 2020 edition.
- Prior to 1994, data refer to fiscal year (April 1993 to March 1994 for 1993). From 1994, data refer to calendar year.
- 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

- For 2018, a shortage of **natural gas** resulted in decreased use of natural gas for electricity generation, and increased use of **sub-bituminous coal**.
- In late 2015, two **natural gas**-fired power stations used for baseload demand closed. As the remaining natural gas-fired plants are used more for peak demand, there is a reduction in generation efficiency between 2015 and 2016.
- **Electricity** and **heat** production from **other sources** represents waste heat recovered and used for electricity production. This includes **heat** from recovered from chemical processes at acid plants in the fertiliser industry, where sulphur is the main input.
- 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.
- In the 2018 edition, electricity production in **hydro** plants was revised back to 2002 due to a change in methodology. This results in a break in time series between 2001 and 2002.

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- 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

- 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, *transmission and distribution losses* include the statistical differences.
- The classifications used by the administration of New Zealand were changed in 1991.
- **Electricity** consumption in *pulp, paper, 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

- **Solar** electricity production in the *residential* sector is available from 2018. However, it only refers to electricity sold – it does not include electricity generated and consumed by households themselves.
- The **electricity** generated from *other sources* represents electricity from waste **heat**.
- Prior to 2009, *transmission and distribution losses* include *statistical differences*.
- **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

- Prior to 2018, **heat** output from heat pumps included district cooling. Electricity inputs to heat pumps run in cooling mode is included for all years. Revisions are pending.
- Increased heat production from **biogases** and **other liquid biofuels** in 2018 is related to replacing fossil fuels.
- For 2017, the apparent increase in heat output from **solid biofuel**-fired Main CHP plants is due to a plant reclassification.

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- In the 2016 edition, Norway corrected the **industrial waste** consumption in heat plants, and reclassified some 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

- Electricity consumption in *road* refers to calculated consumption for 100% electricity vehicles only i.e. it excludes hybrids. This consumption is removed from *residential* and *commercial and public services* consumption where relevant. The Norwegian Administration hopes to include hybrid vehicles in a coming cycle.
- For the 2019 edition, **heat** consumption in the *chemical (incl. petrochemical)* and *commercial and public services* sectors was revised back to 2007. Historical revisions for other sectors are pending. As a result, breaks in series occur for heat consumption in some sectors between 2016 and 2017.
- 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

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coal-fired power plants and created breaks in time series from 2004 onwards.

- In 2019, electricity output from **solid biofuels** increased following the introduction of a new state support scheme. In 2016, output declined following a reduction in state support for biomass co-firing.
- 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 2014 and 2008, a number of CHP plants were reclassified from autoproducer to main activity producer due to an industry re-organisation.
- In 2014 and 2013 some CHP plants were used as backup reserve plants, resulting in a decrease in consumption under main activity producers CHP plants.
- In 2005 and 2004 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.
- Prior to 2013, **electricity** *used for pumped storage (mixed plants)* is included under *used for pumped storage (pure hydro pumping plants)*.

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.

  Electricity consumption in *road* refers to consumption in designated public charging spots. Charging of vehicles in a residential setting is included in *residential* consumption.

Portugal

Source

Direcção-Geral de Energia e Geologia, Lisbon.

Supply

- Data for production of electricity from **solar photovoltaic** and **wind** are available from 1989.
- The large decrease in electricity output from **hydro** for 2017 is due to decreased rainfall.

Transformation

- In 2019 and 2020, one of the two **other bituminous coal**-fired plants in Portugal operated with reduced output. The plant permanently closed in late 2020.
- 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 1992, data for net **electricity** production by autoproducers include production **from combustible fuel** sources only.
- Data for production of **electricity** in main activity producer CHP plants and the associated fuel inputs are not available prior to 1980.

Consumption

- In the 2017 edition, the Portuguese administration reclassified some amounts of **heat** consumption from the *residential* to the *commercial and public services* sector for the period 1998 to 2014 following a new national methodology.
- Data for direct use of **solar thermal heat** is available from 1989 and direct use of **geothermal heat** from 1994.

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Capacity

- Peak load for main activity producer plants includes the autoproducers data and is not available prior to 1986.

Slovak Republic

Source

Statistical Office of the Slovak Republic, Bratislava.

General notes

- Data are available starting in 1971.
- The Slovak Republic became a separate state in 1993 and harmonised its statistics to EU standards in 2000. These two facts lead to several breaks in time series between 1992 and 1993, and between 2000 and 2001.
- 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.

Supply

- For 2018, heat supply declined due to the closure of a large producer in January 2018.
- Electricity and heat from *other sources* refers to waste heat (flue gases).

Transformation

- For 2018, opposing trends in **residual fuel oil** use at Autoproducer and Main CHP plants are due to changes in plant classifications following a merger.
- 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.
- For 1990 to 2003, electricity and heat production from **combustible fuels** have been estimated based on the data on fuel inputs to 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

- For 2018, the apparent decline in **heat** consumption in the *oil refineries* and *chemical (incl. petrochemical)* sectors is due to a merger between companies in those sectors and a CHP plant.
- For 2018, the increase in **electricity** consumption in the *mining and quarrying* sector is because a larger consumer was reclassified.
- 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.

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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.

Supply

- Electricity output from **solar** only includes on-site consumption from 2019 onwards.

Transformation

- In 2018, Slovenia began gradually changing the sources of data for main heat plants from questionnaires to administrative sources. This change has resulted in some variation in reported efficiencies, in particular, for **natural gas**.
- In 2015, one of the main activity electricity plants burning **lignite** ceased its operations.

Consumption

- Breaks occur between 2017 and 2018 for electricity consumption data (in particular, for *Machinery* and *Construction*) due to a change in the sample frames and sample sizes used in surveys.
- Data on electricity consumption in *Road* are available from 2017.
- In 2017, the apparent increase in electricity consumption in *rail* is due to improved data provided by a new survey launched by the Ministry of Infrastructure in 2018.
- 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 para la Transición Ecológica y el Reto Demográfico, 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

- In 2019, electricity production from autoproducer **solar** increased due to implementation of a new regulation incentivising prosumption.
- **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

- Heat production from renewable sources is mostly not sold to third parties but rather, used for industrial purposes or consumed by heat production facilities.
- In the 2020 edition, electricity generation for **wind** was revised from 1998-2017.
- From 2017 onwards, more accurate data on inputs and outputs for **pumped hydro** are available. This improvement in data quality leads to an apparent increase in efficiency.

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- Prior to 2018, some **industrial waste** and **other liquid biofuels** used for electricity and heat generation was reported under **solid biofuels**.
- 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 autoproducer 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.

Consumption

- For 2019 data, some electricity consumption was reallocated from *industry non-specified* to other sectors. As a result, apparent increases are observed for sectors such as *textiles and leather* and *wood and wood products*.
- **Electricity** consumption by electric road transport vehicles includes battery and electric plug-ins, and is modelled based on vehicle registrations.
- For 2012, the **electricity** consumption data are estimated by the Spanish administration.
- Data for direct use of **geothermal** and **solar thermal 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

- Prior to 1980, data on electrical capacity by type of generation are not available. In addition, from 2003 to 2017, no breakdown of capacity by type of fuel and generation type is available.

Sweden

Sources

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

Supply

- In the 2021 edition, upward revisions were applied to heat production and consumption back to 1997, to incorporate new data on recovered flue gas heat. Production is reported under heat from **other sources.**
- For 2017 onwards, electricity inputs to and outputs from pumped **hydro** storage plants are based on a revised methodology. As a result, breaks occur between 2016 and 2017. Prior to 2017, electricity in-

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puts to mixed hydro storage plants are reported under pure pumped plants.

- Inputs to **heat pumps** include heat recovered from industry and from ambient sources (including sewage and seawater).
- Information on **heat** for sale produced in heat pumps and electric boilers is available starting in 1992.
- Data on gross electricity production are sourced from an annual survey, while net production is sourced from monthly surveys. As a result, implied own use may vary.

Transformation

- For 2020, the decrease in electricity output from **other bituminous coal** was due to a plant closure.
- For 2020 onwards, the decrease in electricity output from **nuclear** plants is due to the closure of two reactors, one in late 2019, and another in late 2020.
- 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.
- 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 1992, data on electricity production from **biogases** is included with **solid biofuels**.
- Heat produced for sale by autoproducer CHP plants is reported starting in 1992.
- From 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.
- In 2014, consumption of **electricity** in the mining and quarrying and the *paper, pulp 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 2021 edition, Sweden altered the methodology used to apportion capacity between single and multi-fired plant types, as a result some breaks in-series may occur for solid- and gas-fired plants.
- 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.

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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 auto-producers are available from 1990.

Transformation

- In the 2020 edition, some significant revisions were in **industrial waste (non-renewable)** from 2013 to 2015 for fuel input to autoproducer CHP plants because one plant operator corrected its fuel input.
- For 2019, gross **heat** production from heat pumps ceased, following a decline in 2018. Two such facilities existed in Switzerland, the larger of which closed in 2018, followed by the smaller in 2019.
- For 2016 and 2017, electricity output from **nuclear** sources declined due to shut downs at two of Switzerland's five nuclear power plants (Beznau 1 and Leibstadt). For 2018, output increased due to higher availability at these two plants.
- **Electricity** used for pumped storage (pure hydro pumping plants) is included under used for pumped storage (mixed plants).
- 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 only partially available from 1990-1999, and is not available from 2000-2018.
- 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

- 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

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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 2020p, electricity output from **lignite** declined due to temporary plant closures for environmental refits.
- In 2017, the increase in electricity production from **solar PV** main activity producers is related to new plants coming online, mostly unlicensed.
- 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 autoproducer electricity plant fuelled with **coking 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 of **electricity** to Iraq are included under non-specified/others.
- Trade of **electricity** with Albania and Romania are contractual rather than physical 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.

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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

- Data for **off-grid solar PV** are currently not available in the United Kingdom but the addition of these data is expected in the future.
- 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

- For 2019 onwards, the decline in output from **other bituminous coal** was due to plant closures (Fiddlers Ferry, Cottam, and Aberthaw).
- For 2018-2020, the decrease in electricity output from **nuclear** was due to plant outages for maintenance.
- **Electricity** used for pumped storage (mixed plants) is included under used for pumped storage (pure hydro pumping plants) for confidentiality reasons.
- 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).

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Consumption

- For the 2019 edition, a change in methodology was applied for **heat** consumption figures from 2015 onwards. Due to new information regarding the purchasing and reselling of heat, consumption previously included under the *Commercial and Public services* sector was reallocated to the *Residential* sector.
- For 2017, the decrease in electricity consumption in *mining and quarrying* is due to omission of one company from dataset.
- Prior to 2010, consumption in *mining and quarrying* is included in the *non-metallic minerals* sector.
- **Electricity** consumption in *coal mines* includes consumption in *patent fuel plants*.
- 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 (except 2010-2014, when estimates were supplied by the UK) 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 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. However, prior to 1990, consumption in *gas works* includes electricity use in the transmission/distribution of public supply gas.
- For autoproducers, due to data availability constraints, **heat** is assumed to be consumed within the same sector as it is generated.

Capacity

- Breaks occur between 2016 and 2017 for combustible fuel-fired Autoproducer plants. Historical revisions are pending.
- 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

- Starting with 2017 data, inputs to and outputs from electricity and heat generation include Puerto Rico.
- 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.

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- **Geothermal** supply and inputs to 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

- There is a break in series for **geothermal** and **solar thermal** direct use data between 2017 and 2018 as a new methodology for reporting these data was adopted with 2018 data.
- 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 inputs to and outputs from **pumped storage hydro** plants became available starting in 1987.
- Discrepancies occur between respective reported figures for electricity trade between the US and Mexico from 2013 onwards, and between the US and Canada from 2016 onwards. This is in part due to a change in data source for US electricity trade figures, which creates a break in series between 2015 and 2016.

Transformation

- **Electricity** inputs to both mixed **hydro** and pure pumped storage pumping plants are reported under inputs to pure pumped storage.
- 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 **subbituminous coal** and **lignite** have been estimated by the Secretariat using information provided in the EIA's Annual Electricity Generator Report – Utility.

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- 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.
- Data for **heat** produced in main activity producer heat plants are available from 1992 to 1999, and for autoproducer CHP plants for 1989 to 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* sector was reported as declining by 17%. In addition, as the AEO models are revised annually, but the historical data are not necessarily revised, regular breaks in-series can occur.
- For the 2019 edition, the breakdown of final **electricity** consumption for 2017 was based on the results of the Annual Energy Outlook (AEO) of 2018. The model used in the 2018 edition of the Outlook was updated to incorporate the results of the 2014 Manufacturing Energy Consumption Survey (MECS). The MECS values were last updated in 2010, and in the intervening period, several industries had changed significantly. For industry sub-sectors where disaggregated AEO2018 values are unavailable e.g. non-ferrous metals, textiles, and non-metallic minerals, consumption was extrapolated from the MECS 2014 values at the same rate as shipments in that industry. Breaks in time series occur across several sectors between 2016 and 2017.
- Similarly, 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.
- Electricity consumption in *road* includes all estimated consumption by electric vehicles (both 100% and plug-in hybrids).
- Prior to 1991, total consumption of **heat** sold referred to consumption in *commercial/public* services.

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- 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.

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7. UNITS AND CONVERSIONS

Conversions (to toe)

All units in this publication are metric units. Most IEA 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 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 for each flow or use (i.e. production, imports, exports, electricity generation, coke ovens, blast furnaces and industry). 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 vaporisation 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 TWh = 0.086 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, tidal/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.

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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 TWh = (86 ÷ 0.1) ktoe

33% for solar thermal electricity
1 TWh = (86 ÷ 0.33) 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 TJ = (0.02388 ÷ 0.5) 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

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

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General conversion factors for energy

To:	TJ	Gcal	Mtoe	MBtu	GWh
From:	multiply by:				
Terajoule (TJ)	1	$2.388x10^{2}$	$2.388x10^{-5}$	$9.478x10^{2}$	$2.778x10^{-1}$
Gigacalorie (Gcal)	$4.187x10^{-3}$	1	$1.000x10^{-7}$	3.968	$1.163x10^{-3}$
Million tonnes of oil equivalent (Mtoe)	$4.187x10^{4}$	$1.000x10^{7}$	1	$3.968x10^{7}$	$1.163x10^{4}$
Million British thermal units (MBtu)	$1.055x10^{-3}$	$2.520x10^{-1}$	$2.520x10^{-8}$	1	$2.931x10^{-4}$
Gigawatt hour (GWh)	3.600	$8.598x10^{2}$	$8.598x10^{-5}$	$3.412x10^{3}$	1

Conversion factors for mass

To:	kg	t	lt	st	lb
From:	multiply by:				
Kilogramme (kg)	1	$1.000x10^{-3}$	$9.842x10^{-4}$	$1.102x10^{-3}$	2.205
Tonne (t)	$1.000x10^{3}$	1	$9.842x10^{-1}$	1.102	$2.205x10^{3}$
Long ton (lt)	$1.016x10^{3}$	1.016	1	1.120	$2.240x10^{3}$
Short ton (st)	$9.072x10^{2}$	$9.072x10^{-1}$	$8.929x10^{-1}$	1	$2.000x10^{3}$
Pound (lb)	$4.536x10^{-1}$	$4.536x10^{-4}$	$4.464x10^{-4}$	$5.000x10^{-4}$	1

Conversion factors for volume

To:	gal US	gal UK	bbl	ft^3	l	m^3
From:	multiply by:					
US gallon (gal US)	1	$8.327x10^{-1}$	$2.381x10^{-2}$	$1.337x10^{-1}$	3.785	$3.785x10^{-3}$
UK gallon (gal UK)	1.201	1	$2.859x10^{-2}$	$1.605x10^{-1}$	4.546	$4.546x10^{-3}$
Barrel (bbl)	$4.200x10^{1}$	$3.497x10^{1}$	1	5.615	$1.590x10^{2}$	$1.590x10^{-1}$
Cubic foot (ft^3)	7.481	6.229	$1.781x10^{-1}$	1	$2.832x10^{1}$	$2.832x10^{-2}$
Litre (l)	$2.642x10^{-1}$	$2.200x10^{-1}$	$6.290x10^{-3}$	$3.531x10^{-2}$	1	$1.000x10^{-3}$
Cubic metre (m^3)	$2.642x10^{2}$	$2.200x10^{2}$	6.290	$3.531x10^{1}$	$1.000x10^{3}$	1

Decimal prefixes

0^{1}	deca (da)	10^{-1}	deci (d)
10^{2}	hecto (h)	10^{-2}	centi (c)
10^{3}	kilo (k)	10^{-3}	milli (m)
10^{6}	mega (M)	10^{-6}	micro (μ)
10^{9}	giga (G)	10^{-9}	nano (n)
10^{12}	tera (T)	10^{-12}	pico (p)
10^{15}	peta (P)	10^{-15}	femto (f)
10^{18}	exa (E)	10^{-18}	atto (a)

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8. ABBREVIATIONS

GJ	:	gigajoule (10^9 joules)
GW	:	gigawatt
GWh	:	gigawatt hour = 3.6 Terajoules
kW	:	kilowatt
kWh	:	kilowatt hour
MW_e	:	megawatt (electric)
MWh	:	megawatt hour
MW_{th}	:	megawatt (thermal)
m^2	:	metre squared
t	:	metric ton = tonne
TJ	:	terajoule (10^{12} joules)
1 toe	:	tonne of oil equivalent = 41.868 GJ = 10^7 kcal
TWh	:	terawatt hour
GDP	:	gross domestic product
RES	:	renewable energy sources
TES	:	total energy supply
0 or 0.0	:	negligible
c	:	confidential data
..	:	not available
x	:	not applicable

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