

WORLD ENERGY BALANCES
MAY 2022 EDITION
(IEA FAMILY AND BEYOND)

Database documentation

In an effort to provide users with more timely information, with the May 2022 edition of the World Energy Balances database the IEA is releasing balances for those countries of the IEA Family (including OECD, Association and Accession countries) and beyond, for which data up to 2020 have been already received and validated.

This documentation provides support information for the May 2022 edition of the IEA World Energy Balances database. The July edition will cover the global set of data. Please address your inquiries to stats@iea.org.

Please note that all IEA data is subject to the following Terms and Conditions found on the IEA's website: <http://www.iea.org/t&c/termsandconditions/>

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Changes from last edition

Geographical coverage

In an effort to enhance timeliness of data, the IEA is pleased to expand the coverage of the May edition to include full coverage of the IEA Family, as well as other selected economies. The countries, territories and economies included are:

OECD: Australia, Austria, Belgium, Canada, Chile, Colombia, Costa Rica, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea, Latvia, Lithuania, Luxembourg, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey, United Kingdom, United States;

Accession countries: Chile, Colombia, and Israel;

Association countries: Argentina, Brazil, People's Republic of China, Egypt, India, Indonesia, Morocco, Singapore, South Africa, Thailand;

Other selected countries and economies: Albania, Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Bulgaria, Croatia, Cuba, Cyprus, Georgia, Hong Kong China, Kazakhstan, Kosovo, Kyrgyzstan, Malta, Mauritius, Republic of Moldova, Montenegro, the Republic of North Macedonia, Paraguay, Romania, Saudi Arabia, Serbia, Trinidad and Tobago, Tunisia, and Ukraine.

Accession Countries

Lithuania joined the IEA in February 2022; however, its data have not been included in the IEA member countries aggregate (IEA total) for this edition. They are included in the IEA and Accession/Association countries aggregate (IEA family), for data starting in 1990 and for the entire time series.

Revisions of GDP time series

The sources of GDP data used to derived selected energy indicators have been changed from previous editions to move to a homogenous source across OECD and non-OECD countries. The current sources are:

International Monetary Fund. 2021. World Economic Outlook: War Sets Back the Global Recovery. Washington, DC, October. (IMF WEO)

World Development Indicators. 2022. Washington, D.C. :The World Bank. (WB WDI)

CEPII – CHELEM database. 2022. (CHELEM)

This change has impact on the indicators derived from GDP (e.g. total energy supply/GDP), with variable levels depending on the country. For more information on sources, please refer to *Flow definitions*.

Database structure

The database *World Energy Balances* includes annual data for:

- countries: 74 countries and 10 regional aggregates
(see section *Geographical coverage*);
- years: 1960-2020 (OECD countries);
1971-2020 (non-OECD countries and regional aggregates);

The database includes the following four files:

WBAL.IVT Summary energy balances

Energy balances in matrix form (19 product categories; 80 flows) (ktoe; TJ); Electricity and heat output by type of producer (10 flows) (GWh; TJ; ktoe).

WBIG.IVT Extended energy balances

Energy balances in matrix form (68 products and 98 flows) (ktoe; TJ); Electricity and heat output by type of producer (10 flows) (GWh; TJ; ktoe).

WIND.IVT Indicators

52 energy, economic and coupled indicators (various units).

WCONV.IVT World conversion factors

net calorific values by flow for 15 coal products (toe/t; kJ/kg); average net calorific values for 23 oil products and 5 biofuel products (toe/t; kJ/kg); volume to mass ratio for 22 oil products and 4 biofuel products (barrels/tonne); gross calorific values by flow for natural gas (kJ/m³).

Detailed definitions of each flow and product are presented in sections *Flow definitions* and *Product definitions*.

Flow definitions

Supply

Flow	Short name	Definition
Production	INDPROD	Comprises the production of primary energy, i.e. hard coal, lignite, peat, crude oil, NGLs, natural gas, biofuels and waste, nuclear, hydro, geothermal, solar and the heat from heat pumps that is extracted from the ambient environment (only heat generated from heat pumps that is sold to third parties is included in the energy balance). Production is calculated after removal of impurities (e.g. sulphur from natural gas). Calculation of production of hydro, geothermal, etc. and nuclear electricity is explained in section <i>Units and conversions</i> .
Imports	IMPORTS	<p>Comprise amounts having crossed the national territorial boundaries of the country whether or not customs clearance has taken place.</p> <p><i>For coal:</i> Imports comprise the amount of fuels obtained from other countries, whether or not there is an economic or customs union between the relevant countries. Coal in transit should not be included.</p> <p><i>For oil and natural gas:</i> Quantities of crude oil and oil products imported under processing agreements (i.e. refining on account) are included. Quantities of oil in transit are excluded. Crude oil, NGL and natural gas are reported as coming from the country of origin; refinery feedstocks and oil products are reported as coming from the country of last consignment. Imported LNG which is exported to another country after regasification is considered both as an import and as an export of gas.</p> <p><i>For electricity:</i> 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.</p>
Exports	EXPORTS	<p>Comprise amounts having crossed the national territorial boundaries of the country whether or not customs clearance has taken place.</p> <p><i>For coal:</i> Exports comprise the amount of fuels supplied to other countries, whether or not there is an economic or customs union between the relevant countries. Coal in transit should not be included.</p> <p><i>For oil and natural gas:</i> Quantities of crude oil and oil products exported under processing agreements (i.e. refining on account) are included. Re-exports of oil imported for processing within bonded areas are shown as an export of product from the processing country to the final destination. Imported LNG which is exported to another country after regasification is considered both as an import and as an export of gas.</p> <p><i>For electricity:</i> 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.</p>
International marine bunkers	MARBUNK	<p>Covers those quantities delivered to ships of all flags that are engaged in international navigation. The international navigation may take place at sea, on inland lakes and waterways, and in coastal waters. Consumption by ships engaged in domestic navigation is excluded. The domestic/international split is determined on the basis of port of departure and port of arrival, and not by the flag or nationality of the ship. Consumption by fishing vessels and by military forces is also excluded. See <i>domestic navigation, fishing and non-specified (other)</i>.</p> <p><i>International marine bunkers</i> are excluded from the <i>supply</i> at the country and regional level, but not for world, where they are included in <i>transport</i></p>

Flow	Short name	Definition
		under <i>World marine bunkers</i> .
International aviation bunkers	AVBUNK	Includes deliveries of aviation fuels to aircraft for international aviation. Fuels used by airlines for their road vehicles are excluded. The domestic/international split should be determined on the basis of departure and landing locations and not by the nationality of the airline. For many countries this incorrectly excludes fuel used by domestically owned carriers for their international departures. <i>International aviation bunkers</i> are excluded from the <i>supply</i> at the country and regional level, but not for world, where they are included in <i>transport</i> under <i>World aviation bunkers</i> .
Stock changes	STOCKCHA	Reflects the difference between opening stock levels on the first day of the year and closing levels on the last day of the year of stocks on national territory held by producers, importers, energy transformation industries and large consumers. A stock build is shown as a negative number, and a stock draw as a positive number.
Total energy supply	TES	Total energy supply (TES) is made up of production + imports - exports - international marine bunkers - international aviation bunkers ± stock changes. Note, exports, bunkers and stock changes incorporate the algebraic sign directly in the number. For World, TES is defined as <i>production + imports - exports ± stock changes</i> . Note, exports, bunkers and stock changes incorporate the algebraic sign directly in the number.
Transfers	TRANSFER	Comprises <i>interproduct transfers</i> , <i>products transferred</i> and <i>recycled products</i> . <i>Interproduct transfers</i> results from reclassification of products either because their specification has changed or because they are blended into another product, e.g. kerosene may be reclassified as gasoil after blending with the latter in order to meet its winter diesel specification. The net balance of <i>interproduct transfers</i> is zero. <i>Products transferred</i> is intended for oil products imported for further processing in refineries. For example, fuel oil imported for upgrading in a refinery is transferred to the feedstocks category. <i>Recycled products</i> are finished products which pass a second time through the marketing network, after having been once delivered to final consumers (e.g. used lubricants which are reprocessed).
Statistical differences	STATDIFF	Includes the sum of the unexplained statistical differences for individual fuels, as they appear in the basic energy statistics. It also includes the statistical differences that arise because of the variety of conversion factors in the coal and oil columns.

Transformation processes

Flow	Short name	Definition
Transformation processes	TOTTRANF	Transformation processes comprise the conversion of primary forms of energy to secondary and further transformation (e.g. coking coal to coke, crude oil to oil products, and fuel oil to electricity). Inputs to transformation processes are shown as negative numbers and output from the process is shown as a positive number. Transformation losses will appear in the "total" column as negative numbers.
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 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.
Autoproducer 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. Autoproducer 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.
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 should be adopted. Main activity producers 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.
Autoproducer 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 should be adopted. Note that for autoproducer CHP plants, all fuel inputs to electricity production are taken into account, while only the part of fuel inputs to heat sold is shown. Fuel inputs for the production of heat consumed within the autoproducer's establishment are not included here but are included with figures for the final consumption of fuels in the appropriate consuming sector. Autoproducer 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.
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 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.

Flow	Short name	Definition
Autoproducer 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. Autoproducer 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.
Heat pumps	THEAT	Includes heat produced by heat pumps in transformation. Heat pumps that are operated within the residential sector where the heat is not sold are not considered a transformation process and are not included here – the electricity consumption would appear as residential use.
Electric boilers	TBOILER	Includes electric boilers used to produce heat.
Chemical heat for electricity production	TELE	Includes heat from chemical processes that is used to generate electricity.
Blast furnaces	TBLASTFUR	Includes the production of recovered gases (e.g. blast furnace gas and oxygen steel furnace gas). The production of pig-iron from iron ore in blast furnaces uses fuels for supporting the blast furnace charge and providing heat and carbon for the reduction of the iron ore. Accounting for the calorific content of the fuels entering the process is a complex matter as transformation (into blast furnace gas) and consumption (heat of combustion) occur simultaneously. Some carbon is also retained in the pig-iron; almost all of this reappears later in the oxygen steel furnace gas (or converter gas) when the pig-iron is converted to steel. In the 1992/1993 annual questionnaires, member countries were asked for the first time to report in <i>transformation processes</i> the quantities of all fuels (e.g. pulverised coal injection [PCI] coal, coke oven coke, natural gas and oil) entering blast furnaces and the quantity of blast furnace gas and oxygen steel furnace gas produced. The IEA Secretariat then needed to split these inputs into the transformation and consumption components. The transformation component is shown in the row <i>blast furnaces</i> in the column appropriate for the fuel, and the consumption component is shown in the row <i>iron and steel</i> , in the column appropriate for the fuel. The IEA Secretariat decided to assume a transformation efficiency such that the carbon input into the blast furnaces should equal the carbon output. This is roughly equivalent to assuming an energy transformation efficiency of 40%.
Gas works	TGASWKS	Includes the manufacture of town gas. <i>Note: in the summary balances this item also includes other gases blended with natural gas (TBLENDGAS).</i>
Coke ovens	TCOKEOVS	Includes the manufacture of coke and coke oven gas.
Patent fuel plants	TPATFUEL	Includes the manufacture of patent fuels.
BKB/peat briquette plants	TBKB	Includes the manufacture of BKB and peat briquettes.
Oil refineries	TREFINER	Covers the use transformation of hydrocarbons for the manufacture of finished oil products.
Petrochemical plants	TPETCHEM	Covers backflows returned from the petrochemical industry. Note that backflows from oil products that are used for non-energy

Flow	Short name	Definition
		purposes (i.e. white spirit and lubricants) are not included here, but in non-energy use.
Coal liquefaction plants	TCOALLIQ	Includes coal, oil and tar sands used to produce synthetic oil.
Gas-to-liquids (GTL) plants	TGTL	Includes natural gas used as feedstock for the conversion to liquids, e.g. the quantities of fuel entering the methanol production process for transformation into methanol.
For blended natural gas	TBLENDGAS	Includes other gases that are blended with natural gas.
Charcoal production plants	TCHARCOAL	Includes the transformation of solid biofuels into charcoal.
Non-specified (transformation)	TNONSPEC	Includes the transformation of natural gas for hydrogen manufacture and other non-specified transformation.
Flows used in the summary balances		
Liquefaction plants	LIQUEFAC	Is equal to the sum of TCOALLIQ and TGTL.
Other transformation	TNONSPEC	Is equal to the sum of TCHARCOAL and TNONSPEC.

Energy industry own use and Losses

Flow	Short name	Definition
Energy industry own use	TOTENGY	Energy industry own use covers the amount of fuels used by the energy producing industries (e.g. for heating, lighting and operation of all equipment used in the extraction process, for traction and for distribution). It includes energy consumed by energy industries for heating, pumping, traction and lighting purposes [ISIC Rev. 4 Divisions 05, 06, 19 and 35, Group 091 and Classes 0892 and 0721].
Coal mines	EMINES	Represents the energy which is used directly within the coal industry for hard coal and lignite mining. It excludes coal burned in pithead power stations (included under electricity plants in transformation processes) and free allocations to miners and their families (considered as part of household consumption and therefore included under <i>residential</i>).
Oil and gas extraction	EOILGASEX	Represents the energy which is used for oil and gas extraction. Flared gas is not included.
Blast furnaces	EBLASTFUR	Represents the energy which is used in blast furnaces.
Gas works	EGASWKS	Represents the energy which is used in gas works.
Gasification plants for biogases	EBIOGAS	Represents own consumption of biogas necessary to support temperatures needed for anaerobic fermentation.
Coke ovens	ECOKEOVS	Represents the energy used in coke ovens.
Patent fuel plants	EPATFUEL	Represents the energy used in patent fuel plants.

Flow	Short name	Definition
BKB/peat briquette plants	EBKB	Represents the energy used in BKB and peat briquette plants.
Oil refineries	EREFINER	Represents the energy used in refineries for the operation of equipment, heating and lighting.
Coal liquefaction plants	ECOALLIQ	Represents the energy used in coal liquefaction plants.
Liquefaction (LNG)/regasification plants	ELNG	Represents the energy used in LNG and regasification plants.
Gas-to-liquids (GTL) plants	EGTL	Represents the energy used in gas-to-liquids plants.
Own use in electricity, CHP and heat plants	EPOWERPLT	Represents the energy used in electricity, CHP and heat plants.
Pumped storage plants	EPUMPST	Represents electricity consumed in hydro-electric plants for pumped storage.
Nuclear industry	ENUC	Represents the energy used in the nuclear industry.
Charcoal production plants	ECHARCOAL	Represents the energy used in charcoal production plants.
Non-specified (energy)	ENONSPEC	Represents use in non-specified energy sector.
Losses	DISTLOSS	Represents losses in energy distribution, transmission and transport.

Flow used in the summary balances

Energy industry own use	OWNUSE	Is equal to the sum of EMINES, EOILGASEX, EBLASTFUR, EGASWKS, EBIOGAS, ECOKEOVS, EPATFUEL, EBKB, EREFINER, ECOALLIQ, ELNG, EGTL, EPOWERPLT, EPUMPST, ENUC, ECHARCOAL, ENONSPEC.
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Final consumption

Flow	Short name	Definition
Total final consumption	TFC	Is the sum of the consumption in the end-use sectors and for non-energy use. Energy used for transformation processes and for own use of the energy producing industries is excluded. Final consumption reflects for the most part deliveries to consumers (see note on <i>stock changes</i>). Backflows from the petrochemical industry are not included in final consumption (see <i>from other sources</i> under supply and <i>petrochemical plants</i> in transformation). Note that <i>international aviation bunkers</i> and <i>international marine bunkers</i> are not included in final consumption except for the world total, where they are reported as <i>world aviation bunkers</i> and <i>world marine bunkers</i> in transport.
Industry	TOTIND	Industry consumption is specified by sub-sector as listed below. Energy used for transport by industry is not included here but is reported under transport. Non-energy use in industry is excluded from industry and reported separately.
Mining and quarrying	MINING	[ISIC Rev. 4 Divisions 07 and 08 and Group 099] Mining (excluding fuels) and quarrying.
Construction	CONSTRUC	[ISIC Rev. 4 Divisions 41 to 43]
Manufacturing	MANUFACT	Manufacturing refers to the sum of the following industrial sub-sectors: <ul style="list-style-type: none"> • 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 can be found under the listing for each respective sub-sector below.
Iron and steel	IRONSTL	[ISIC Rev. 4 Group 241 and Class 2431]
Chemical and petrochemical	CHEMICAL	[ISIC Rev. 4 Divisions 20 and 21] Excluding petrochemical feedstocks.
Non-ferrous metals	NONFERR	[ISIC Rev. 4 Group 242 and Class 2432] Basic industries.
Non-metallic minerals	NONMET	[ISIC Rev. 4 Division 23] Such as glass, ceramic, cement, etc.
Transport equipment	TRANSEQ	[ISIC Rev. 4 Divisions 29 and 30]
Machinery	MACHINE	[ISIC Rev. 4 Divisions 25 to 28] Fabricated metal products, machinery and equipment other than transport equipment.
Food and tobacco	FOODPRO	[ISIC Rev. 4 Divisions 10 to 12]

Flow	Short name	Definition
Paper, pulp and print	PAPERPRO	[ISIC Rev. 4 Divisions 17 and 18]
Wood and wood products	WOODPRO	[ISIC Rev. 4 Division 16] Wood and wood products other than pulp and paper.
Textile and leather	TEXTILES	[ISIC Rev. 4 Divisions 13 to 15]
Industry not elsewhere specified	INONSPEC	Including but not limited to: [ISIC Rev. 4 Divisions 22, 31 and 32] Any industry not included above. Note: Most countries have difficulties supplying an industrial breakdown for all fuels. In these cases, the <i>non-specified (industry)</i> row has been used. Regional aggregates of industrial consumption should therefore be used with caution.
Transport	TOTTRANS	Consumption in transport covers all transport activity (in mobile engines) regardless of the economic sector to which it is contributing (except for military fuel use) [ISIC Rev. 4 Divisions 49 to 51], and is specified below. Non-energy use in transport is excluded from transport and reported separately.
World aviation bunkers	WORLDAV	Covers fuels delivered to aircraft of all countries that are engaged in international aviation (<i>international aviation bunkers</i>) for the world total. <i>World aviation bunkers</i> is not applicable for individual countries and regions and is included in <i>transport</i> for the world total. Note that for World, <i>total energy supply</i> includes <i>international aviation bunkers</i> .
Domestic aviation	DOMESAIR	Includes deliveries of aviation fuels to aircraft for domestic aviation - commercial, private, agricultural, etc. It includes use for purposes other than flying, e.g. bench testing of engines, but not airline use of fuel for road transport. The domestic/international split should be determined on the basis of departure and landing locations and not by the nationality of the airline. Note that this may include journeys of considerable length between two airports in a country (e.g. San Francisco to Honolulu). For many countries this incorrectly includes fuel used by domestically owned carriers for outbound international traffic.
Road	ROAD	Includes fuels used in road vehicles as well as agricultural and industrial highway use. Excludes military consumption as well as motor gasoline used in stationary engines and diesel oil for use in tractors that are not for highway use.
Rail	RAIL	Includes quantities used in rail traffic, including industrial railways, and in rail transport laid in public roads as part of urban or suburban transport systems (trams, metro, etc.).
Pipeline transport	PIPELINE	Includes energy used in the support and operation of pipelines transporting gases, liquids, slurries and other commodities, including the energy used for pump stations and maintenance of the pipeline. Energy for the pipeline distribution of natural gas or coal gases, hot water or steam (ISIC Rev. 4 Division 35) from the distributor to final users is excluded and should be reported in <i>energy industry own use</i> , while the energy used for the final distribution of water (ISIC Rev. 4 Division 36) to household, industrial, commercial and other users should be

Flow	Short name	Definition
		included in <i>commercial/public services</i> . Losses occurring during the transport between distributor and final users should be reported as <i>losses</i> .
World marine bunkers	WORLDMAR	Includes fuels delivered to ships of all flags not engaged in international navigation (international marine bunkers) for the world total. <i>World marine bunkers</i> is not applicable for individual countries and regions and is included in transport for the world total. Note that for World, total energy supply includes international marine bunkers.
Domestic navigation	DOMESNAV	Includes fuels delivered to vessels of all flags not engaged in international navigation (see <i>international marine bunkers</i>). The domestic/international split should be determined on the basis of port of departure and port of arrival and not by the flag or nationality of the ship. Note that this may include journeys of considerable length between two ports in a country (e.g. San Francisco to Honolulu). Fuel used for ocean, coastal and inland fishing and military consumption are excluded;
Transport not elsewhere specified	TRNONSPE	Includes all transport not elsewhere specified. Note: <i>international marine bunkers</i> and <i>international aviation bunkers</i> are shown in <i>supply</i> and are not included in <i>transport</i> as part of final consumption at a country level (except for the world total).
Residential	RESIDENT	Includes consumption by households, excluding fuels used for transport. Includes households with employed persons [ISIC Rev. 4 Divisions 97 and 98], which is a small part of total residential consumption.
Commercial and public services	COMMPUB	[ISIC Rev. 4 Divisions 33, 36-39, 45-47, 52, 53, 55-56, 58-66, 68-75, 77-82, 84 (excluding Class 8422), 85-88, 90-96 and 99]
Agriculture/forestry	AGRICULT	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) [ISIC Rev. 4 Divisions 01 and 02].
Fishing	FISHING	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 [ISIC Rev. 4 Division 03].
Final consumption not elsewhere specified	ONONSPEC	Includes all fuel use not elsewhere specified as well as consumption in the above-designated categories for which separate figures have not been provided. Military fuel use for all mobile and stationary consumption is included here (e.g. ships, aircraft, road and energy used in living quarters) regardless of whether the fuel delivered is for the military of that country or for the military of another country.

Flow	Short name	Definition
Non-energy use	NONENUSE	Covers those fuels that are used as raw materials in the different sectors and are not consumed as a fuel or transformed into another fuel. Non-energy use is shown separately in final consumption under the heading <i>non-energy use</i> . Note that for biofuels, only the amounts specifically used for energy purposes (a small part of the total) are included in the energy statistics. Therefore, the non-energy use of biomass is not taken into consideration and the quantities are null by definition.
Non-energy use industry/transformation/energy	NEINTREN	Non-energy in industry, transformation processes and energy industry own use.
<i>Memo: Non-energy use in industry</i>	NEIND	Non-energy in industry (please see above for more details on industry sub-sector definitions).
<i>Memo: Non-energy use in iron and steel</i>	NEIRONSTL	Non-energy use in iron and steel (please see above for more details on industry sub-sector definitions).
<i>Memo: Non-energy use chemical/petrochemical</i>	NECHEM	Fuels used for chemical feedstocks and non-energy products in the petro-chemical industry, which includes cracking and reforming processes for the purpose of producing ethylene, propylene, butylene, synthesis gas, aromatics, butadiene and other hydrocarbon-based raw materials in processes such as steam cracking, aromatics plants and steam reforming [part of ISIC Rev. 4 Group 201]. <i>Note: this flow was called “of which petrochemical feedstocks” in previous editions.</i>
<i>Memo: Non-energy use in non-ferrous metals</i>	NENONFERR	Non-energy use in non-ferrous metals (please see above for more details on industry sub-sector definitions).
<i>Memo: Non-energy use in non-metallic minerals</i>	NENONMET	Non-energy use in non-metallic minerals (please see above for more details on industry sub-sector definitions).
<i>Memo: Non-energy use in transport equipment</i>	NETRANSEQ	Non-energy use in transport equipment (please see above for more details on industry sub-sector definitions).
<i>Memo: Non-energy use in machinery</i>	NEMACHINE	Non-energy use in machinery (please see above for more details on industry sub-sector definitions).
<i>Memo: Non-energy use in mining and quarrying</i>	NEMINING	Non-energy use in mining and quarrying (please see above for more details on industry sub-sector definitions).
<i>Memo: Non-energy use in food/beverages/tobacco</i>	NEFOODPRO	Non-energy use in food/beverages/tobacco (please see above for more details on industry sub-sector definitions).
<i>Memo: Non-energy use in paper/pulp and printing</i>	NEPAPERPRO	Non-energy use in paper/pulp and printing (please see above for more details on industry sub-sector definitions).
<i>Memo: Non-energy use in wood and wood products</i>	NEWOODPRO	Non-energy use in wood and wood products (please see above for more details on industry sub-sector definitions).
<i>Memo: Non-energy use</i>	NECONSTRUC	Non-energy use in construction (please see above for more

Flow	Short name	Definition
in construction		details on industry sub-sector definitions).
Memo: Non-energy use in textiles and leather	NETEXTILES	Non-energy use in textiles and leather (please see above for more details on industry sub-sector definitions).
Memo: Non-energy use in non-specified industry	NEINONSPEC	Non-energy use in non-specified industry (please see above for more details on industry sub-sector definitions).
Non-energy use in transport	NETRANS	Non-energy use in transport.
Non-energy use in other	NEOTHER	Non-energy use in other sectors such as residential, commercial/public services, agriculture/forestry and fishing.

Electricity output (GWh)

Flow	Short name	Definition
Electricity output (GWh)	ELOUTPUT	Shows the total number of GWh generated by power plants separated into electricity plants and CHP plants. Contrary to the <i>Energy Statistics</i>, electricity production for hydro pumped storage is excluded within the <i>Energy Balances</i>.
Electricity output (GWh) - main activity producer electricity plants	ELMAINE	
Electricity output (GWh) - autoproducer electricity plants	ELAUTOE	
Electricity output (GWh) -main activity producer CHP plants	ELMAINC	
Electricity output (GWh) - autoproducer CHP plants	ELAUTOC	

Heat output

Flow	Short name	Definition
Heat output	HEATOUT	Shows the total heat generated by plants separated into CHP plants and heat plants.
Heat output-main activity producer CHP plants	HEMAINC	
Heat output-autoproducer CHP plants	HEAUTOC	
Heat output-main activity producer heat plants	HEMAINH	
Heat output-autoproducer heat plants	HEAUTOH	

Other flows

Flow	Short name	Definition
Flow used in the summary balances		
Memo: Iron and steel, blast furnaces and coke ovens	MIRONSTL	Is equal to IRONSTL – (TBLASTFUR + TCOKEOVS + EBLASTFUR + ECOKEOVS). Negative signs are due to the convention used for the transformation flows, where a negative sign shows an input to transformation.

Conversion factors

Calorific values, expressed in **tonne of oil equivalent/tonne** and **kilojoules/kilogramme** represent the average gross energy content minus the latent heat of vaporisation of 1 unit of mass; volume to mass for oil products is expressed in **barrels/tonne**.

Flow	Short name	Definition
Average net calorific value	NAVERAGE	Available for primary and secondary oil products, liquid biofuels and charcoal.
NCV of production	NINDPROD	Available for coal products, peat, oil shale, and primary oil products.
NCV of other sources	NOSOURCES	Available for coal products, peat, oil shale, and primary oil products.
NCV of imports	NIMPORTS	Available for coal products, peat, oil shale, and primary oil products.
NCV of exports	NEXPORTS	Available for coal products, peat, oil shale, and primary oil products.
NCV of coke ovens	NCOKEOVS	Only available for coal products, peat, oil shale.
NCV of blast furnaces	NBLAST	Only available for coal products, peat, oil shale.
NCV in main activity producer electricity plants	NMAIN	Only available for coal products, peat, oil shale.
NCV in autoproducer electricity plants	NAUTOELEC	Only available for coal products, peat, oil shale.
NCV in main activity CHP plants	NMAINCHP	Only available for coal products, peat, oil shale.
NCV in autoproducer CHP plants	NAUTOCHP	Only available for coal products, peat, oil shale.
NCV in main activity heat plants	NMAINHEAT	Only available for coal products, peat, oil shale.
NCV in autoproducer heat plants	NAUTOHEAT	Only available for coal products, peat, oil shale.
NCV in industry	NIND	Only available for coal products, peat, oil shale.
NCV for other uses	NOTHER	Only available for coal products, peat, oil shale.

Flow	Short name	Definition
Volume to mass ratio	BBLTONRATIO	This ratio (barrels/tonne), inverse of density, is used to calculate the oil demand by product (in barrels) presented within the <i>World Energy Statistics</i> files.
GCV of production	GINDPROD	Only available for natural gas.
GCV of imports	GIMPORTS	Only available for natural gas.
GCV of exports	GEXPORTS	Only available for natural gas.
GCV of consumption	GFINCONS	Only available for natural gas.

Indicators

Flow	Short name	Notes
Total energy supply (TES) (Mtoe)	TES	Total energy supply, expressed in Mtoe.
Total final consumption (TFC) (Mtoe)	TFC	Total final consumption, expressed in Mtoe.
Population (millions)	POP	<p>For OECD countries: The main source of these series for 1970 to 2020 when available is the OECD <i>National Accounts Statistics</i> database [ISSN: 2221-433X (online)], last published in book format as <i>National Accounts of OECD Countries, Volume 2021 Issue 1: Detailed Tables</i>, OECD 2021. Data for 1960 to 1969 have been estimated using the growth rates from the population series published in the <i>OECD Factbook 2015</i> (online database version). Growth rates from the <i>OECD Factbook 2015</i> were also used to estimate data for Chile (prior to 1986), Estonia (prior to 1993), Israel (prior to 1995), the Slovak Republic (prior to 1990) and Slovenia (prior to 1995). Data for Colombia (prior to 1985), Latvia (prior to 1995) and Lithuania (prior to 1995) are IEA Secretariat estimates based on GDP growth rates from the World Bank.</p> <p>For non-OECD countries: The main source of the population data is <i>World Development Indicators</i>, The World Bank, Washington D.C., 2022. Population data for Cyprus¹ are taken from the Eurostat online database.</p>
GDP (billion USD, 2015 prices and exchange rates)	GDP	<p>Please note that sources for GDP were changed from previous editions. This can impact derived indicators.</p> <p>GDP data are derived from three sources:</p> <ul style="list-style-type: none"> - <i>International Monetary Fund. 2021. World Economic Outlook: War Sets Back the Global Recovery. Washington, DC, October.</i> (IMF WEO) - <i>World Development Indicators. 2022. Washington, D.C. :The World Bank.</i> (WB WDI) - <i>CEPII – CHELEM database. 2022.</i> (CHELEM) <p>Data from IMF WEO are used as a primary source for the period starting in 1980; if not available, data gaps are filled based on the other sources, based on data availability and the hierarchy described below:</p> <ol style="list-style-type: none"> 1. Data from IMF WEO 2. WDI growth rates applied to IMF WEO data 3. Data from WB WDI for countries not included in IMF WEO for any year 4. CHELEM growth rates applied to IMF WEO data 5. Data from CHELEM

¹ Please refer to the section on Geographical coverage.

Flow	Short name	Notes
		<p>Data in year n are rebased to 2015 using nominal GDP figures, GDP deflators and market exchange rates using following formula:</p> $GDP_n = \frac{GDP_Nominal_NC_n}{Exchange_rate_{base_year}} * \frac{deflator_{base_year}}{deflator_n}$ <p>Please note that the regional totals shown for OECD and other regions were calculated by summing individual countries' GDP data. This calculation yields slightly different results to the GDP totals published by primary sources.</p>
GDP (billion USD, 2015 prices and PPPs)	GDPPPP	<p>Please note that sources for GDP were changed from previous editions. This can impact derived indicators.</p> <p>GDPPPP figures are derived using same sources and methodology as for GDP USD.</p> <p>Data in year n are rebased to 2015 using nominal GDP figures, GDP deflators and PPP rates using following formula:</p> $GDPPPP_n = \frac{GDP_Nominal_NC_n}{PPP_{base_year}} * \frac{deflator_{base_year}}{deflator_n}$ <p>International price comparisons based on exchange rates may not reflect the relative purchasing power in each currency. PPPs are the rates of currency conversion that equalize the purchasing power of different currencies by eliminating the differences in price levels between countries. In their simplest form, PPPs are simply price relatives that show the ratio of the prices in national currencies of the same good or service in different countries.</p>
Energy production (Mtoe)	INDPROD	Total primary energy production, expressed in Mtoe.
Net imports (Mtoe)	NETIMP	Imports minus exports for total energy, expressed in Mtoe.
Oil supply (Mtoe)	OILTES	Primary supply of oil, expressed in Mtoe.
Net oil imports (Mtoe)	OILIMP	Imports of oil minus exports of oil, expressed in Mtoe.
Electricity generation (TWh)	ELOUTPUT	Shows the total amount of electricity generated by power plants separated into electricity plants and CHP plants, expressed in TWh.
Electricity consumption (TWh)	ELECONS	Domestic consumption, i.e. gross production + imports - exports - losses, expressed in TWh.
Total self-sufficiency	TOTSELF	Production divided by TES expressed as a ratio.
Coal self-sufficiency	COALSELF	Production divided by TES expressed as a ratio. Includes coal, peat and oil shale.
Oil self-sufficiency	OILSELF	Production divided by TES expressed as a ratio.

Flow	Short name	Notes
Gas self-sufficiency	GASSELF	Production divided by TES expressed as a ratio.
Share of fossil in TES	FOSSILTES	TES of fossil fuels divided by total TES expressed as a ratio. Fossil fuels include coal, oil shale, peat and peat products, oil and natural gas.
Share of fossil in electricity generation	FOSSILELE	Output of electricity produced based on fossil fuels divided by total output of electricity expressed as a ratio. Fossil fuels include coal, oil shale, peat and peat products, oil and natural gas.
Share of renewable sources in TES	RENTES	Renewable sources TES divided by total TES, expressed as a ratio. Renewable sources include hydro, geothermal, solar, wind, tide, wave, biofuels and the renewable fraction of municipal waste.
Share of renewable sources in electricity generation	RENEL	Output of electricity produced from renewable sources divided by total output of electricity, expressed as a ratio. Renewable sources include electricity from hydro, geothermal, solar, wind, tide, wave, biofuels and the renewable fraction of municipal waste.
TES/population	TESPOP	Expressed as toe per capita.
TES/GDP	TESGDP	Expressed as toe per thousand 2015 USD. Based on national GDP.
TES/GDP PPP	TESGDPPPP	Expressed as toe per thousand 2015 USD PPP.
GDP/TES	GDPTES	Expressed as thousand 2015 USD per toe. Based on national GDP.
GDP/TES	GDPPPTES	Expressed as thousand 2015 USD PPP per toe.
Oil supply/population	OILSUPPOP	Expressed as toe per capita.
Oil supply/GDP	OILSUPGDP	Expressed as toe per thousand 2015 USD. Based on national GDP.
Oil supply/GDP PPP	OILSUPGDPPPP	Expressed as toe per thousand 2015 USD PPP.
Net oil imports/GDP	OILIMPGDP	Expressed as toe per thousand 2015 USD. Based on national GDP.
Net oil imports/GDP PPP	OILIMPGDPPPP	Expressed as toe per thousand 2015 USD PPP.
Electricity consumption/population	ELEPOP	Expressed as kWh per capita. Electricity consumption equals domestic supply less losses.
Electricity consumption/GDP	ELEGDP	Expressed as kWh per 2015 USD. Based on national GDP. Electricity consumption equals domestic supply less losses.
Electricity consumption/GDP PPP	ELEGDPPPP	Expressed as kWh per 2015 USD. Electricity consumption equals domestic supply less losses.
TFC/population	TFCPOP	Expressed as toe per capita.

Flow	Short name	Notes
TFC/GDP	TFCGDP	Expressed as toe per thousand 2015 USD. Based on national GDP.
TFC/GDP PPP	TFCGDPPPP	Expressed as toe per thousand 2015 USD PPP.
Transport/population	TRANPOP	Expressed as toe per capita.
Transport/GDP	TRANGDP	Expressed as toe per thousand 2015 USD. Based on national GDP.
Transport/GDP PPP	TRANGDPPPP	Expressed as toe per thousand 2015 USD PPP.
Residential/population	RESPOP	Expressed as toe per capita.
Residential/GDP	RESGDP	Expressed as toe per thousand 2015 USD. Based on national GDP.
Residential/GDP PPP	RESGDPPPP	Expressed as toe per thousand 2015 USD PPP.
Services/population	SERVPOP	Expressed as toe per capita.
Services /GDP	SERVGDP	Expressed as toe per thousand 2015 USD. Based on national GDP.
Services /GDP PPP	SERVGDPPPP	Expressed as toe per thousand 2015 USD PPP.
Industry/population	INDPOP	Expressed as toe per capita.
Industry/GDP	INDGDP	Expressed as toe per thousand 2015 USD. Based on national GDP.
Industry/GDP PPP	INDGDPPPP	Expressed as toe per thousand 2015 USD PPP.
Industrial production index (2015=100)	IPI	Only available for OECD countries. The main source of these series is the OECD database Main Economic Indicators, July 2021. Industrial production refers to the goods produced by establishments engaged in mining (including oil extraction), manufacturing, and production of electricity, gas and water. These are Sections B, C, D and E of ISIC Rev. 4 or NACE Rev. 2 classifications. From 1991, the industrial production index for Germany refers to unified Germany and has been linked to the series for western Germany. Data for Mexico include construction (Section F). For OECD Total and OECD Europe, the IPI has been chain linked and data refer to all OECD countries from 1990 onwards; prior to 1990 Chile , the Czech Republic , Estonia , Hungary , Israel , Poland , the Slovak Republic , Slovenia and Switzerland are not included.
Index of industry consumption/industrial production	INDIPI	For OECD countries only Expressed as an index where 2015=100.
Index of industry oil consumption/industrial production	OILINDIPI	For OECD countries only Expressed as an index where 2015=100.

Flow	Short name	Notes
Total thermal efficiency of electricity only plants (main and auto) (%)	THERMELE	
Total thermal efficiency of electricity and heat plants (%)	THERMEFF	

Product definitions

Coal

Product	Short name	Definition
Hard coal (if no detail)	HARDCOAL	This item is only used if the detailed breakdown is not available. It includes anthracite, coking coal, other bituminous coal. Hard coal refers to coal of gross calorific value greater than 24 MJ/kg (~5 732 kcal/kg) on an ash-free but moist basis and with a mean random reflectance of vitrinite of at least 0.6. Hard coal may include coals with a GCV greater than or equal to 24 MJ/kg and a mean Rr < 0.6%. Hard coal is the sum of anthracite, coking coal, other bituminous coal and for some countries, prior to 1978, hard coal includes subbituminous coal.
Brown coal (if no detail)	BROWN	This item is only used if the detailed breakdown is not available. It includes lignite and sub-bituminous coal. Brown coal is the sum of lignite and sub-bituminous coal. For some countries prior to 1978 brown coal excludes sub-bituminous coal.
Anthracite	ANTCOAL	Anthracite is a high rank coal used for industrial and residential applications. It is generally less than 10% volatile matter and a high carbon content (about 90% fixed carbon). Its gross calorific value is greater than 24 000 kJ/kg on an ash-free but moist basis.
Coking coal	COKCOAL	Coking coal refers to 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 on an ash-free but moist basis.
Other bituminous coal	BITCOAL	Other bituminous coal is used mainly for steam raising and space heating purposes and includes all bituminous coal that is not included under coking coal nor anthracite. It is usually more than 10% volatile matter and a relatively high carbon content (less than 90% fixed carbon). Its gross calorific value is greater than 24 000 kJ/kg on an ash-free but moist basis.
Sub-bituminous coal	SUBCOAL	Sub-bituminous coal includes non-agglomerating coals with a gross calorific value between 20 000 kJ/kg and 24 000 kJ/kg containing more than 31% volatile matter on a dry mineral matter free basis.
Lignite	LIGNITE	Lignite is a non-agglomerating coal with a gross calorific value of less than 20 000 kJ/kg and greater than 31% volatile matter on a dry mineral matter free basis.
Patent fuel	PATFUEL	Patent fuel is a composition fuel manufactured from hard coal fines with the addition of a binding agent. The amount of patent fuel produced may, therefore, be slightly higher than the actual amount of coal consumed in the transformation process. Consumption of patent fuels during the patent fuel manufacturing process is included under <i>energy industry own use</i> .
Coke oven coke	OVENCOKE	Coke oven coke is 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

Product	Short name	Definition
		steel industry, acting as energy source and chemical agent. Also included are semi-coke (a solid product obtained from the carbonisation of coal at a low temperature), lignite coke (a semi-coke made from lignite), coke breeze and foundry coke. The heading <i>energy industry own use</i> includes the consumption at the coking plants themselves. Consumption in the <i>iron and steel industry</i> does not include coke converted into blast furnace gas. To obtain the total consumption of coke oven coke in the iron and steel industry, the quantities converted into blast furnace gas have to be added (these are included in <i>blast furnaces</i>).
Gas coke	GASCOKE	Gas coke is a by-product of hard coal used for the production of town gas in gas works. Gas coke is used for heating purposes. <i>Energy industry own use</i> includes the consumption of gas coke at gas works.
Coal tar	COALTAR	Coal tar is a result of the destructive distillation of bituminous coal or of the low-temperature carbonisation of brown coal. Coal tar 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	BKB	Brown coal briquettes are composition fuels manufactured from lignite, produced by briquetting under high pressure with or without the addition of a binding agent. The heading <i>energy industry own use</i> includes consumption by briquetting plants.
Gas works gas	GASWKSGS	Gas works gas covers all types of gas produced in public utility or private plants, whose main purpose is the manufacture, transport and distribution of gas. It includes gas produced by carbonisation (including gas produced by coke ovens and transferred to gas works), by total gasification (with or without enrichment with oil products) and by reforming and simple mixing of gases and/or air.
Coke oven gas	COKEOVGS	Coke oven gas is obtained as a by-product of the manufacture of coke oven coke for the production of iron and steel.
Blast furnace gas	BLFURGS	Blast furnace gas is 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.
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. The quantity of recuperated fuel should be reported on a gross calorific value basis. 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.

Peat and peat products

Product	Short name	Definition
Peat	PEAT	Peat is a combustible soft, porous or compressed, fossil sedimentary deposit of plant origin with high water content (up to 90% in the raw state), easily cut, of light to dark brown colour. Peat used for non-energy purposes is not included here. Milled peat is included here.
Peat products	PEATPROD	Products such as peat briquettes derived directly or indirectly from sod peat and milled peat.

Oil shale

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. Oil shale and tar sands used as inputs for other transformation processes are also included here (this includes the portion consumed in the transformation process). Shale oil and other products derived from liquefaction are included in <i>from other sources</i> under crude oil (<i>other hydrocarbons</i>).

Natural gas

Product	Short name	Definition
Natural gas	NATGAS	Natural gas comprises gases, occurring in underground deposits, whether liquefied or gaseous, consisting mainly of methane. It includes "non-associated" gas originating from fields producing hydrocarbons only in gaseous form; "associated" gas produced in association with crude oil; and methane recovered from coal mines (colliery gas) or from coal seams (coal seam gas). Production represents dry marketable production within national boundaries, including offshore production and is measured after purification and extraction of NGL and sulphur. It includes quantities used within the natural gas industry; in gas extraction, pipeline systems and processing plants. Quantities of gas that are re-injected, vented or flared are excluded.

Crude, NGL, refinery feedstocks

Product	Short name	Definition
Crude/NGL/feedstocks (if no detail)	CRNGFEED	This item is only used if the detailed breakdown is not available. It includes crude oil, natural gas liquids, refinery feedstocks, additives/blending components and other hydrocarbons.
Crude oil	CRUDEOIL	Crude oil is 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	NGL are the 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 feedstocks	REFFEEDS	A refinery feedstock is a processed oil destined for further processing (e.g. straight run fuel oil or vacuum gas oil) other than blending in the refining industry. It is transformed into one or more components and/or finished products. With further processing, it will be transformed into one or more components and/or finished products. This definition also covers returns from the petrochemical industry to the refining industry (e.g. pyrolysis gasoline, C4 fractions, gasoil and fuel oil fractions)
Additives/blending components	ADDITIVE	Additives are non-hydrocarbon substances added to or blended with a product to modify its properties, for example, to improve its combustion characteristics. Alcohols and ethers (MTBE, methyl tertiary-butyl ether) and chemical alloys such as tetraethyl lead are included here. The biomass fractions of biogasoline, biodiesel and ethanol are not included here, but under liquid biofuels. This differs from the presentation of additives in the <i>Oil Information</i> publication.
Other hydrocarbons	NONCRUDE	This category includes synthetic crude oil from tar sands, shale oil, etc., liquids from coal liquefaction, output of liquids from natural gas conversion into gasoline, hydrogen and emulsified oils (e.g. Orimulsion).

Oil products

Product	Short name	Definition
Refinery gas	REFINGAS	Refinery gas is defined as non-condensable gas obtained during distillation of crude oil or treatment of oil products (e.g. cracking) in refineries. It consists mainly of hydrogen, methane, ethane and olefins. It also includes gases which are returned from the petrochemical industry. Refinery gas production refers to gross production. Own consumption is shown separately under <i>oil refineries in energy industry own use</i> .
Ethane	ETHANE	Ethane is a naturally gaseous straight-chain hydrocarbon (C ₂ H ₆). It is a colourless paraffinic gas which is extracted from natural gas and refinery gas streams.
Liquefied petroleum gases (LPG)	LPG	Liquefied petroleum gases are the light hydrocarbon fraction of the paraffin series, derived from refinery processes, crude oil stabilisation plants and natural gas processing plants, comprising propane (C ₃ H ₈) and butane (C ₄ H ₁₀) or a combination of the two. They could also include propylene, butylene, isobutene and isobutylene. LPGs are normally liquefied under pressure for transportation and storage.
Motor gasoline excl. biofuels	NONBIOGASO	Motor gasoline is light hydrocarbon oil for use in internal combustion engines such as motor vehicles, excluding aircraft. Motor gasoline is distilled between 35°C and 215°C and is used as a fuel for land based spark ignition engines. Motor gasoline may include additives, oxygenates and octane enhancers, including lead compounds such as TEL (tetraethyl lead) and TML (tetramethyl lead). Motor gasoline excluding biofuels does not include the liquid biofuel or ethanol blended with gasoline - see liquid biofuels.
Aviation gasoline	AVGAS	Aviation gasoline is motor spirit prepared especially for aviation piston engines, with an octane number suited to the engine, a freezing point of -60°C, and a distillation range usually within the limits of 30°C and 180°C.
Gasoline type jet fuel	JETGAS	Gasoline type jet fuel includes all light hydrocarbon oils for use in aviation turbine power units, which distil between 100°C and 250°C. This fuel is obtained by blending kerosenes and gasoline or naphthas in such a way that the aromatic content does not exceed 25% in volume, and the vapour pressure is between 13.7 kPa and 20.6 kPa. Additives can be included to improve fuel stability and combustibility.
Kerosene type jet fuel excl. biofuels	NONBIOJETK	Kerosene type jet fuel is a medium distillate used for aviation turbine power units. It has the same distillation characteristics and flash point as kerosene (between 150°C and 300°C but not generally above 250°C). In addition, it has particular specifications (such as freezing point) which are established by the International Air Transport Association (IATA). It includes kerosene blending components. Kerosene type jet fuel excluding biofuels does not include the liquid biofuels blended with jet kerosene.
Other kerosene	OTHKERO	Kerosene (other than kerosene used for aircraft transport which is included with aviation fuels) comprises refined petroleum distillate intermediate in volatility between gasoline and gas/diesel oil. It is a medium oil distilling between 150°C and 300°C.

Product	Short name	Definition
Gas/diesel oil excl. biofuels	NONBIODIES	Gas/diesel oil includes heavy gas oils. Gas oils are obtained from the lowest fraction from atmospheric distillation of crude oil, while heavy gas oils are obtained by vacuum redistillation of the residual from atmospheric distillation. Gas/diesel oil distills between 180°C and 380°C. Several grades are available depending on uses: diesel oil for diesel compression ignition (cars, trucks, marine, etc.), light heating oil for industrial and commercial uses, and other gas oil including heavy gas oils which distil between 380°C and 540°C and which are used as petrochemical feedstocks. Gas/diesel oil excluding biofuels does not include the liquid biofuels blended with gas/diesel oil – see liquid biofuels.
Fuel oil	RESFUEL	Fuel oil defines oils that make up the distillation residue. It comprises all residual fuel oils, including those obtained by blending. Its kinematic viscosity is above 10 cSt at 80°C. The flash point is always above 50°C and the density is always higher than 0.90 kg/l.
Naphtha	NAPHTHA	Naphtha is a feedstock destined either for the petrochemical industry (e.g. ethylene manufacture or aromatics production) or for gasoline production by reforming or isomerisation within the refinery. Naphtha comprises material that distills between 30°C and 210°C. Naphtha imported for blending is shown as an import of naphtha, and then shown in the <i>transfers</i> row as a negative entry for naphtha and a positive entry for the corresponding finished product (e.g. gasoline).
White spirit & industrial spirit (SBP)	WHITESP	White spirit and industrial spirit (SBP) are refined distillate intermediates with a distillation in the naphtha/kerosene range. White spirit has a flash point above 30°C and a distillation range of 135°C to 200°C. Industrial Spirit (SBP) comprises light oils distilling between 30°C and 200°C, with a temperature difference between 5% volume and 90% volume distillation points, including losses, of not more than 60°C. In other words, SBP is a light oil of narrower cut than motor spirit. There are seven or eight grades of industrial spirit, depending on the position of the cut in the distillation range defined above.
Lubricants	LUBRIC	Lubricants are hydrocarbons produced from distillate or residue; they are mainly used to reduce friction between bearing surfaces. This category includes all finished grades of lubricating oil, from spindle oil to cylinder oil, and those used in greases, including motor oils and all grades of lubricating oil base stocks.
Bitumen	BITUMEN	Bitumen is 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.
Paraffin waxes	PARWAX	Paraffin waxes are saturated aliphatic hydrocarbons. These waxes are residues extracted when dewaxing lubricant oils, and they have a crystalline structure which is more or less fine according to the grade. Their main characteristics are that they are colourless, odourless and translucent, with a melting point above 45°C.

Product	Short name	Definition
Petroleum coke	PETCOKE	Petroleum coke is defined as a black solid residue, obtained mainly by cracking and carbonising of petroleum derived feedstocks, 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 "calcined 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.
Other oil products	ONONSPEC	Other oil products not classified above (e.g. tar, sulphur and grease) are included here. This category also includes aromatics (e.g. BTX or benzene, toluene and xylene) and olefins (e.g. propylene) produced within refineries.

Biofuels and Waste

Product	Short name	Definition
Industrial waste	INDWASTE	Industrial waste of non-renewable origin consists of solid and liquid products (e.g. tyres) combusted directly, usually in specialised plants, to produce heat and/or power. Renewable industrial waste is not included here, but with solid biofuels, biogases or liquid biofuels.
Municipal waste (renewable)	MUNWASTER	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. Municipal waste is split into renewable and non-renewable.
Municipal waste (non-renewable)	MUNWASTEN	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. Municipal waste is split into renewable and non-renewable.
Primary solid biofuels	PRIMSBIO	Primary solid biofuels is defined as any plant matter used directly as fuel or converted into other forms before combustion. This covers a multitude of woody materials generated by industrial process or provided directly by forestry and agriculture (firewood, wood chips, bark, sawdust, shavings, chips, sulphite lyes also known as black liquor, animal materials/wastes and other solid biofuels). Note that for biofuels, only the amounts of biomass specifically used for energy purposes (a small part of the total) are included in the energy statistics. Therefore, the non-energy use of biomass is not taken into consideration and the quantities are null by definition.
Biogases	BIOGASES	Biogases are gases arising from the anaerobic fermentation of biomass and the gasification of solid biomass (including biomass in wastes). The biogases from anaerobic fermentation are composed principally of methane and carbon dioxide and comprise landfill gas, sewage sludge gas and other biogases from anaerobic fermentation. Biogases can also be produced from thermal processes (by gasification or pyrolysis) of biomass and are mixtures containing hydrogen and carbon monoxide (usually known as syngas) along with other components. These gases may be further processed to

Product	Short name	Definition
		modify their composition and can be further processed to produce substitute natural gas. Biogases are used mainly as a fuel but can be used as a chemical feedstock.
Biogasoline	BIOGASOL	Biogasoline includes bioethanol (ethanol produced from biomass and/or the biodegradable fraction of waste), biomethanol (methanol 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 calculated 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.
Biodiesels	BIODIESEL	Biodiesels includes biodiesel (a methyl-ester produced from vegetable or animal oil, of diesel quality), biodimethylether (dimethylether produced from biomass), Fischer Tropsch (Fischer Tropsch produced from biomass), cold pressed bio-oil (oil produced from oil seed through mechanical processing only) and all other liquid biofuels which are added to, blended with or used straight as transport diesel. Biodiesels includes the amounts that are blended into the diesel - it does not include the total volume of diesel into which the biodiesel is blended.
Bio jet kerosene	BIOJETKERO	Liquid biofuels derived from biomass and blended with or replacing jet kerosene.
Other liquid biofuels	OBIOLIQ	Other liquid biofuels include liquid biofuels not reported in either biogasoline or biodiesels.
Non-specified primary biofuels and waste	RENEWNS	This item is used when the detailed breakdown for primary biofuels and waste is not available.
Charcoal	CHARCOAL	It covers the solid residue of the destructive distillation and pyrolysis of wood and other vegetal material.
Memo: Renewables	MRENEW	Is equal to the direct sum of HYDRO, GEOTHERM, SOLARPV, SOLARTH, TIDE, WIND, MUNWASTER, PRIMSBIO, BIOGASES, BIOGASOL, BIODIESEL, OBIOLIQ, RENEWNS and CHARCOAL. Note that it does not include any estimation of the amount of electricity and heat derived from renewable sources.

Electricity and Heat

Product	Short name	Definition
Elec/heat output from non-specified manufactured gases	MANGAS	This item is only used if the detailed breakdown is not available. It includes coke oven gas, blast furnace gas and other recovered gases. Gas works gas is not included here.
Heat output from non-specified combustible fuels	HEATNS	This item is only used if the detailed breakdown is not available.

Product	Short name	Definition
Nuclear	NUCLEAR	Energy released by nuclear fission or nuclear fusion.
Hydro	HYDRO	Hydro energy represents the potential and kinetic energy of water converted into electricity in hydroelectric plants.
Geothermal	GEO THERM	Geothermal energy is the 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: <ul style="list-style-type: none"> for electricity generation using dry stream or high enthalpy brine after flashing directly as heat for district heating, agriculture, etc.
Solar photovoltaics	SOLARPV	Electricity from photovoltaic cells.
Solar thermal	SOLARTH	Solar energy is the solar radiation exploited for hot water production and electricity generation, by: <ul style="list-style-type: none"> flat plate collectors, mainly of the thermosyphon type, for domestic hot water or for the seasonal heating of swimming pools solar thermal-electric plants Passive solar energy for the direct heating, cooling and lighting of dwellings or other buildings is not included.
Tide, wave and ocean	TIDE	Tide, wave and ocean represents the mechanical energy derived from tidal movement, wave motion or ocean current and exploited for electricity generation.
Wind	WIND	Wind energy represents the kinetic energy of wind exploited for electricity generation in wind turbines.
Other sources	OTHER	Other sources includes production not included elsewhere such as fuel cells.
Electricity	ELECTR	Gross electricity production is measured at the terminals of all alternator sets in a station; it therefore includes the energy taken by station auxiliaries and losses in transformers that are considered integral parts of the station. The difference between gross and net production is generally estimated as 7% for conventional thermal stations, 1% for hydro stations, and 6% for nuclear, geothermal and solar stations. Production in hydro stations includes production from pumped storage plants.
Heat	HEAT	Heat production includes all heat produced by main activity producer CHP and heat plants, as well as heat sold by autoproducer CHP and heat plants to third parties. Fuels used to produce quantities of heat for sale are included in the transformation processes under the rows <i>CHP plants</i> and <i>Heat plants</i> . The use of fuels for heat which is not sold is included under the sectors in which the fuel use occurs. Data on heat have become available in different years for different countries and thus any aggregated data should be used with caution.

Products for summary balances

Product	Short name	Definition
Coal and coal products	COAL	Is equal to the sum of HARDCOAL, BROWN, ANTCOAL, COKCOAL, BITCOAL, SUBCOAL, LIGNITE, PATFUEL, OVENCOKE, GASCOKE, COALTAR, BKB, GASWKSGS, COKEOVGS, BLFURGS, OXYSTGS and MANGAS.
Peat and peat products	PEAT	Is equal to PEAT and PEATPROD.
Oil shale and oil sands	OILSHALE	Is equal to OILSHALE.
Crude, NGL and feedstocks	CRNGFEED	Is equal to the sum of CRNGFEED, CRUDEOIL, NGL, REFFEEDS, ADDITIVE and NONCRUDE.
Oil products	TOTPRODS	Is equal to the sum of REFININGAS, ETHANE, LPG, NONBIOGASO, AVGAS, JETGAS, JETKERO, OTHKERO, NONBIODIES, RESFUEL, NAPHTHA, WHITESP, LUBRIC, BITUMEN, PARWAX, PETCOKE and ONONSPEC.
Natural gas	NATGAS	Is equal to NATGAS .
Nuclear	NUCLEAR	Is equal to NUCLEAR.
Hydro	HYDRO	Is equal to HYDRO.
Geothermal	GEO THERM	Is equal to GEO THERM.
Solar/wind/other	SOLWIND	Is equal to the sum of SOLARPV, SOLARTH, TIDE, WIND, HEATPUMP, BOILER, CHEMHEAT and OTHER.
Biofuels and waste	COMRENEW	Is equal to the sum of INDWASTE, MUNWASTER, MUNWASTEN, PRIMSBIO, BIOGASES, BIOGASOL, BIODIESEL, OBIOLI, RENEWNS and CHARCOAL.
Heat production from non-specified combustible fuels	HEATNS	Is equal to HEATNS.
Electricity	ELECTR	Is equal to ELECTR.
Heat	HEAT	Is equal to HEAT.
Total	TOTAL	Is equal to TOTAL of all the previous energy sources. Is also equal to the sum of MTOTSOLID, MTOTOIL, NATGAS, NUCLEAR, HYDRO, COMRENEW and MTOTOTHER.
Memo: Renewables	MRENEW	Is equal to the sum of HYDRO, GEO THERM, SOLARPV, SOLARTH, TIDE, WIND, MUNWASTER, PRIMSBIO, BIOGASES, BIOGASOL, BIODIESEL, OBIOLI, RENEWNS and CHARCOAL.
Memo: Coal, peat and oil shale	MTOTSOLID	Is equal to the sum of COAL, PEAT and OILSHALE.
Memo: Primary and secondary oil	MTOTOIL	Is equal to the sum of CRNGFEED and TOTPRODS.
Memo: Geothermal, solar/wind/other, heat, electricity	MTOTOTHER	Is equal to the sum of GEO THERM, SOLARWIND, HEAT and ELECTR.

Geographical coverage

Geographical divisions

This document is without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boundaries and to the name of any territory, city or area. In this publication, 'country' refers to country, economy or territory, as case may be. Data start in 1960 for OECD countries, and in 1971 for non-OECD countries and regional aggregates, unless otherwise specified.

Country/Region	Short name	Definition
OECD Americas	OECDAM	Includes Canada; Chile; Colombia; Costa Rica; Mexico and the United States.
OECD Asia Oceania	OECDAO	Includes Australia; Israel ¹ ; 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; Lithuania; 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.
China (P.R. of China and Hong Kong, China)	CHINAREG	Includes the People's Republic of China and Hong Kong, China.
Albania	ALBANIA	
Argentina	ARGENTINA	Argentina is currently an IEA Association country, therefore it is included in the IEA and Accession/Association countries aggregate (IEA Family), for data starting in 1971 and for the entire time series.
Armenia	ARMENIA	Data for Armenia are available starting in 1990.
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	
Azerbaijan	AZERBAIJAN	Data for Azerbaijan are available starting in 1990.
Belarus	BELARUS	Data for Belarus are available starting in 1990.
Belgium	BELGIUM	

¹ The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

Bosnia and Herzegovina	BOSNIAHERZ	Data for Bosnia and Herzegovina are available starting in 1990.
Brazil	BRAZIL	Brazil is currently an IEA Association country, therefore it is included in the IEA and Accession/Association countries aggregate (IEA Family), for data starting in 1971 and for the entire time series.
Bulgaria	BULGARIA	
Canada	CANADA	
Chile	CHILE	Data start in 1971. Chile is currently seeking accession to full IEA membership (Accession country), therefore it is included in the IEA and Accession/Association countries aggregate (IEA Family), for data starting in 1971 and for the entire time series.
People's Republic of China	CHINA	People's Republic of China is currently an IEA Association country, therefore it is included in the IEA and Accession/Association countries aggregate (IEA Family), for data starting in 1971 and for the entire time series.
Colombia	COLOMBIA	Data start in 1971. Data for Colombia prior to 1990 in the <i>Oil Information</i> may be different from those in <i>World Energy Statistics</i> due to a change in reporting methodology. Colombia is currently seeking accession to full IEA membership (Accession country), therefore it is included in the IEA and Accession/Association countries aggregate (IEA Family), for data starting in 1971 and for the entire time series.
Costa Rica	COSTARICA	Costa Rica joined the OECD in May 2021; data are now included in the OECD aggregates.
Croatia	CROATIA	Data for Croatia are available starting in 1990.
Cuba	CUBA	
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 recognizes 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 report relates to the area under the effective control of the Government of the Republic of Cyprus.
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.
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.
Egypt is currently an IEA Association country, therefore it is included in the IEA and Accession/Association countries aggregate (IEA Family), for data starting in 1971 and for the entire time series.

Estonia	ESTONIA	Data start in 1990.
Finland	FINLAND	
France	FRANCE	Includes Monaco and excludes the overseas collectivities: New Caledonia; French Polynesia; Saint Barthélemy; Saint Martin; Saint Pierre and Miquelon; and Wallis and Futuna. Energy data for the following overseas departments: Guadeloupe; French Guiana; Martinique; Mayotte; and Réunion are included for the years from 2011 onwards, and excluded for earlier years.
Georgia	GEORGIA	Data for Georgia are available starting in 1990.
Germany	GERMANY	Includes the new federal states of Germany from 1970 onwards.
Greece	GREECE	
Hong Kong, China	HONGKONG	
Hungary	HUNGARY	Data start in 1965.
Iceland	ICELAND	
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. India is currently an IEA Association country, therefore it is included in the IEA and Accession/Association countries aggregate (IEA Family), for data starting in 1971 and for the entire time series.
Indonesia	INDONESIA	Indonesia is currently an IEA Association country, therefore it is included in the IEA and Accession/Association countries aggregate (IEA Family), for data starting in 1971 and for the entire time series.
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. Israel is currently seeking accession to full IEA membership (Accession country), therefore it is included in the IEA and Accession/Association countries aggregate (IEA Family), for data starting in 1971 and for the entire time series.
Italy	ITALY	Includes San Marino and the Holy See.
Japan	JAPAN	Includes Okinawa.

		Starting 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.
Kazakhstan	KAZAKHSTAN	Data for Kazakhstan are available starting in 1990.
Korea	KOREA	Data start in 1971.
Kosovo	KOSOVO	Data for Kosovo are available starting in 2000. Between 1990 and 1999, data for Kosovo are included in Serbia.
Kyrgyzstan	KYRGYZSTAN	Data for Kyrgyzstan are available starting in 1990.
Latvia	LATVIA	Data for Latvia are available starting in 1990.
Lithuania	LITHUANIA	Lithuania joined the IEA in February 2022; however, its data have not been included in the IEA member countries aggregate (IEA total) for this edition. It is included in the IEA and Accession/Association countries aggregate (IEA family), for data starting in 1990 and for the entire time series. Data for Lithuania are available starting in 1990.
Luxembourg	LUXEMBOU	
Malta	MALTA	
Mauritius	MAURITIUS	
Mexico	MEXICO	Data start in 1971.
Republic of Moldova	MOLDOVA	Data for Moldova are available starting in 1990.
Montenegro	MONTENEGRO	Data for Montenegro are available starting in 2005. Between 1990 and 2004, data for Montenegro are included in Serbia.
Morocco	MOROCCO	Morocco is currently an IEA Association country, therefore it is included in the IEA and Accession/Association countries aggregate (IEA Family), for data starting in 1971 and for the entire time series.
Netherlands	NETHLAND	Excludes Suriname, Aruba and the other former Netherland Antilles (Bonaire, Curaçao, Saba, Saint Eustatius and Sint Maarten).
New Zealand	NZ	
Republic of North Macedonia	NORTHMACED	Data for the Republic of North Macedonia (North Macedonia) are available starting in 1990.
Norway	NORWAY	
Paraguay	PARAGUAY	
Poland	POLAND	
Portugal	PORTUGAL	Includes the Azores and Madeira.
Romania	ROMANIA	
Saudi Arabia	SAUDIARABI	

Serbia	SERBIA	Data for Serbia are available starting in 1990. Serbia includes Montenegro until 2004 and Kosovo until 1999.
Singapore	SINGAPORE	Singapore is currently an IEA Association country, therefore it is included in the IEA and Accession/Association countries aggregate (IEA Family), for data starting in 1971 and for the entire time series.
Slovak Republic	SLOVAKIA	Data start in 1971.
Slovenia	SLOVENIA	Data start in 1990.
South Africa	SOUTHAFRIC	Nuclear and Hydro electricity generation data are reported on a fiscal year basis, beginning on the 1 April Y and ending on the 31 March Y+1. South Africa is currently an IEA Association country, therefore it is included in the IEA and Accession/Association countries aggregate (IEA Family), for data starting in 1971 and for the entire time series.
Spain	SPAIN	Includes the Canary Islands.
Sweden	SWEDEN	
Switzerland	SWITLAND	Includes Liechtenstein for the oil data. Data for other fuels do not include Liechtenstein.
Thailand	THAILAND	Thailand is currently an IEA Association country, therefore it is included in the IEA and Accession/Association countries aggregate (IEA Family), for data starting in 1971 and for the entire time series.
Trinidad and Tobago	TRINIDAD	
Tunisia	TUNISIA	
Turkey	TURKEY	
Ukraine	UKRAINE	Data for Ukraine are available starting in 1990.
United Kingdom	UK	Shipments of coal and oil to the Channel Islands and the Isle of Man from the United Kingdom are not classed as exports. Supplies of coal and oil to these islands are, therefore, included as part of UK supply. Exports of natural gas to the Isle of Man are included with the exports to Ireland. As of the 1st of February 2020, the United Kingdom (UK) is no longer part of the European Union (EU) and has entered into a transition period until 31 December 2020. In this publication with data up to 2020, the UK is still included in the EU28 aggregate. However, it is excluded from the EU27_2020 aggregate.
United States	USA	Includes the 50 states and the District of Columbia but generally excludes all territories, and all trade between the U.S. and its territories. Oil statistics include Guam, Puerto Rico ² and the United States Virgin Islands; trade statistics for coal include international trade to and from Puerto Rico and the United

² Inputs to and outputs from electricity and heat generation up to 2016, and natural gas data for the entire time series for Puerto Rico are included under Other non-OECD Americas (available in July 2022 edition).

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

Memo: OECD Total	OECDTOT	Includes Australia; Austria; Belgium; Canada; Chile; Colombia; Costa Rica; the Czech Republic; Denmark; Estonia; Finland; France; Germany; Greece; Hungary; Iceland; Ireland; Israel; Italy; Japan; Korea; Latvia; Lithuania; Luxembourg; Mexico; the Netherlands; New Zealand; Norway; Poland; Portugal; the Slovak Republic; Slovenia; Spain; Sweden; Switzerland; Turkey; the United Kingdom and the United States. Estonia, Latvia, Lithuania and Slovenia are included starting in 1990.
Memo: 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. Lithuania joined the IEA in February 2022; however, its data have not been included in this aggregate for this edition.
Memo: IEA and Accession/Association countries	IEAFAMILY	Includes: IEA member countries: Australia, Austria, Belgium, Canada, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Korea, Lithuania, 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, and Israel; Association countries: Argentina; Brazil; the People's Republic of China; Egypt; India; Indonesia; Morocco; Singapore; South Africa; Thailand.
Memo: European Union - 27	EU27_2020	Includes Austria, Belgium, Bulgaria, Croatia, Cyprus ³ , the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Portugal, Romania, the Slovak Republic, Slovenia, Spain, and Sweden. Please note that in the interest of having comparable data, all of these countries are included since 1990 despite different entry dates into the European Union.
Memo: European Union - 28	EU28	Refers to the EU27 with the addition of the United Kingdom ⁴ . Includes Austria; Belgium; Bulgaria; Croatia; Cyprus; the Czech Republic; Denmark; Estonia; Finland; France; Germany; Greece; Hungary; Ireland; Italy; Latvia; Lithuania; Luxembourg; Malta; the Netherlands; Poland; Portugal; Romania; the Slovak Republic; Slovenia; Spain, Sweden, and the United Kingdom. Please note that in the interest of having comparable data, all these countries are included since 1990 despite different entry dates into the European Union.
Memo: G7	MG7	Includes Canada, France, Germany, Italy, Japan, United Kingdom and United States.

³ Refer to the country note for Cyprus earlier in this section.

⁴ As of the 1st of February 2020, the United Kingdom (UK) is no longer part of the European Union (EU) and has entered into a transition period until 31 December 2020.

Fiscal year

This table lists the countries for which data are reported on a fiscal year basis. More information on beginning and end of fiscal years by country is reported in the column 'Definition'.

This document is without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boundaries and to the name of any territory, city or area. In this publication, 'country' refers to country, economy or territory, as case may be. Data start in 1960 for OECD countries, and in 1971 for non-OECD countries and regional aggregates, unless otherwise specified.

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.
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.
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.
Japan	JAPAN	Starting 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.
South Africa	SOUTHAFRIC	Nuclear and Hydro electricity generation data are reported on a fiscal year basis, beginning on the 1 April Y and ending on 31 March Y+1.

Country notes and sources

OECD countries

General notes

The notes given in this document refer to data for the years 1960 to 2020 published in the on-line data service. 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 IEA information publications ([Oil information](#), [Natural Gas information](#), [Coal information](#), [Electricity information](#) and [Renewables information](#)).

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

All data refer to the fiscal year (e.g. July 2019 to June 2020 for 2020).

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

Coal

General notes

Stock change and statistical difference are both subject to further review for black coal grade by the Australian administration.

In the 2022, 2021 and 2020 editions, part of the demand side data for **other bituminous coal**, **subbituminous coal**, **lignite** and **coal tar** have been estimated by the IEA Secretariat for the years 2018, 2019 and 2020. Due to confidentiality reasons, some flows for those products were suppressed in the data submission to the IEA. The figures estimated have been qualified in the dataset as estimated. Some subtotals are not qualified as estimated but many flows within them are, this is because the subtotals were submitted but not their breakdown or part of it.

In the 2022, 2021 and 2020 editions, part of the demand side for **anthracite** is confidential. Some of the quantities reported under “Industry, not elsewhere specified” could refer to other flows.

In the 2021 edition, the split between underground and surface production of **coking coal** and **other bituminous coal** was revised back to 2015 based on new available data.

In the 2017 edition, the Australian administration revised data on **coal tar** back to 2010 resulting in breaks in time series between 2009 and 2010.

In the 2016 edition, extensive revisions were made to 2010 to 2013 data for many primary and manufactured products causing breaks in production, trade and consumption between 2009 and 2010. Time series which begin in 2010 may be reported in other flows until 2009. 2014 data were reported on the same basis as 2010 to 2013.

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.

Reclassification of some **coal** types in the 2013 edition were calculated on an energy basis and resulted in a net increase of quantities of primary coal from 2003 to 2011.

Breaks in the time series for **gas works gas** between 2008 and 2009 are due to a change of survey, while reduced production and consumption between 2006 and 2008 are due to the removal of some **natural gas** inputs.

Data on **blast furnace gas** for electricity production by autoproducers begins in 1986.

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

Supply

In 2018, a substantial stock draw of **coking coal** followed a 2017 stock build caused by meteorological phenomena.

The decrease of **lignite** production and consumption in 2017 and 2018 was due to the closure of brown coal fired Hazelwood power plant in early 2017, contributing to a higher consumption of **other bituminous coal**.

Only **anthracite** trade is reported separately; the remainder that is consumed domestically is included with **other bituminous coal** due to confidentiality

requirements. There were no recorded anthracite exports or estimated anthracite production in 2018.

Anthracite production data are unavailable and are therefore estimated by the Australian administration as a balance of trade and consumption. There is no visibility over stock movements of this fuel.

Registers show large sporadic shipments of **anthracite** rather than steady supply streams.

Export trade in **coke oven coke** between 2005 and 2011 exists, but data are unavailable for reasons of confidentiality. From 2012 onward exports are estimated by the Australian administration but without providing information on the destination country.

Transformation

In 2015, a new plant within the mining sector started its operations increasing the consumption of **coke oven coke**.

The one company producing **BKB** closed its operation during 2015. As such, production and consumption declined significantly.

For 2003 to 2012, **coke oven gas** reported as energy industry own-use in electricity or CHP plants is used for generation purposes, while **natural gas** used for own-use plant support is reported in the transformation sector.

Natural gas consumed to fuel the distribution of **natural gas** in natural gas networks is reported as transformation for **gas works gas** production until 2005.

The drop in **BKB** production in 2004 was due to a fire in the main production plant.

Consumption

Decline in **coking coal** use alongside rising steel production appears commensurate with process changes in Iron and Steel sector.

In the 2016 edition, revisions for 2010 onwards have increased the quantities of **sub-bituminous coal** and decreased the quantities of **other bituminous coal** being used in the non-metallic minerals industry as more accurate information has become available.

Consumption in *wood and wood products* is included in *paper, pulp and print* from 2001 onwards.

Oil

General notes

In the 2022 edition, the Australian administration introduced further revisions due to a change in reporting methods, which included mandatory reporting obligation for refineries and companies in the oil sector, resulting in a break in series between 2016 and 2017.

In the 2022 edition, 2019 and 2020 data for **white spirit** and **bitumen** (except for trade data for the latter) are included in **other oil products** due to confidentiality.

There are breaks in series between 2017 and 2018 due to a change in reporting methods, which includes new mandatory reporting for refineries and companies in the oil sector.

Moreover, in the 2019 edition the Australian administration introduced several revisions to the time series back to 2011 as a result of new and updated data sources becoming available.

In 2017, the Australian administration added new companies to their reporting. This primarily impacts the stocks of **motor gasoline** and **gas/diesel oil**.

Between 2009 and 2010 some breaks in time series may occur due to changes in methodologies and to improved data sources, with major revisions explained below.

Other hydrocarbons reported under *from other sources natural gas* correspond to hydrogen used in refineries from 2011 to 2016, also represented as the output of *non-specified transformation* in the balances format.

An in-depth review of Australian oil statistics, in particular investigation of amounts currently reported under recycled products as well as statistical differences for **motor gasoline** and **bitumen**, is on-going and may result in further improvements in the next editions.

Supply

In the 2022 edition, refinery output of **naphtha** (2019 and 2020) and **aviation gasoline** (2020) are confidential. These are included in **other oil products**.

In the 2022 edition, refinery fuel use of **fuel oil** in 2020 is confidential.

In the 2022 edition, stock changes are confidential for **naphtha** (2019 and 2020), **other kerosene** (2020) and **gas/diesel oil** (partially for 2020). Where

appropriate, these are included in **other oil products**. Stock breaks may therefore appear.

Part of **LPG** exports in 2019 is confidential.

In 2019, refinery output of **other oil products** increased as a result of higher consumption in *oil and gas extraction* and improved data collection.

In 2018, production of **NGL** declined as a result of product reclassification where quantities of condensate had previously been included and now moved to **crude oil**.

Crude oil production and imports continued to decline in 2016 following the closure of domestic refining capacity in New South Wales (Kurnell Refinery) and Queensland (Bulwer Island Refinery). Refinery outputs also fell as a result. These two sites have been converted to import terminals helping Australia expanding its import capacity. As a result refined products imports increased considerably in 2016.

From 2010 **crude oil** production estimates for selected companies have been replaced by actual data.

Imports of **fuel oil** have been estimated by the Australian administration.

In the 2015 data, **fuel oil** imports dropped significantly due to the closure of the two large consumers of this product, the Gove alumina refinery and the Point Henry aluminium smelter.

There is a break in the time series for **crude oil** and **NGL** between 2001 and 2002.

The drop in the production of **crude oil** in 1999 is due to a gas explosion at the Longford plant.

Prior to 1992, part of the **NGL** production is included in **crude oil**.

Transformation

There is a break in the refinery balance between 2010 and 2011 due to the reclassification of a facility from upstream to downstream.

As a result of a new methodology adopted to split **gas/diesel oil** inputs between main activity and autoproducer plants, breaks in series appear between 2009 and 2010.

Consumption

In the 2022 edition, due to improved data and mandatory reporting, the Australian administration introduced revisions from 2016 onwards for **LPG, motor gasoline, gas/diesel oil, kerosene type jet fuel, fuel oil, lubricants and other oil products**.

In the 2021 edition, due to a change in the reporting methods, the Australian administration has reallocated some consumption of **LPG, other kerosene, fuel oil and other oil products** from the *commercial and public services* sector to *not elsewhere specified (energy)* for 2018 data onwards.

In the 2021 edition, consumption of **LPG, gas/diesel oil and other oil products** in *oil and gas extraction* increased owing to new facilities going online in 2019.

In the 2021 edition, non-energy use of **white spirit** and **bitumen** in *not elsewhere specified (industry)* are included in **other oil products** due to confidentiality.

In the 2021 edition, there is a break between 2018 and 2019 in the transport sector consumption notably for **LPG, gas/diesel oil, kerosene type jet fuel and fuel oil**. The Australian administration intends to submit historical revisions in the 2022 edition.

In 2018 **fuel oil** consumption in the *commercial and public services* sector increased due to the inclusion of data for a new water and waste services facility.

In 2017 the Queensland Nickel refinery closed down and the Portland Aluminium refinery was reduced for an extended period due to a power fault. As a result **fuel oil** consumption in the *non-ferrous metal* sector declined in 2017.

In the 2019 edition the bitumen time series was revised with higher levels of consumption for 2015 and 2016. This is based on the monthly Australian Petroleum Statistics which now has better coverage of the consumption data.

Breaks in the time series appear between 2009 and 2010 in transport consumption due to a change in methodology.

Natural gas

General notes

In the 2020 edition, the Australian administration reallocated quantities in the consumption side, based on analysis of new data and to be consistent with

Australian Energy Statistics. Additionally, revisions were made to trade flows based on a revised methodology for calculating the volumes of imports and exports.

In the 2019 edition, the Australian administration proceeded to major revisions on the supply side from 2013 onwards due to a change in methodology on production quantities and more recent sources on calorific values. Additionally the *Oil and gas extraction*, and *Liquefaction (LNG)/regasification plants* on the demand side were revised from 2003 onwards, which resulted in increased statistical differences.

In the 2016 edition, the Australian administration revised **natural gas** demand data for some flows back to 2010, resulting in breaks in time series between 2009 and 2010.

In 2015, the Australian administration revised production and certain consumption data back to 2006. The production figures now include previously uncaptured flows.

Prior to 1991 **natural gas** data include **ethane**.

Supply

In 2022 edition, historical revisions were made to *gas vented* and *gas flared* back to 1990 due to new methodology.

The GCV of *inland consumption (calculated)* has been falling since 2017 due to increases in liquefaction and the volume lost during this process.

For 2018, there is a continuation of the increase in *indigenous production* (+15%) and *exports* (+18%) of gas, which started in 2017 due to the LNG exporting capacity coming online in 2016 and 2017.

Around 30% of the production (mainly coal seam gas) is estimated by the Australian administration.

Transformation

From 2011 to 2016, the *Non-specified transformation* of **natural gas** represents amounts used to produce hydrogen for hydrosulphurization in refineries.

Until 2005, natural gas consumed to fuel the distribution of natural gas in natural gas networks was reported as transformation for gas works gas production.

Consumption

In 2022 edition, historical revisions were made to *distribution losses* due to a new source for this data.

Consumption in the *residential* and *agriculture/forestry* sectors is estimated by the Australian administration based on models.

There are breaks between 2002 and 2003 in due to major revisions made in the *Oil and gas extraction*, and *Liquefaction (LNG)/regasification plants* in the context of the 2019 edition.

Between 2009 and 2010 some breaks in time series may occur due to changes in methodologies and to improved data sources. Revisions to the consumption data include changes to energy use in liquefaction plants, and a shift of *gas works gas (transformation)* to *non-specified energy* from 2006 onwards. Revisions to previous years are pending.

Between 2001 and 2002 there are breaks in time series for consumption data due to an industry structural shift and changes in methodology.

Data for 1999 and 2000 end-use consumption are estimated by the Australian administration.

Biofuels and waste

General notes

In the 2018 edition, **biogases** were revised downward by the Australian administration back to 2015 as a result of the removal on 1 July 2015 of a production subsidy for domestic ethanol. The subsidy was equal to the excise rate on unleaded petrol.

A large **biogas** production facility did not report any production in 2016-2017. In 2017, this led to reductions in the consumption of **biogases** in auto CHP plants and the commercial and public services sector.

Increases in production of **solid biofuels** since 2014 are related to incentives under the Renewable Energy Target legislation, which went into effect in 2001 and aims to increase the share of electricity generation from renewable sources. More information is available here: <http://www.cleanenergyregulator.gov.au/RET>.

The data for **biogasoline** and **biodiesel** are not available before 2003 and 2004 respectively.

From 1996, a different industry consumption breakdown for biofuels and waste is available and leads to breaks in time series.

Supply

Biogas production data at sewage treatment works are not available.

Indigenous production of **biodiesel** has decreased substantially starting with 2016 data because one of the major **biodiesel** producers ceased production in January 2016. The trend continues in 2017, when, according to Bioenergy Australia, low oil prices and higher feedstock prices created a difficult market for the remaining **biodiesel** producers. The trend continues in 2018 data.

Production of **biogasoline (ethanol)** decreased since the Ethanol Production Grants Programme ended on 30 June 2015. On 1 July 2015, the fuel excise on domestically produced ethanol was reduced to zero and will be increased by 2.5 cents per litre until it reaches 12.5 cents per litre. Additionally, 2017 quantities were also affected by low oil prices.

Consumption

In the 2018 edition, **solid biofuels** were revised back to 2010 by the Australian administration, expanding the scope from the revisions in the 2016 and 2017 editions to *indigenous production* and consumption sectors which weren't previously revised. This results in a break in time series between 2009 and 2010.

In the 2017 edition of this publication, there has been a revision to the time series of **solid biofuels** consumption in "*Paper, pulp and printing*" sector. This time series has been revised back to 2010 resulting in break in time series between 2009 and 2010.

In the 2016 edition of this publication, the Australian administration revised **primary solid biofuels** back to 2010 which impact mostly final consumption in *food and tobacco*. This created breaks in time series.

The consumption data of **biogases** in industry is not available before 2003.

Electricity and heat

General notes

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

For 2018 data, 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 2022 and 2021 editions, the Australian administration revised sectoral consumption data back to 2009 to incorporate a change of methodology. In particular, data for *Construction* were significantly revised in the 2022 edition. 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.

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

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

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*.

Austria

Source

Bundesanstalt Statistik Österreich, Vienna.

General notes

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

Coal

General notes

In the 2021 edition, revisions were made in several products for the period 2005-2018, most of them were small in absolute and/or relative value.

In the 2019 edition, revisions concerning the iron and steel industry were received for data since 2005. The revisions impacted the energy sector for **coke oven gas** and **blast furnace gas**.

In 2018 data, **blast furnace gas** decreased following maintenance work in one of the blast furnaces. Additionally, other recovered gases (LD-gas) are reported separately following an improvement in reporting from the 2020 edition (in previous editions it was reported under **blast furnace gas**).

The last **lignite** mine closed in the second quarter of 2004 and **lignite** use for power generation ceased in 2006.

Since 1996, **gas works gas** data are reported with **natural gas** because it is distributed in the same network. The amount of **gas works gas** is negligible and it is mostly consumed by households.

“Trockenkohle” is included with **BKB** because of its high calorific value.

Supply

In 2018 there were high values of **patent fuel** imported and consumed in the paper and pulp industry, which was not the case in 2019.

Consumption

One of the revisions made in the 2021 edition was the reallocation of some quantities from Blast furnace (energy) to Coke oven (Energy) for the products **blast furnace gas**, **coke oven gas** and **other recovered gases**.

Among the revisions made in the 2021 edition, some quantities of **coke oven coke** were reallocated from the industry Iron & Steel (TFC) to the category Non-Energy Use-Chemical/ Petrochemical.

Oil

General notes

In the 2022 edition, revisions in the time series for **gas/diesel oil** deliveries for international marine bunkers appear as a result of a change in the methodology reported by the Federal Environment Agency to Statistics Austria. As a consequence of this change in methodology, revisions also appear for **gas/diesel** oil consumption in road transport and domestic navigation from 1990 onwards.

Supply

In the 2021 edition, the Austrian administration revised the stock levels (national territory) of **motor gasoline** (from 2006 onwards) and **fuel oil** (from 2005 onwards) but with the stock changes preserved as in the previous edition. A stock break appears for **fuel oil** between 2004 and 2005.

In the 2016 edition, exports of naphtha are no longer reported from 2014, past values may refer to exports of petrochemical raw material.

Deliveries of gas/diesel to international marine bunkers were revised back to 1990 after implementation of a new study results.

Prior to 1990, a portion of naphtha is included with other oil products.

Transformation

In the 2019 edition the administration incorporated revisions as a result of improved reporting from the refinery to Statistics Austria. As a result there may be breaks in the time series between 2004 and 2005.

Natural gas

Supply

In the 2022 edition, the time series for *Opening and Closing stock level (National Territory)* was revised in Terajoules from 1990 onwards due to new information becoming available from data providers.

Export amounts are calculated by the national administration by subtracting *stock changes* and domestic consumption from *import* figures.

Transformation

In the 2018 edition, the time series for *blast furnaces* was reclassified from 1990 onwards, and thus moved from the Transformation to the Energy sector. This has resulted in increasing the efficiency of the blast furnaces process.

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.

Consumption

In the 2019 edition, Austrian administration revised *oil and gas extraction* and *oil refinery natural gas* consumption data for 2005 onwards based on data reported to the Emissions Trading Scheme (ETS). Additionally, it revised data since 2005 for *other sectors'* flows since 2005 and *industry sector* since 2012 based on a combination of the results of sample surveys and data from the regulator.

Any inconsistencies in the time series for *commercial/public services* until 2011 are the result of this sub-sector being computed as a residual. Since 2012 the *commercial/public services* consumption figures are surveyed annually and the consumption quantities in small and medium enterprises in *industry* are the projected results of biannual sample surveys. The increase in *pipeline transport* consumption for 2013 is due to a new methodology of data collection. Historical

revisions are pending. Prior to 2000, differences due to measurement are included with *distribution losses*.

Biofuels and waste

General notes

Data for 1986 to 1989 for **solid biofuels**, **industrial waste**, **biogases** and **liquid biofuels** are IEA Secretariat estimates based on information published by OSTAT in *Energieversorgung Österreichs Endgültige Energiebilanz*.

Consumption

In the 2016 edition, improvement in the iron and steel industry data have allowed more precision in the consumption, among other for **industrial waste** in blast furnaces.

In the 2016 edition, the consumption of **solid biofuels** in the residential sector was revised down from 2005 data.

Electricity and heat

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.

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.

Electricity only plant 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.

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 2000.

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 timeseries 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.

Also prior to 1991, **electricity** consumption in the iron and steel industry includes consumption in coke ovens and blast furnaces.

Belgium

Source

Observatoire de l'Energie, Brussels.

Coal

General notes

For the year 2020, the trade flows for **anthracite** include transit trade. This will be amended in the next publication (2022).

Oil shales and **sub-bituminous coal** have been grouped due to confidentiality reasons.

In the 2020 edition, data from 2013 was revised, and **sub-bituminous coal** figures are now reported under this category, whilst previously they were under **other bituminous coal**. **BKB** figures has been also revised back to 2013.

In the 2016 edition, improved data collection has led to some breaks in time series. These revisions include **hard coal** classifications, products and processes in integrated iron and steel manufacture and may be extended further back in future editions.

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**.

Other bituminous coal and **sub-bituminous coal** data reported in *from other sources* refer to coal recuperated from coal dumps.

Supply

Supply-side data are obtained through surveying questionnaires instead of customs data.

Transit trade is excluded. For each country (trade partner), the imported and exported quantities are compared and cleared. In the case of Belgium, this decreases the final figure of exports. 2019 data shows a rise in exports of **other bituminous coal**; the imports decreased during that year but some companies

continued to export the stocks originated from those countries in 2019, leading to this rise.

In the 2019 edition, the calorific values of imported **bituminous coal** were revised upwards by the Belgian administration since 2015, resulting in a significant increase in the coal primary energy supply. Historical revisions are pending.

Conventional production of **other bituminous coal** ceased on 31 August 1992.

Transformation

In the 2019 edition, **anthracite** previously reported as consumption in the *iron and steel industry* was reclassified as part of the transformation process in *blast furnaces* since 2013.

In 2016, the decrease of **other bituminous coal** inputs to main activity producer electricity plants was due to the permanent closure of Langerlo, Belgium's last coal-fired main activity electricity.

In 2015, the decrease of **coke oven gas** inputs to autoproducer CHP plants is due to a power plant closure in 2015.

In 2014 and 2015, **coking coal** inputs to coke ovens decreased due to a coke oven closure in June 2014.

In 2014, the decrease of **other bituminous coal** inputs to main activity producer electricity plants is due to a power plant closure in 2014.

Consumption

In the 2021 edition, consumption of **other bituminous coal** in the sectors of Transport/Rail and Other sectors/Agriculture were included starting in 2015.

In the 2018 edition, industrial consumption for the period 2013 through 2015 was revised for **coking coal** and **anthracite**, as more accurate consumption data became available. Data for **coking coal** prior to 2013 may include a small portion of **anthracite**.

The decrease of **other bituminous coal** and **coke oven coke** in the iron and steel industry in 2002 is due to the closure of several plants.

The use of **coke oven gas** in chemical and petrochemical activities ceased in 1996.

Oil

General notes

Between 2008 and 2009 breaks in series occur for **naphtha** and **LPG** in both transformation and final consumption in the petrochemical sector as a result of methodological improvements made by the Belgian administration.

Data on biofuels are not available before 2009.

Other hydrocarbons correspond to pure hydrogen used in refineries.

Supply

Following a change in legislation, there is an increase in blended **biodiesel** in 2020.

In the 2022 edition, the Belgian administration revised **petroleum coke** imports and inland deliveries from 2015 onwards.

In 2019, the increase in *refinery gross output* of **petroleum coke** is due to a new delayed coker unit.

In 2018, increase in *imports* and deliveries for *international marine bunkers* of **residual fuel oil** is due to the inclusion of volumes of aromatic oils.

In 2017 new legislation increased the biofuel blending target for **motor gasoline** from 4% of volume to 8.5% of volume. As part of this E10 gasoline was introduced and became the new standard product in the country.

In the 2019 edition, the Belgian administration included new companies in their reporting; some of which are particularly active in the production and trade of **lubricants** and **bitumen**.

Consumption in *international marine bunkers* dipped in 2014 and 2015 due to the closure of several bunkering companies. During 2015 these were replaced by new companies which became fully operational in 2016.

Starting from 2013, a new data source was introduced for petroleum coke trade.

Transformation

In 2017 the upgrade project of Antwerp refinery and petrochemical plant was completed. Two key projects were completed: new refinery capacity for the conversion of heavy fuel oil into low sulphur light products and increasing steam

cracker flexibility to maximize the processing of low cost advantaged feedstock. The latter is reflected in feedstock needs. Output of lighter end products as well as petroleum coke is impacted by these upgrades.

In 2002, patent fuel plants used fuel oil to increase the calorific value of patent fuel.

Consumption

In the 2021 edition, the Belgian administration revised the consumption data for **lubricants** from 2010 onwards as a result of the identification of new active players in the market. Breaks may occur in the series between 2009 and 2010.

In 2018, a project in a petrochemical plant in Antwerp has started in which **refinery gases** are treated to recover valuable hydrocarbons. These quantities are reported under **LPG** and reflect the increase observed for non-energy use in the petrochemical industry in 2018.

The decrease of **fuel oil** in industry consumption since 1993 is due to the introduction of an excise tax as well as increased use of natural gas.

Natural gas

General Notes

In the 2022 edition, historical revisions were made back to 2013 due to better data availability and harmonisation with other gas data.

Supply

In the 2022 edition, a sharp increase of *supply from renewables* was observed and a continued increase is expected as more injection points of biomethane become active.

The trade data from 2018 onwards include transit figures as a result of a change in methodology.

Since 2009 gas trade in Belgium includes imported LNG which is regasified and subsequently exported to other countries.

In the 2019 edition, the LNG consumption data in *international marine bunkers* are confidential.

Transformation

New reporting of *blast furnaces* in the 2022 edition, this is linked to the recent installation of a DRI-plant which uses natural gas to replace coal for the reduction of iron ore.

The Belgian administration is in the process of revising 2010 and 2011 transformation sector data. As such, an unusually high quantity of **natural gas** is reported under not elsewhere specified (transformation).

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**.

Consumption

In 2018 refinery gas started being further purified into products, leading to a higher consumption by *oil refineries*.

Consumption in the transport equipment sector decreased in 2015 due to the closure of a large industry of this sector in December 2014.

In 2003, the large decrease in *non-specified industry* consumption is due to improvements in data collection.

Since 2000, **natural gas** began to replace **blast furnace gas** in the *iron and steel* industry.

Biofuels and waste

General notes

Renewable **municipal waste** includes a share of renewable **industrial waste**.

Data for **biodiesels** and **biogasoline** are available starting in 2009.

Supply

Data on pure **biogasoline** and **biodiesels** trade are not available for 2009 and 2010.

Transformation

In 2015, part of the law regulating the blending of biodiesel with diesel was temporarily suspended but in 2016, this law was reinstated.

Consumption

Consumption of **bioethanol** increased in 2017 due to legislation coming into effect on 1 January 2017, which increased the blending obligation for gasoline products.

Industrial waste consumption in the chemical sector started in 2011.

Other liquid biofuels consumed in power plants reported before 2011 can include biodiesel.

New data on consumption cause breaks in time series for primary solid biofuels between 2011 and 2012.

Electricity and heat

General notes

In the 2022 edition, Belgium revised data back to 2014 due to improved data availability, and improved natural gas data.

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

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 waste water treatment plant.

From 2013 onwards, reported **heat** distribution losses decreased due to a more precise estimation method.

The production of electricity from **wind** is available from 1987.

Transformation

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

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.

Offshore wind production in Belgium commenced in 2009. Data are available from 2010.

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 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*.

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.

For 2012, **electricity** consumption in the mining and quarrying sector has been estimated by the IEA Secretariat.

For 2012, oil refineries **electricity** consumption has been estimated by the IEA Secretariat based on refinery activity data. Part of the estimated amount has been removed from consumption in the chemical and petrochemical sector.

Breaks in time series may exist between 2007 and 2008 due to revisions of the Classification of the Economic Activities in the European Community (NACE) classifications.

There is no **heat** consumption starting in 2007 in the iron and steel industry because the installation concerned became an autoproducer in July 2006 and the heat is no longer sold.

Canada

Source

Natural Resources Canada, Ottawa.

General notes

In the 2018 edition, data for Canada were revised back to 2005 following a ten year revision of the Report on Energy Supply and Demand (RES-D), the main set of Canadian annual data. The revision standardizes the methodology used for the IEA data submission and has mainly affected the demand side. Additional details are given under each fuel.

From the 2014 edition, the Canadian administration revised time series back to 2005, using additional data from the Annual Industrial Consumption of Energy, the Annual Survey of Secondary Distributors, the Report on Energy Supply and Demand and the Natural Resources Canada Office of Energy Efficiency. Breaks in time series also between appear 1989 and 1990, due to changes in methodology, incorporated in 2002.

Coal

General notes

The 2022 edition includes revisions to coal production starting in 2015.

The 2021 edition includes some revised data as the methodology implemented in the previous edition was further refined by the Canadian administration.

The 2020 edition includes revisions for all the time series by the Canadian administration as more accurate data was available.

Significant statistical differences can be observed for several coal products. This is under investigation and further improvements are expected in further editions.

In the 2018 edition, data for Canada were revised back to 2005 following a ten year revision of the Report on Energy Supply and Demand (RES-D), the main set of Canadian annual data. The revision standardizes the methodology used for the IEA data submission and has mainly affected the demand side.

In the 2017 edition, due to the extensive revisions of the Report on Energy Supply and Demand (RES-D), significant statistical differences can be observed

for several coal products for the period 2005-2015. In the 2016 and 2017 edition, extensive revisions for the period 2005 to 2015 were received as more data became available due to improvements in data collection.

In the 2014 and 2015 editions, some revisions to the 2004 to 2006 data were received in addition to some time series and products for 2007 to 2011.

From the 2014 edition, the Canadian administration revised time series back to 2005, using additional data from the Annual Industrial Consumption of Energy, the Annual Survey of Secondary Distributors, the Report on Energy Supply and Demand and the Natural Resources Canada Office of Energy Efficiency. Breaks in time series also between appear 1989 and 1990, due to changes in methodology, incorporated in 2002.

Due to a Canadian confidentiality law, it is not possible for the Canadian administration to submit disaggregated time series for all of the **coal** types. Between 2002 and 2006, the IEA Secretariat has estimated some of the missing time series. The data for 2007 onwards are given directly as reported, however data may be present in non-representative products, and additionally these ad hoc reclassification methodologies contribute significantly to larger than normal statistical differences across products.

At this point in time, **oil shale and oil sands** data are not submitted, and this energy source is deemed to enter the supply stream as shale oil (**other hydrocarbons**).

Supply

Due to confidentiality constraints, from 2014 the breakdown of production by type of coal is estimated by the Canadian administration, while stock changes and statistical differences are estimated since 2001.

Transformation

In December 2018, Canada announced regulations to phase-out traditional coal-fired electricity by 2030.

Injection of pulverized coal into blast furnaces (PCI) occurs, but is not available for confidentiality reasons. Coals consumed in this manner are reported in the iron and steel industry along with other consumption.

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.

Consumption

Data of consumption of **anthracite** in the iron & steel sector is confidential. The Canadian administration provides an estimate.

Since 2001, consumption of **anthracite** in non-energy use is estimated by the Canadian administration.

Due to the unavailability of data, non-energy use of **coke oven coke** and **hard coal** is included with final consumption sectors prior to 1978 and 1980, respectively.

Oil

General notes

Several breaks in series appear between 2018 and 2019 due to the new Monthly Refined Petroleum Products survey launched by the Canadian administration in the beginning of 2019. The survey, redesigned to better reflect the evolution of the refined petroleum industry, includes greater coverage of all products.

The 2018 edition includes numerous time series revisions for the years 2005-2016. This is due to the 10 year revision of the Report on Energy Supply and Demand, which is the main set of Canadian annual data. The majority of these revisions were applied to the demand side.

In the 2016 edition, the Canadian administration was able to reconcile some historical inconsistencies by reporting inputs and outputs to upgraders. In the supply side, these quantities are reported under **other hydrocarbons**. In the demand side, they are reported under the respective output products (**refinery gas, road diesel, and petroleum coke**).

Time series for **other non-specified oil products** may fluctuate as they have been computed as residuals.

Receipts from non-reporting companies are currently represented in the statistical difference flow, work is ongoing with the Canadian administration to address gaps in the coverage that lead to increasing statistical differences.

Supply

In the 2022 edition, the Canadian administration no longer reports imports of **additives/oxygenates** from 2019 onwards. As these amounts refer to hydrocarbon-based **motor gasoline** blending components, they are therefore included in the imports of this oil product.

The Sturgeon refinery began operations in late 2017. The refinery produced its first diesel fuel in December 2017. It primarily processed synthetic **crude oil** but has successfully transitioned to **bitumen**.

In the 2018 edition the domestic supply of crude oil was revised due overall revisions to the Report on Energy Supply and Demand and the inclusion of additional data sources in the reporting.

From 2014 data the Canadian administration started using customs based trade data to report crude oil imports. In the 2017 edition, **crude oil** imports data have been revised back to 2005 following this methodology. Some revisions to imports of secondary products have already been made and further revisions are expected.

Condensates and pentanes plus are included in **crude oil** from 2005, in **NGL** 1990 to 2004 and in **LPG** prior to 1990. Historical revisions are pending.

From 2005 primary oil products include direct imports of condensates by crude oil producers.

Production of **other hydrocarbons** represents synthetic crude oil produced from tar sands.

From 2005, **other hydrocarbons** from other sources natural gas corresponds to natural gas used for the upgrading of synthetic crude oil (reported under GTL transformation in the natural gas consumption data) and natural gas used to upgrade petroleum products (reported under non-specified transformation in the natural gas consumption data). Revisions to this flow were introduced in the 2019 edition. From 1990 to 2005, these quantities are reported in indigenous production of **other hydrocarbons**. Prior to 1990, they are included in the natural gas supply.

Imports of **other hydrocarbons** from 1994 to 2000 correspond to orimulsion imports from Venezuela.

Refinery output from **gas/diesel oil** and **petroleum coke** includes output from oil sands and upgraders.

The Canadian administration is currently unable to provide a figure for the domestic production of additives, but is working on solutions which will make this possible. Meanwhile, significant statistical differences can be observed for several secondary oil products.

Consumption

In the 2022 edition, the Canadian administration reports **refinery gas, gas/diesel oil** and **petroleum coke** consumption by crude bitumen upgraders in the oil/gas extraction sector from 2019 onwards.

In the 2022 edition, the Canadian administration provides newly-available data for petroleum coke consumption for energy-use in non-ferrous metals, chemical and iron and steel sectors from 2019 onwards. Prior to 2019, they remain confidential.

In the 2021 edition, the Canadian administration has moved the consumption of **aviation gasoline** from *commercial and public services* to *domestic aviation* from 2013 onwards. Similarly, consumption of **jet kerosene** in *non-specified (industry)* has been moved to *domestic aviation* from 2013 onwards.

In 2019, the increase in refinery fuel use of **refinery gas** is due to the inclusion of refinery fuel used by upgraders. Prior to 2019, this is included in the *oil and gas extraction* sector.

In the 2020 edition in order to increase consistency with IEA's Energy Efficiency Indicators methodology, the Canadian administration has moved the consumption of **motor gasoline** and **gas/diesel oil** from *commercial and public services* to *road transport*. Moreover, consumption of **jet kerosene** in *commercial and public services* has been moved to *domestic aviation*.

Due to confidentiality issues, consumption data for selected products and flows, such as fuel oil and gas/diesel consumption in *iron and steel* from 2009, are not available. For the same reason, selected products may include estimates provided by the Canadian administration, such as Fuel Oil and Bitumen data for 2014.

In the 2019 edition the data series for consumption in *oil and gas extraction* was revised back to 2005 by the Canadian administration as new data sources meant a more accurate distribution between this sector and mining is now possible.

International marine bunkers are included with inland waterways prior to 1978.

Natural gas

General notes

In the 2019 edition, the Canadian administration proceeded to data revisions from 2005 onwards based on the revised source statistics from Statistics Canada and with the aim of achieving greater consistency with the Energy Efficiency Indicators data submission to IEA.

Supply

Indigenous production is measured by the Canadian administration by upscaling the marketable production by approximately 11% to account for own-use in the extraction process.

Associated gas has been estimated by the Canadian administration for 2016 and 2017.

Non-associated gas production data include *colliery gas* as well as associated gas produced in Alberta.

Transformation

For 2000, the increase in *main activity producer electricity* is due to new generation plants in Alberta and Ontario.

Due to confidentiality reasons, the Canadian administration estimated **natural gas** consumption in *oil refineries* for the 2014-2017.

Gas-to-liquids (transformation) represents quantities of **natural gas** consumed in the production of synthetic crude oil.

Non-specified transformation represents quantities of **natural gas** used for the upgrading of refined oil products.

Consumption

In the 2019 edition, the *oil and gas extraction* consumption was revised back to 2005 in order to more accurately separate it from other mining/extractive activities.

In the 2019 edition, an improved methodology was applied to *industry sector* for 2005 onwards resulting in a share of the *not elsewhere specified (industry)* being

allocated to various industrial sub-sectors and creating breaks between 2004 and 2005.

Starting with 2014 data, **natural gas distribution losses** will no longer be reported by Canada as this flow was historically computed as a balancing variable.

Due to confidentiality reasons, the Canadian administration estimated **natural gas** consumption in the following sectors for 2014-2017: *iron and steel, non-ferrous metal, transport equipment and machinery*.

For 2011, the increase consumption by *non-metallic mineral* production is due to switching from **coal** to **natural gas** in cement manufacturing.

Prior to 1990 data for consumption of **natural gas** for *construction* are not available.

Prior to 1978, consumption in *non-specified industry* includes gas used as fuel in *oil refineries*.

Prior to 1978, agriculture is included in industry, and no detailed industry sub-sector data are available.

Biofuels and waste

General notes

In the 2022 edition, **solid biofuels** were significantly revised starting from 2016 due to the utilization of new data sources. This may lead to data breaks in the transformation sector between 2015 and 2016.

The split of **municipal waste** reported assumes 65% renewable and 35% non-renewable.

The IEA Secretariat has estimated the data for **biogases, industrial and municipal waste** from 1990 to 2004, **biogasoline** (ethanol) from 1998 to 2004 based on information supplied by Natural Resources Canada.

Supply

Canadian **biodiesel** production increased significantly in 2014 because a large producer came online at the end of 2013. In 2016 again, there was a big increase in production of **biodiesel** due to a large plant coming online in Alberta. This is also the reason for the increase in export, as Canada exports most of its **biodiesel** to the US.

There were no exports of **biogasoline** since 2013.

Consumption

In the 2022 edition, due to the utilisation of new data sources, data breaks are visible between 2004 and 2005 for **solid biofuels**.

Electricity and heat

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 (RESO). 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

In 2019, the Annapolis Royal **tidal** power station closed.

In the 2018 edition, revisions were made to electricity production from **wind** back to 2013.

Discrepancies occur between respective reported figures for **electricity** trade between Canada and the US from 2016 onwards.

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.

Starting in 2009, a new source has been used for electricity production from **solar**, **wind**, and **tide**. This new source covers production from **solar** and **wind** only from plants with capacity higher than 500 kW.

Heat production includes **heat** produced by **nuclear** power stations for distribution to other consumers up to 1997.

Electricity production from **other sources** mainly refers to steam and waste heat.

Transformation

For the 2022 edition, the Canadian Administration submitted revised data for **solid biofuel**, due to the incorporation of data from the Industrial Consumption of Energy survey alongside existing data from the Annual Electric Thermal Generating Stations survey.

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.

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**.

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

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

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 chemicals 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.

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.

Coal

General notes

Other bituminous coal data includes **sub-bituminous coal** for all years up to 2018, if present.

Supply

Stock change data for the year 2020p is not currently available. It will be completed in the next publication.

Data for **sub-bituminous coal** is reported for the first time for the year 2020.

In the 2021 edition, imports and consumption of **anthracite** are reported for the first time. The time series has been completed back to 2015.

Consumption

Since 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 series between 1989 and 1990.

Oil

General notes

There are breaks in time series between 2008 and 2009 due to a change in methodology by the Chilean administration.

Supply

Receipts from other sources of other hydrocarbons correspond to natural gas used in refineries. These quantities are the results of *not-elsewhere specified transformation* in the Balances format.

Consumption

Starting with 2017 reference year data the administration can now identify consumption in construction and agriculture. Prior to these quantities were reported under not elsewhere specified.

Natural gas

General notes

The 2017 and 2018 values for *not elsewhere specified transformation* and *oil refineries* have been estimated by the IEA secretariat.

Supply

Chile started reporting *exports* of **natural gas** with 2016 data.

Data representing **LPG** injected into the **natural gas** distribution network are available starting in 2009. They are reported in *from other sources - oil*.

Transformation

For 2009 and 2010, inputs of **natural gas** to *autoproducer CHP* plants were estimated by the Chilean administration. For other years, these inputs are included in *autoproducer electricity* consumption.

Not elsewhere specified transformation represents **natural gas** that is blended with **refinery gas**.

Consumption

Natural gas used for *oil and gas extraction* is included in gas consumption for energy use in *oil refineries*.

Non-specified transport corresponds to marine transport.

Biofuels and waste

Supply

Production of **landfill gas** ceased from 2001 - 2014 as landfill sites stopped producing adequate gas to continue collection.

Transformation

A new survey on primary **solid biofuels** causes breaks in production and input to autoproducer CHP between 2011 and 2012.

Consumption

Charcoal production and consumption have been estimated by the IEA Secretariat until 2013. From 2014 data, only **solid biofuels** input to **charcoal** production plant is estimated.

The Chilean administration applied a new revised methodology for *final consumption* of **primary solid biofuels**. This may lead to data breaks in time series between 2013 and 2014.

Electricity and heat

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 from autoproducer **hydro** 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 2014, data on 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) includes 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 by sector are not available. Therefore, all consumption is allocated to the *non-specified other* sector.

Prior to 2009, most statistical differences are included in distribution losses.

Colombia

Sources

Sources for 2019 onwards:

Ministry of Mines and Energy, Bogota.

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Energía y Minas Para el Progreso Social 1982-1986, Ministerio de Minas y Energía, Bogotá, 1987.

Sources for Biofuels and waste:

Ministry of Mines and Energy, Energy Information Department, Bogotá.

General notes

Data for Colombia are available starting in 1971.

Colombia joined the OECD in April 2020. Colombia submitted questionnaires with data for 2019 starting in 2021 edition.

Historical revisions were not provided and some breaks in the time series can appear for 2018/2019.

Due to the new questionnaire layout used, minor revisions occurred for years 1990-2018, leading to minor breaks in the time series for 1989/1990.

In the 2020 edition, data for solar photovoltaic and biogas were added, based on new information from Unidad de Planeación Minero Energética (UPME) and the International Renewable Energy Agency (IRENA).

In the 2020 edition, the oil balance was revised based on new information from UPME, Asociación Colombiana del Petróleo (ACP), Refinería de Cartagena and Ecopetrol. Time series for paraffin waxes, bitumen and lubricants are now available from 1992 onwards. Petroleum coke data are available from 2016

onwards. Data for non-specified oil products are partially estimated by the IEA Secretariat, and include products such as arotar, slop, sulphur and propylene. Naphtha is revised from 2008 onwards to reflect UPME and Ecopetrol information on exports and imports. Transfers of naphtha for crude oil dilution are estimated by the IEA Secretariat. Crude oil stock changes and transfers are revised from 2010 onwards, as well as 2010-2013 supply and refinery input of crude oil to take into account the latest information from UPME.

In the 2020 edition, the correction of discrepancies in biodiesel and ethanol data leads to revisions in biodiesel, ethanol, diesel and motor gasoline data from 2005 onwards.

In the 2018 edition, time series for the period 2013-2016 were revised based on new energy balances received from UPME. Breaks in time series may occur between 2012 and 2013.

Coal

Supply

Coking coal production was estimated by the IEA Secretariat for the data year 2020.

Consumption

Data for non-energy use is not currently available.

Oil

General notes

In the 2021 and 2022 editions, data for Colombia prior to 1990 in the Oil Information may be different from those in World Energy Statistics due to a change in reporting methodology. The data from 1990 onwards reflect the conventions and methodologies of the IEA/Eurostat/UNECE annual oil questionnaire. As such, there may be breaks between 1989 and 1990.

In the 2021 edition, data for **lubricants** and **paraffin wax** are estimated by the IEA Secretariat.

Supply

The stock change of crude oil in 2020 may include some missing coverage in indigenous production.

From 2010, products transferred of **refinery feedstocks** refer to naphtha blended with crude oil for dilution at refineries.

Stock changes of some primary and secondary oil products are estimated by the IEA Secretariat.

Consumption

Consumption of **jet kerosene** for international aviation may include consumption for domestic aviation.

Crude oil may be used at refineries to support refinery operations. From 1990 onwards, these are reflected in the statistical difference.

Electricity and heat

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.

Costa Rica

Sources

Sources for 2016 onwards:

Secretaría Planificación Subsector Energía (SEPSE), San José

Sources up to 2015:

Direct communication with the Ministerio del Ambiente y Energía, San José.

Balance Energético Nacional, Secretaría Planificación Subsector Energía (SEPSE), San José, various editions.

IEA Secretariat estimates.

General notes

Data for Costa Rica are available starting in 1971.

Costa Rica joined the OECD in May 2021. Costa Rica submitted questionnaires with data for 2020 starting in 2022 edition.

In the 2022 edition, data were largely revised across all fuels for years 2016 to 2019, leading to large breaks in 2015/2016.

In the 2020 edition, due to clarification given by Secretaría Planificación del Subsector Energía (SEPSE), data for **coke oven coke** were revised to zero and corresponding figures reported as **petroleum coke**, for use in the cement industry.

In the 2020 edition, crude oil transfers and stock changes are revised between 2013 and 2015 to reflect the blending of remaining crude oil inventories with products after the closure of the refinery in 2011. As a result of this revision, NGL data is no longer reported. Transfers of fuel oil to gasoil are estimated in 2016 and 2017, while 2018 transfers data is reported by SEPSE.

Data previously reported in non-specified (other) consumption of gasoil is now reported in the construction sector from 2005.

In the 2019 edition, the IEA integrated revisions received from the country for the years 2006-2016. Most changes are for primary solid biofuels.

Coal

General notes

Other bituminous coal and **anthracite** are reported together until 2015 and separated from 2016.

Oil

Consumption

In the 2022 edition, non-energy consumption of **bitumen** is reported in construction for the time series. Previously, they were reported in non-energy use in industry/transformation/energy.

Biofuels and waste

Transformation

Solid biofuels CHP auto-producers are classified as electricity auto-producers before 2016.

Electricity and heat

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 nettogross ratio for each year. Revisions are pending.

Transformation

Prior to 2016, inputs of **residual fuel oil** and **nonbio gas/diesel oil** 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

Due to ongoing review of energy data for 2010-2014, revisions have been made in the 2017 edition. Full details are given under each fuel.

Data are available starting in 1971.

Coal

General notes

Other bituminous coal data include **sub-bituminous coal** for all years, if present.

In the 2022 edition, calorific values were revised for the historical time series leading to revised input to main electricity producer plants and TES.

In the 2018 edition, data for the Czech Republic were revised back to 2010 based on administrative data causing breaks in time series between 2009 and 2010. These revisions impacted mainly industrial consumption for **lignite**, **BKB** and **other recovered gases**.

In the 2017 edition, coal consumption in the residential sector has been revised back to 2010 due to a new survey in households made by Czech Statistical Office, creating breaks in time series between 2009 and 2010.

Increased production and consumption of **other recovered gases** in 2014 is due to improved tracking of by-products from various transformation processes. Tail gases from the production of carbon black from coal tar are reported here, as are off gases from the manufacture and cleaning of syngas from lignite for an IGCC plant.

Coal which had been previously classified as **sub-bituminous coal** until the 2008 edition is now reported under **lignite** for all years.

Revisions by the Czech administration have resulted in some breaks in time series between 2001 and 2002.

Data for 1990 to 1995 were estimated based on the Czech publication Energy Economy Year Book.

In 1995, town gas production (included in **gas works gas**) ceased.

Since 2010 **BKB** includes multipurpose brown coal dust for both supply and consumption.

Supply

In the 2021 edition, revisions were made for the period 2010-2018 to the consumption of **other bituminous coal** and **lignite** in Main Activity Producer CHP Plants and Main Activity Producer Electricity Plants. Only the structure changed, the total did not change. Revisions were also made to the calorific values of these products and flows for the same time period.

Mining in Lazy Mine was lowered until the closure of the mine in November 2019. This shows in the decrease of production of **coking coal**.

Imports of **lignite** for the year 2019p are expected to be revised upward in the next edition as more comprehensive data will be available.

Other recovered gases are combustible gases obtained during the production of **gas works gas** and as a result of chemical processes.

Production *from other sources* of **other bituminous coal** is from coal slurries.

A portion of **other bituminous coal** reported under *from other sources* for the period 2010-2015 correspond to reclassified **coking coal**.

Statistical differences for **coking coal** for the period 2010-2015 are partly due to the reclassification of coking coal to **other bituminous coal**.

Consumption

In the 2019 edition, **coke oven gas** in energy own-use consumed by electricity, CHP and heat plants was revised for 2016 resulting in a break in the series.

In the 2015 edition, improved reporting enabled revisions to be made for certain primary **coal** consumption flows between 2010 and 2012.

In the 2014 edition, residential consumption for the period 1990 through 2011 was revised for **other bituminous coal, lignite, coke oven coke** and **BKB**, as more accurate consumption data became available.

Due to economic restructuring in consumption in the late 1990s (big state enterprises subdividing and/or privatising and the utilisation of new technologies by businesses), there may be breaks in time series in these sectors.

Oil

General notes

Data prior to 1994 are estimated by the IEA Secretariat.

In 2016 both Czech refineries were affected by accidents which resulted in decreased refinery throughput, increased refinery losses and a large decrease in imports of **crude oil** offset by increased imports of finished products. The second accident affected the ethylene production unit and led to decreased activity in the petrochemical sector.

In 2017, the units previously affected by accidents were upgraded and operations resumed with increased output

Transformation

From 2002 data onwards, some amounts of **fuel oil** have been reclassified under **other products**. This change mainly affects the transformation sector.

Consumption

Between 1998 and 1999, breaks in **gas/diesel** final consumption time series are due to a new data management system implemented by the Czech administration.

Natural gas

General notes

Between 1993 and 1994 there are some breaks in time series due to a change in the energy balance methodology between former Czechoslovakia and the Czech Republic. Since 1993, data have been officially submitted by the Czech Statistical Office.

Supply

From 2013 all *non-associated gas* production was reclassified as *colliery gas* production.

Transformation

In the 2022 edition, the large increase in inputs for electricity generation in autoproducers is due to the cessation of energy gas production (gas works gas) in one company and its replacement by natural gas.

In 1996 **natural gas** inputs into *gas works (transformation)* ended.

Consumption

Prior to 1994 data in *transport sector* are for former Czechoslovakia.

There is a break in time series in the *industry* and *transformation sectors* between 2009 and 2010 due to new available data from distribution companies.

Starting with 2008 data, hydrogen production is reported in *chemical and petrochemical* feedstocks as non-energy use. Up to 2007, *chemical and petrochemical* consumption includes both energy and non-energy use.

Biofuels and waste

General notes

The restructuring of the Czech electricity market leads to breaks in the time series in all sectors between 1998 and 1999.

Data for **municipal waste** and **solid biofuels** are not available prior to 1990 and **liquid biofuels** data are not available prior to 1992.

Supply

The increase in the consumption of **industrial wastes (non-renewable)** in the *non-metallic minerals* sector in 2018 is related to increased demand from cement companies.

Transformation

For 2016 data, an increased excise duty was imposed on **biofuels**, causing a decline in consumption.

In 2016, a main activity producer CHP incineration plant fired by **municipal waste** was in test operation at Chotikov.

Consumption

In the 2017 edition, due to a new survey in households made by the Czech Statistical Office in 2015 (ENERGO 2015), **solid biofuels** consumption in residential sector has been considerably revised upwards since 1990.

Hospital waste previously reported as **municipal waste** is reported under **industrial waste** since 2008.

New survey systems cause breaks in final consumption in 1999 and in 2002. Breaks in both supply and consumption of biofuels and waste occur again in 2003.

Electricity and heat

General notes

In the 2021 edition, there were revisions for **solar thermal** from 2006 to 2018.

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.

For 2017, apparent declines in autoproducer **heat** production by the *chemical and petrochemical* sector, and in consumption by *petroleum refineries*, occur due to the incorporation of an oil refinery into a neighbouring petrochemical enterprise.

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 the Slovak Republic.

Transformation

For 2020 data onwards, a new method was used to allocate data between electricity only and CHP plants. This result in some breaks between 2019 and 2020.

In the 2020 edition, a revision of the methodology for reporting the production of autoproducer plants running on **combustible fuels** removed multiple breaks in time series between 2009 and 2010 for CHP and electricity-only plants that were 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.

Electricity generated from **waste heat** in CHP plants is included with the total production from **combustible fuels**.

Data on **heat** own use and **heat** imports start in 2010 and 2009 respectively, following extensive revisions by the Czech administration in the 2017 edition due to the acquisition of new administrative data. Prior to this period, data are not available due to lack of sources.

The production of electricity reported in the category **other fuel sources** refers to electricity produced from turbines driven by the mixture of air, ammonia and other non-coal gases derived from the petrochemical industry.

From 2014, some autoproducer **heat** plants production figures became too small to appear in data collected.

From 2012 data, new autoproducer **heat** plants were added to the data collection, causing a break in time series.

In 2012, a main activity producer electricity plant using **solid biofuels** started to produce also heat and was reclassified as main activity CHP plant.

A different reporting methodology used by the Czech administration for **biofuels and waste** causes some breaks in time series between 2002 and 2003.

In 1999 and 2000, various big enterprises have been 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.

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.

Coal

General notes

In the 2020 edition, the historical series for gas works gas have been revised and set to 0 for all flows. After a revision of the definitions it was concluded that there is no gas works gas transformation taking place in Denmark.

Supply

Trade data for **other bituminous coal** might include transit trade.

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*.

Oil

General notes

In the 2020 edition, as a result of resolved confidentiality issues, **biogasoline** and **biodiesel** are reported separately from 2012 onwards.

Starting with 2013 data the Danish administration reports products transferred to refinery feedstocks. In previous years refinery output is reported net of product transfers.

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.

Information on waste oil recycling and final consumption begins in 1989 and is reported in other oil products.

In 1988, consumption of **gasoline type jet fuel** ceased.

As of 1987, separate data for **paraffin waxes** are no longer available.

Prior to 1975, **refinery gas** is reported net of consumption in refineries.

Supply

Quantities of other hydrocarbons represent **natural gas** used by refineries.

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.

Consumption

Consumption data are based on a detailed survey sent to companies in Denmark every other year. For non-survey years, the consumption figures are estimated by the Danish Energy Agency

White spirit and lubricants deliveries are estimated by Denmark.

For 1994 and 1995, industry detail is based on a new survey.

Prior to 1990, gas/diesel oil and fuel oil consumption for fishing are included in domestic navigation

Natural gas

Transformation

In Edition 2020, *gas works (transformation)* were revised due to a change in the reporting methodology.

Consumption

The consumption of LNG for marine transport and *international marine bunkers* is not reported due to confidentiality.

The breakdown for industrial consumption for the latest year is estimated by the Danish administration using the previous year's *industry sector* sub-sectoral shares and updated the following year.

Biofuels and waste

Transformation

In the 2022 edition, the 2020 figure of heat generation from **biogas** heat autoproducer plants has been estimated by the IEA Secretariat.

From 2012, **biodiesel** production is confidential and gathered with imports.

Consumption

In the 2020 edition, the consumption of **municipal wastes** in the *commercial and public services sector* for 2017 data was revised.

In the 2016 edition, the Danish administration revised energy consumption in industry sectors causing some breaks in **solid biofuels** consumption between 2010 and 2011.

The data on the consumption of **municipal waste** in the industry sector are delayed by one year and the Danish administration duplicates the previous year's data until the data become available.

The Danish administration estimates the growth in consumption of **solid biofuels** in the industry sector for the most recent year based on the growth in the transformation sector.

Electricity and heat

General notes

In the 2020 edition, there were revisions from 2010 to 2017 for **solid biofuels**, **biogases** and **solar thermal**.

Heat data are not available prior to 1976.

Supply

For 2019 data, 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.

In 2017, the declines 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.

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

Heat produced for sale by heat pumps starts in 1994.

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

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

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

Transformation

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, solid biofuels, 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. Inclusion

of small quantities of heat output from oil used alongside municipal waste in data for municipal waste may also affect efficiencies.

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 2020, the breakdown of **electricity** and **heat** total final consumption is estimated by the Danish administration based on 2019 data and will be revised in the following 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.

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.

Coal

General notes

Fuels reported as **coke oven gas** and **gas works gas** are the gaseous by-products of **oil shale** liquefaction. Shale oil production has two technologies: solid heat carrier (SHC) and gas generators (GG). SHC output byproduct (in addition to oil shale) is semi-coke oven gas, which is categorized under **coke oven gas**. The GG byproducts (in addition to oil shale, fenols) are generator gas, which is categorized under **gas work gas** and semi-coke, which is categorized under **coke oven coke**. Inputs of **oil shale** to “gas works”, “coke ovens” and for “coal liquefaction plants”, while reported separately, combined, are the inputs for retorting in liquefaction plants. These definitions and classification were applied to all the time series, back to 1990, in the 2022 edition.

In 2019, the production and consumption of **oil shale** decreased significantly. This was due to two factors: CO₂ and Russian electricity prices made the power generation from this fuel less accessible to the market; and at the same time Estonia was developing a strategy to reduce the direct burning of oil shale into electricity.

In the 2013 edition, data for **oil shale** production for the period 1991 to 1997 were revised to match Estonian GHG National Inventory values. Consumption data remained unchanged.

Supply

Indigenous production of **peat products** stopped in 2017.

Oil

General notes

In the 2021 edition, the Estonian administration submitted some revisions for *residential* consumption data and corrections in the historical time series. This affects **gas/diesel oil**, in particular.

In 2012 data, breaks in time series occur for trade figures, now including re-exports, and for international bunkers.

For 1990 to 2007, oil data are based on direct communication with Statistics Estonia and UNECE.

Natural gas

Consumption

Consumption reported under *not elsewhere specified (Energy)* represents consumption of different activities of companies in the energy sector (NACE 35) for own uses without transformation.

There are inconsistencies in the time series for *residential* consumption as this sector is computed as a residual.

In 2014 Estonia's main company in the *chemical and petrochemical* sector ceased activity, resulting in no non-energy use of natural gas.

In 2009 Estonia's main producer of fertilisers ceased activity, resulting in a sharp decrease in the non-energy use of **natural gas**. The plant reopened in 2012.

Biofuels and waste

General notes

In the 2021 edition, revisions were made in main activity producers burning **municipal wastes** from 2015 to 2018.

In the 2021 edition, revisions were made in electricity plants burning **solid biofuels** in 2017 and 2018.

In the 2021 edition, revisions were made in main activity producers burning **industrial waste (non-renewable)** from 2016 to 2018.

In the 2021 edition, there were revisions in the *non-metallic minerals* sector from 2015 to 2018 for **industrial waste (non-renewable)** and **municipal wastes**.

In the 2021 edition, there was a revision in the *wood and wood products* sector for **primary solid biofuels (excluding charcoal)** in 2017.

Data for **biogases** include **landfill gas** starting in 2005.

Electricity and heat

General notes

In the 2022 edition, the Estonian Administration revised historical data, in particular, for **oil shale**, **coke oven gas**, and **gas works gas**, in order to better align data with that reported by companies under the EU Emissions Trading System (ETS).

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 2016. In particular, for **renewable municipal waste**, **coke oven gas**, and **industrial waste**.

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

Electricity consumption in *road* mainly refers to trolley buses.

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.

Coal

General notes

Coal tar used for non-energy purposes or exported is not reported in either production or consumption.

In the 2015 edition, revisions were received for some consumption flows of **other bituminous coal** and **coke oven coke**, while **other recovered gases** (from ferrochromium manufacture) were reported separately for the first time, with revisions back to 2000. Prior to 2000, off-gases from ferrochromium manufacture are included in blast furnace gas, and inputs of **coke oven coke** for ferrochromium manufacture in inputs to blast furnaces instead of *non-specified transformation*.

Prior to 2008, **peat products** are included with peat data.

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.

Production of **gas works gas** ceased in April 1994.

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

Supply

Peat products refer to peat briquettes and pellets, which were supplied from old stocks for 2019 and 2020.

Transformation

The consumption of **other bituminous coal** in the energy sector (own use in electricity, CHP and heat plants) covers the use of coal in the pilot phase of a new power plant (the amount of coal was not used for producing any useful heat or electricity).

In 2017, the consumption of coal in main activity producer electricity plants decreased considerably following the move of a large plant to the national capacity reserve.

The significant increases and decreases of **other bituminous coal** inputs into main activity producer electricity plants from year to year are due to coal replacing imported electricity and hydro power.

Likewise, **peat** production is highly dependent upon favourable weather conditions and the pricing of other fuels. The decrease in **peat** and **other bituminous coal** usage in main activity electricity plants in 2008 was due to record electricity generation from hydro plants. A similar circumstance occurred in 2012.

The first coking plant started operation in 1987, hence imports of **coking coal** and production of **coke oven coke** and **coke oven gas** started in that year.

Consumption

Some consumption of **other bituminous coal** is reported for the first time in 2019 as energy industry own use. This covers the use of coal in the pilot phase of a new power plant (the amount of coal was not used for producing any useful heat or electricity).

Food, tobacco and beverages reports 1kt consumption of **coke oven coke** in 2019 after zero in 2018. This is due to rounding (2018: 0,46 kt and 2019: 0,72 kt).

Oil

General notes

The 2018 edition includes revisions to data for several products from 1999 onwards.

Several revisions to petrochemical data were introduced, including a reclassification of quantities between energy and non-energy use. Further revisions are pending.

In spring 2015, the Porvoo refinery had the largest shut down in its history for maintenance works. This is the reason for the large decrease in refinery throughput in 2015.

In 2014, the Finnish administration revised the time series for **refinery gas** from 2000 and included flaring of petrochemical gases under *distribution losses*.

Prior to 2002, **petroleum coke** used as *refinery fuel* was included with refinery gas.

In 1995, there is a break in time series for **oil products** trade due to the aligning of the National Board of Customs trade data collection system with the European Union's Intrastat system.

Other hydrocarbons reported under *from other sources natural gas* correspond to hydrogen used in refineries, also represented as the output of *non-specified transformation* in the balances format.

Consumption

Data on non-energy transformation of naphtha in the petrochemical sector is now available from 1990 onwards.

Due to a new calculation model, there is a break in **fuel oil other consumption** between 1998 and 1999.

Natural gas

General notes

Finland imports LNG since September 2016. Before 2018 there was only one company operating in this market, LNG supply data was thus confidential and excluded from the supply side flows.

Between 1999 and 2000 there are some breaks in the time series due to a new survey system and a reclassification of the data.

Supply

Data for *international marine bunkers* consumption started being reported in 2017.

The opening and closing stock levels data are confidential and stock changes data for 2017 are estimates by the Finnish administration. Transformation

Non-specified transformation data represent **natural gas** used for hydrogen manufacture. This hydrogen is used for hydrodesulphurization and hydrocracking in oil refineries

Consumption

Distribution losses include the quantities of boil-off **natural gas** originating from the natural evaporation of LNG in tanks.

Not elsewhere specified (transport) includes LNG consumption for domestic navigation.

Since 1995 data, the breakdown between *residential* and *commercial/public services* is available due to a new system of data collection.

Prior to 1989, **natural gas** consumption in *residential* and *agriculture/forestry* had been estimated by the Finnish administration.

Biofuels and waste

General notes

Prior to 2004, **industrial waste** also included other energy forms such as hydrogen, heat from chemical processes, natural gas and blast furnace gas.

Data for **biogases** and **industrial waste** are available from 1996.

Supply

Due to confidentiality, the **biodiesel** production includes trade figures and stock changes starting with 2015 data. **Biogasoline** import for the same time period covers production, exports and stock changes.

Transformation

The use of **charcoal** in blast furnaces started in 2018 on a test basis.

The amount of **biodiesel** used for blending with diesel fell greatly in 2016 after record levels for the past two years. Annual variation in the consumption of biofuels is possible and caused by Finland's biofuel legislation, which gives distributors the possibility to fulfil the bio obligation flexibly in advance.

Consumption

Starting in 2017, the large increase of **biogas** consumption in the *paper, pulp and printing* industry is due to a change in process in the industry. Wood was gasified and replaced **natural gas** or **oil**.

Electricity and heat

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 from the new Katri Vala district heating and cooling plant.

Heat from chemical processes and associated electricity generation are available from 2000.

Transformation

Electricity plants data may include some CHP plants operating in electricity-only mode. Likewise, heat plants data may include some CHP plants operating in heat-only mode.

In the 2017 edition, fuel inputs and heat production from **peat** main activity heat plants have been revised since 2000 as new data became available for small peat heat plant units.

In the 2016 edition, the allocation of **solar photovoltaic** between main activity and autoproducer plants was revised.

From 2014 data, an autoproducer in the field of iron and steel industry running on **coke oven gases** and **blast furnace gases** was sold and is now reported as main-activity producer.

The increase in heat production from **municipal waste** in 2014 is due to the opening of a new plant.

In 2014, the new consumption of **other liquid biofuels** in main activity electricity plant corresponds to biopyrolysis oil made from wood chips.

Data on **peat products** electricity and heat generation are available since 2008. Prior to that, they are included in **peat**.

Heat output from autoproducer CHP plants is available starting in 1996 and from autoproducer heat plants starting in 2000; corresponding inputs may be under-reported.

Before 1999, all electricity production from autoproducers running on **fuelwood** is allocated to CHP plants.

Electricity and heat production from **biogases** are available from 1996.

Prior to 1992, outputs from the use of **combustible renewables and waste** to generate electricity and/or heat were included in peat. Therefore, the IEA Secretariat estimated the breakdown of outputs from **municipal waste** and **solid biofuels** based on reported inputs.

Inputs of **liquid fuels** and **natural gas** to CHP plants are included with the inputs of these fuels to main activity producer electricity only and heat only plants prior to 1978.

Electricity production from **biofuels and waste** is not available between 1974 and 1976.

Consumption

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 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.

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.

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 consumption in *agriculture/forestry* and *commercial/public services* is included under *industry non-specified*.

Consumption of **electricity** in the industry sub-sector *machinery* includes consumption in *transport equipment* prior to 1995.

France

Source

Ministère de la Transition Écologique et Solidaire, Paris.

General notes

In the 2018 edition, data for France were revised back to 2011 following changes in methodology and procedures used by the energy statistics sub-department (SDSE) within the Ministry for the ecological and inclusive transition. As a result, the revisions, to bring the reporting more in line with the international standards, impacted all fuels. Additional details are given under each fuel.

From 2012, the energy consumption is more detailed due to a more precise national survey.

From 2011 data onwards, France now 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).

Coal

General notes

Due to confidentiality reasons, some demand flows have been merged for the products **other bituminous coal** and **anthracite**, starting in 2020. Those aggregations are: paper, pulp and printing, food, beverage and tobacco, and not elsewhere specified (industry); machinery, non ferrous metals and non-metallic minerals.

Due to confidentiality reasons, some demand flows have been merged for the products **lignite** and **BKB**, starting in 2020. The flows merged are iron & steel, chemical and petrochemical, non ferrous metals and non metallic minerals.

Due to confidentiality reasons, the flows iron and steels and non ferrous metals have been merged for **coke oven coke**, starting in 2020.

Due to confidentiality reasons, **blast furnace gas** includes **blast furnaces gas**, **coke oven gas** and **other recovered gases** from 2018 onwards. This

aggregation may lead to unusual figures and efficiencies in the energy balance and CO₂ emissions.

The losses of **blast furnace gas**, **coke oven gas** and **other recovered gases** are included under statistical difference until 2016. From 2017 onwards these losses are reported under “other energy uses”.

In 2018 edition, the calorific value of coking coal has been revised in agreement with Eurostat and the IEA. The revision was made for the period 1990 to 2016.

In the 2017 edition, the French administration undertook comprehensive revisions on sectoral coal consumption back to 2011. Starting this edition, new information became available for **anthracite**, **BKB** and **other recovered gases**.

From 2012, the energy consumption is more detailed due to a more precise national survey.

Prior to 2011, **other manufactured gases** (oxygen steel furnace gas) are included in **blast furnace gas**.

For 1989 to 1998, the IEA Secretariat has estimated industry consumption based on *Consommations d’Energie dans l’Industrie*, SESSI.

Prior to 1985, consumption of colliery gas is included with the use of **coke oven gas** by autoproducers.

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

Transformation

In the 2021 edition, revisions were made on the split of **other bituminous coal** between Main Activity Producer Electricity Plants and Main Activity Producer CHP Plants for the period 2011-2018.

In the 2021 edition, following a methodological change, a power plant was reallocated from main activity producer to autoproducer. Hence, there is no more figure for **other manufactured gases** in the first. This was done for 2018 and 2019.

In 2017 the use of **other bituminous coal** into transformation for electricity increased by more than 20% to compensate lower generation from nuclear and hydro plants.

In 2016 the company that consumed **blast furnace gas** for electricity and heat generation ceased its activity.

Consumption

In the 2018 edition, the split of energy consumption between the residential sector and the commerce and public services sector has been revised back to 1990 by the French administration for **other bituminous coal, lignite, coke oven coke, BKB** and **patent fuel**.

Blast furnace gas and **coke oven gas** used for energy purposes in blast furnaces are no longer reported under the iron and steel industry. As of the 2018 edition these quantities are reported under the energy sector.

Final consumption in industry is estimated by the Secretariat from 1986 to 2001 for some products.

Oil

General notes

In the 2021 edition, the French administration revised the deliveries of **gas/diesel oil** and **fuel oil** for *international marine bunkers* and consumption in *domestic navigation* from 2011 onwards as a result of a change in methodology and improved data for the overseas territories.

Statistical differences observed for motor gasoline and naphtha are partly due to the absence of a specific naphtha category in the customs classification.

Statistical differences appear for other products as a result of different definitions used for this residual category between the customs, refineries, power plants and petrochemical industry.

From 2013, information is available for imports of condensates used by the petrochemical sector. These are reported under imports of NGL, interproduct transfers of NGL to other oil products, and consumption of other products.

From 1991, **additives and oxygenates** data are available.

Supply

Due to classification issues noted by the French administration, there is a large statistical difference for **other kerosene** in 2020.

Breaks in trade and transfers of refinery feedstocks, **naphtha**, **gas/diesel oil** and **fuel oil** occur in 2020 due to new reallocation following customs information obtained by the French administration.

The decrease in output of **naphtha** in 2019 is due to refinery maintenance shutdowns, particularly of the Grandpuits refinery with the drilling of the Ile-de-France pipeline (PLIF).

Higher than usual seasonal maintenance in the spring of 2018 impacted refinery intake and output.

From 2009, transfers of **kerosene type jet fuel** to **white spirit** correspond to kerosene used as a base for making white spirit.

From 2008 data, refinery intake of **refinery feedstock** and refinery output of **refinery gas** output figures exclude natural gas used in the steam reformer of the Gonfreville refinery.

From 2008 data, **ethane** refinery output is reported

From 2002 data onwards, ethylene produced in Lacq is not included in NGL.

From 1998 data, a different treatment of transfers was adopted. Imported oil products needing further refinery processing are no longer reported as **refinery feedstock** imports but as oil product imports and products transferred. **Fuel oil** includes part of the amounts previously reported in **other oil products** from 1999 and various other products from 2001.

Transformation

Starting in 2012, separate data on main activity heat plants inputs are available.

Consumption

In the 2021 edition, the French administration revised the consumption split of **kerosene type jet fuel** between *international* and *domestic aviation* from 2011 onwards, taking into account non-commercial flights and resulting in an increase in the consumption share for *domestic aviation*.

From 2018, due to a reclassification of a power plant from the main electricity production sector to the chemicals sector, a decrease in inputs of **refinery gas** for main activity plants for CHP production is observed and complemented by an increase in its consumption for energy use in the *chemical sector*.

From 2018, consumption of **gas/diesel oil** in bakeries is reported in *food, beverage and tobacco*. In previous years, this consumption is included in *commercial and public services*.

In 2018, there is a decrease in deliveries to the petrochemical sector due to plant shutdowns for maintenance.

The breakdown between international and domestic marine bunkers is estimated by the French administration.

Between 2005 and 2006, a break is visible in **LPG** time series, as consumption from one chemical company was re-classified from energy use to non-energy use. Breaks in **LPG** time series also appear in 2001 due to improved data collection.

From 2000 data, **petroleum coke** consumption in the non-ferrous metals industry is no longer available separately. Prior to 1982, no breakdown between energy and non-energy use is available for this product.

From 1998 data, military consumption of **kerosene type jet fuel** is reported separately from domestic aviation.

Prior to 1988, **LPG** includes ethane consumption.

Prior to 1985, the residential sector consumption **of gas/diesel oil** is reported under the commerce/public services sector, as no separate data were available.

Natural gas

General notes

Starting from the 2018 edition, the French administration revised the methodology used in the 2018 edition to bring it more in line with the international standards. More specifically, (i) Supply figures were revised for the period 2007-2016, (ii) *transformation sector* consumption for 2007-2016, (iii) *energy sector* consumption for 2011-2016, (iv) transport and *commercial/public services* for 2000-2016, (v) *industry sector* for 2011-2016 and (vi) *imports and exports* for 2011-2016.

In the 2019 edition, the French administration revised the demand side from 2011 onwards by improving the methodology with the consolidation of data from SDSE surveys and additional official sources. In the 2022 edition, *inland consumption* was updated using the same methodology.

Until 2007, some statistical differences reported by the French utilities were included in *distribution losses*. Since 2008, these amounts are included under *statistical differences*.

Between 1999 and 2000, there are some breaks in time series due to a new methodology for preparing the **natural gas** balances.

The data include the French overseas departments, however **natural gas** is neither produced, nor consumed in these departments.

Supply

The total *imports* and *exports* data include transit amounts.

From 1990 to 1998, *statistical difference* includes gas consumption which is not broken down by sector.

Consumption

In the 2020 edition, *commercial and public services*, and *residential* was revised from 1990 to 1999 due to new data becoming available.

The increase in **natural gas** consumption in the electricity sector for 2016 and 2017 has been mainly driven by the decrease in nuclear generation due to maintenance operations, which was compensated by gas-fired power plants. Gas for pipelines is included in *distribution losses*.

Between 2005 and 2006, there is a break in the time series of the industry sub-sectors.

Biofuels and waste

General notes

In the 2018 edition, following an analysis of **biogases** in the energy sector by the French administration, there are revisions in **biogas** indigenous production, inputs to the transformation sector, heat production and final consumption back to 2005. Electricity production from **biogases** is revised back to 2011. This causes breaks in time series between 2004 and 2005 as well as 2010 and 2011.

Indigenous production, transformation and final consumption of industrial waste are reported from 2013. In the 2018 edition, indigenous production and transformation of industrial waste were added from 2007 - 2012. It follows that there is a break in time series between 2012 and 2013.

In the 2018 edition, solid biofuels' indigenous production and inputs to main activity and autoproducer heat plants have been revised back to 2007 Electricity

production has been revised back to 2013. This causes breaks in time series between 2006 and 2007 as well as 2012 and 2013.

In the 2018 edition, indigenous production and inputs to main activity heat plants have been revised back to 2007 for municipal waste. Electricity production has been revised back to 2011. This causes breaks in time series between 2006 and 2007 as well as 2010 and 2011.

Prior to 2007, production and consumption of industrial waste were included in municipal waste.

Transformation

Plants using **municipal waste** were reclassified as autoproducer CHP plants from 1995, which leads to a break in time series.

Breaks in time series in 2005 for **municipal waste** and **solid biofuels** are caused by sectoral reclassifications.

Consumption

A revision of the **solid biofuels** and **biogases** time series created breaks in the direct use time series between 2004 and 2005.

The breakdown of the final energy consumption of **biogases** was estimated by the French administration from 1970 to 2003.

Electricity and heat

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 MWp 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.

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.

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.

In the 2018 edition, electricity production from **hydro** was revised back to the year 2000, in some cases only amounting to plant reclassification.

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.

The amount of **heat** not sold in autoproducer plants is included in total heat production up to 2007.

In 2005, autoproducer CHP efficiencies for **biogases** drop due to the opening of a larger, less efficient plant.

From 2000 several plants have been reclassified from electricity only to CHP plants. This causes breaks in the time series between 1999 and 2000.

Prior to 2000, inputs and outputs of **oil products** are not available separately and are reported together under **other oil products**. From 2000 to 2008, there are further classification problems for inputs and outputs of electricity and heat from oil products. The French administration is working to reconcile their data collection methods for the inputs and the outputs for electricity generation.

A new method of survey and a reclassification between main activity producer electricity plants and autoproducer electricity plants may cause breaks in the time series for **other bituminous coal** between 1998 and 1999.

There was re-classification 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 and 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 *transmission and distribution losses* for **heat** 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.

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.

Coal

General notes

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.

Up to 2002, other bituminous coal includes anthracite.

Between 1998 and 2005, breaks in time series may occur for **coke oven gas** and **blast furnace gas**.

Between 1990 and 1992, breaks in time series may occur due to earlier reclassification of several sectors by the German administration; this particularly affects **BKB**, **lignite** and **coke oven coke**.

Supply

Hard coal mining in Germany ceased in 2018 with the last two hard coal mines being closed on December 21, 2018 due to profitability reasons. **Anthracite**, **coking coal** and **other bituminous coal** show null production in 2019.

Data on stock changes in the coal production sector (provided individually for all coal products) are no longer available from 2019 onwards as the companies in this sector no longer operate. For the other sectors (electricity and heat

producers, and industry), data on stock changes are only available for **hard coal** as an aggregate, and that is all reported under **other bituminous coal**.

Transformation

Breaks in time series between 2014 and 2015 for **coke oven gas** and **blast furnace gas** are due to a reclassification of main activity producers and autoproducers.

In 1997, BKB inputs to gas works plants stopped.

For some years of the period 1990-2002, discrepancies can appear between the publications *Coal Information* and *Electricity Information* in Electricity and CHP plants for the products lignite, gas works gas, coke oven gas and blast furnace gas.

Consumption

Consumption of **non-renewable municipal waste** and **other solid biofuels** as a reductant occurs in German blast furnaces, but is not currently quantified. Likewise, **coal tar** is a by-product of coke ovens, but not currently reported.

The data providers for the *commercial* and *residential* sectors were coal producers and import statistics, the first reporting the biggest amounts. As the **hard coal** production ceased in Germany, coal producer do not longer operate, and this data is not available from 2019. As consequence, the year 2019 shows a significant decrease in consumption in these sectors. In 2019, there was no increase in the imports delivered to these sectors.

Oil

General notes

In 2018, decreases in refinery intake and deliveries to the market can be attributed to the temporary shutdown of two high-capacity refineries.

In 2018, there are breaks in time series for several products due to methodological changes involving the inclusion of companies with olefin plants into the reporting group and the possibility to identify semi-finished products as deliveries to the market.

In 2017, the German administration included additional firms in the chemical sector to their data collection system. As a result, for 2017 data there is an increase in deliveries of oil products to the petrochemical sector.

In 2016 the German administration reclassified the consumption of a chemical company from **fuel oil** to **other oil products**. This leads to a decrease in the supply and consumption of fuel oil with a corresponding increase for other oil products. Due to the assumptions made by the German administration about the energy consumption of the respective products, this also creates a break in time series in the split between energy and non-energy consumption for the chemical sector.

In 2016 there are breaks in time series for **white spirit** due to an increase in data coverage. Historical revisions are expected in the next edition.

From 2000 data, part of the product *Andere Rückstände* (other residues) is included with fuel oil instead of other oil products.

Starting from 1994 data, there has been a reclassification of jet gasoline to kerosene type jet fuel.

Prior to 1979 data, **other products** include **paraffin waxes**, **bitumen**, **white spirit & SBP** and **lubricants** for eastern Germany.

The methodology to determine net calorific values has been changed for 2015 data. The values for crude oil and refinery feedstocks were revised back to 2003.

Transformation

In 2018, owing to methodological changes, inputs of **motor gasoline** for transformation use in the *petrochemical industry* are reported for the first time.

Consumption

In 2018, owing to methodological changes, consumption data for **motor gasoline** in the *chemical and petrochemical industry* as well as in *non-specified industry* are reported for the first time.

In 2018, consumption data for **motor gasoline** and **gas/diesel oil** in *construction* and *agriculture/forestry* are reported where they had previously been subsumed within the *commercial and public services* sector.

Between 2002 and 2003, breaks in time series in consumption data are due to structural changes in energy statistics following the newly introduced Energy Statistics Act.

In 1995 data, a break in **gas/diesel oil** consumption occurs as a result of an alignment with the Classification of the Economic Activities in the European Community (NACE).

Beginning in 1994, final consumption by individual sector has been improved due to new survey methods instituted by the *Minerölwirtschaftsverband*.

In 1989, end-use consumption of **gas/diesel** oil decreased due to an exceptionally warm winter and a lowering of consumer stocks.

Prior to 1980 data, consumption of **fuel oil** in blast furnaces was included in the iron and steel sector

Prior to 1970 data, consumption of **refinery gas** in the chemical industry is included with refineries' own consumption.

Natural gas

General notes

Between 2009 and 2010, there is a break in time series due to a new, more comprehensive legal framework that resulted in methodological changes for production and new calorific values for **natural gas**.

Supply

Starting in 2018, due to a change in the reporting methodology, *Imports* and *Exports* no longer include transit volumes, as was the case up until 2017.

Since 2018 onwards, indigenous production is being phased out, leading to a decrease in *non-associated gas*

Transformation

In 2003, there is a break in time series for input to electricity and CHP plants (both autoproducers and main activity producers).

Prior to 1995, inputs of **natural gas** for *main activity producer heat* plants are included with *main activity producer CHP* plants.

Consumption

In the 2020 edition, the German administration included energy use in *Agriculture/Forestry* and *Construction* for the period 2010-2018. In the next reporting cycle, values for 2003-2010 are expected.

Since 2018, gas distribution networks are included in *pipeline transport*, while it was only covering transmission networks before.

Since 2003, there are no official data for the *construction* sector.

Since 2003, consumption in *agriculture* and *non-specified other*, which were previously estimated, are no longer shown, and losses data have been included in *statistical differences*.

Since 2003, gas consumption in *coke ovens (transformation)* was negligible.

Between 2002 and 2003, there are breaks in time series for some sectors due to modifications in reporting methodology.

Between 1994 and 1995, there are some breaks in time series due to the fact that the industry sub-sector breakdown is based on the 1995 NACE classification.

Also, prior to 1995, end-use consumption data are based on *Arbeitsgemeinschaft Energiebilanzen*.

Before 1970 there is no detailed breakdown available for the *industry* sector with the exception of *iron and steel* and *chemical and petrochemical* industries.

Biofuels and waste

General notes

In the 2020 edition, there was a revision of nearly all renewables data back to 2003, basically related to error correction and new information. This leads to a break in series between 2002 and 2003.

Starting with the 2020 edition, final consumption in the *agriculture* sector is now reported separately. Previously, it was included in *commercial and public services*.

Starting in 2008, **municipal waste** and **industrial waste** data were collected separately. This leads to breaks in the time series between 2007 and 2008.

Between 1996 and 1997, a new survey for renewables causes breaks in the time series.

Supply

Trade data for **biogasoline** are available from 2004 and for **biodiesels** from 2003.

Consumption

Increased consumption of **industrial wastes (non-renewable)** in the *non-metallic minerals* sector in 2018 is related to increased cement production due to a high level of activity in the construction sector.

For **solid biofuels** consumption in the commercial and public services sector, new data were derived in cooperation with the Federal Research Institute for Rural Areas, Forestry and Fisheries by applying a different calculation approach based on the total demand for material and energy use of the resource wood in Germany. This had resulted in break in time series between 2013 and 2014.

Electricity and heat

General notes

In the 2014 edition, the German administration performed some major revisions back to 2003. This led to breaks in the time series between 2002 and 2003.

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.

Prior to 1970, **heat** production and consumption have been estimated by the Secretariat based on *Energie-bilanz der 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 onshore 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 reclassification of **blast furnace gas** main activity **electricity plants** into autoproducer plants results in a break in time series for the same period.

From 2003 onwards, all **heat** production in autoproducers is considered as non-sold (i.e. for self-use) and, therefore, not reported. Inputs for this heat production are no longer reported in the transformation sector.

For 2002 and 2003, the German administration did not submit the breakdown of electricity and heat production from **combustible fuels**. The data were estimated as follows: renewables and waste were taken from the Renewables and Waste Questionnaire and the other combustible fuels were estimated pro rata based on 2001 estimates.

Prior to 2003, **electricity** production in electricity plants includes production from CHP plants and heat production in CHP plants includes production from heat plants.

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

A new survey for the renewable products can cause breaks in the time series between 1998 and 1999.

Prior to 1993, all heat production from **BKB/peat briquettes** is included in main activity producer CHP plants.

Consumption

Increases in 2016 **electricity** generation by auto-producers within the *transport equipment* sector are due to reclassification from main activity generation, rather than development of new plant.

More information on district heat became available, causing breaks in the time series between 2006 and 2007.

Data on **geothermal heat** production and direct consumption are only available starting in 2003.

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.

Greece

Source

Ministry for Environment and Energy, Athens.

Coal

Supply

In 2019p data there was a significant decrease in **lignite** production and consumption due to less power generation in the country using this fuel.

Oil

General notes

In the 2016 edition, the Greek administration reclassified gasoline-type jet fuel as aviation gasoline starting from 2009 data.

Between 2012 and 2013, breaks time in time series for biodiesel, lubricants and stocks appear due to the introduction of a new reporting system.

Supply

Crude oil production stopped on 30 November 1998 and started again in December 1999.

From 1986 data onwards, information on **refinery feedstocks** is available

Transformation

From 1990 onwards, there has been an increased use of **refinery gas** in electricity generation, replacing **fuel oil**.

Consumption

In 2020, consumption of **gas/diesel oil** in electricity/CHP/heat plants (energy sector) refers to quantities used to support operations of a lignite plant. For previous years, they are reported in the transformation sector as inputs for CHP production in main activity plants.

In 2013 data, the drop of **gas/diesel oil** residential consumption is linked with changes in the taxation of heating oil.

From 1993 data onwards, more information is available on the allocation of fuel oil to specific industrial sub-sectors. Fuel oil consumption in the agriculture and residential sectors has been replaced by gas/diesel oil starting in 1993.

Prior to 1987 data, consumption in the commerce/public services sector is included with residential. Peaks in residential sector consumption in 1978 and 1982 are due to unusually cold winters.

Natural gas

General notes

Natural gas produced in Greece has a higher than average gross calorific value due to a high content of C₂/C₄ hydrocarbons.

In the 2020 edition, due to more disaggregated data and a revised methodology, years 2017 and 2018 are not comparable to time-series prior to this.

Supply

In November 1998 the *indigenous production* of **natural gas** stopped in and started again in December 1999.

In 1997, Greece started importing natural gas as a result of a new operational pipeline between Russia and Greece.

Consumption

In 2011 there is a break in time series for the *non-ferrous metals* due to a new methodology for measuring gas consumption in this sub-sector.

Since 2017, **natural gas** has started to be consumed in the *construction* sub-sector as well.

For 1998 data, consumption in the *residential* sector is included with *commercial/public services*.

Biofuels and waste

General notes

New information on **solid biofuels** is available from 1996 and leads to breaks between 1995 and 1996.

Data for **biogases** are available from 1990 and data for **industrial waste** from 1992.

Supply

Indigenous production and domestic supply of **industrial waste** have been estimated by the IEA Secretariat for 2019p.

Indigenous production of **solid biofuels** is estimated by the IEA Secretariat for 2015 based on consumption.

Transformation

The big increase in delivery of **industrial waste** to autoproducer CHP plant in 2010 is mainly due to the opening of a new plant.

Inputs of **solid biofuels** to **charcoal** production are estimated for 2007 to 2010 by the IEA Secretariat assuming an efficiency of 40%.

Industrial waste used in autoproducer CHP plants decreased substantially in 2006 because a plant closed.

Consumption

Solid biofuels consumption in commercial/public services is included in residential until 2011.

The consumption of **solid biofuels** in the paper, pulp and printing industry is not available from 2003 to 2012.

Electricity and heat

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

Prior to 2020, use of **gas/diesel oil** to support operations (rather than generate power) at **lignite**-fired Main CHP plant operations was reported as a transformation input.

Data on heat outputs from **natural gas**-fired Autoproducer CHP plants are available from 2020.

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.

Data for **biofuels and waste** input and output to transformation are available from 1992.

Consumption

In 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.

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.

Coal

General notes

In the 2020 edition, revisions back to 2014 were done for **blast furnace gas** to report separately the energy consumption for the support of blast furnaces. Previously, this consumption was reported as final consumption in the industry iron & steel.

From 1992, the production of **sub-bituminous** coal has been included with **lignite** due to the low quality of the coal. From 1990 to 1999, the use of this domestic coal in main activity producer electricity and CHP plants has also been reclassified to **lignite**. Since 2017, imports, transformation and consumption of **sub-bituminous coal** was reclassified as **lignite** by the Hungarian administration to align with foreign trade statistics.

Transformation

Some CHP units consuming **blast furnace gas** and **coke oven gas** were under maintenance in 2018.

In 2017, a main activity CHP plant using **other bituminous** coal was merged with an industrial unit of the pulp, paper and print sector and was since reclassified as an autoproducer.

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

Consumption

In the 2022 edition, revisions back to 2017 were made for the non-metallic minerals industry, by reallocating some quantities previously reported as **lignite** to **BKB**.

The cement industry in Hungary is progressively replacing the consumption of coal by waste. This situation is translated to a decreasing trend in consumption of other bituminous coal in the non-metallic minerals industry.

The consumption of coal tar in the category Non-Energy Use (petrochemical sector) increases in the year 2019. In previous years, CO₂ quotes prevented companies of this sector from using more coal tar, but in 2019 they installed new CO₂ filters, that enabled them to use more coal tar keeping CO₂ emission on the same level.

Oil

General notes

From 2010, *from other sources - natural gas* of **other hydrocarbons** correspond to hydrogen used in refineries for hydrodesulphurization, also represented as the output of *non-specified transformation* in the balances format.

Starting from 1998, data for additives and aviation gasoline are available.

In the 2022 edition, **other oil products** include ethylene, toluene, sulphur and FCC residue from 2012 onwards.

From 1994 onwards, other products include aromatics and other products that were previously included mainly under white spirit. Prior to 1993, **white spirit** is included in motor gasoline. Data for **refinery gas**, **paraffin waxes** and **lubricants** are partly estimated by the Secretariat.

Supply

In 2020, changes in the national legislation mandated an increase in the minimum blending of **biofuels**.

Consumption

In the 2016 and 2017 editions, revisions to consumption data back to 2010 were provided by the Hungarian administration following a survey introduced in 2014. This results in breaks in time series between 2009 and 2010.

Natural gas

General notes

Since 2022, one *chp plant* has been reclassified to an *autoproducer electricity plant*.

Between 2012 and 2013 there are some breaks in time series for the *energy, transport and industry sectors* consumption due to a new methodology. Historical revisions are pending.

Between 1996 and 1997 some breaks in time series exist due to a new methodology applied by the Hungarian administration.

Supply

Imports and *Exports* data are reported according to the TSO's data, which include transit volumes.

Transformation

Since 2010, data reported for *non-specified transformation* represent **natural gas** used for hydrogen manufacture used in refineries for hydrodesulphurization. Prior to this year, these quantities are reported under *oil refineries*.

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

Consumption

Beginning in 2016, electricity consumption under the *non-specified other* sector includes military usage, following recent clearance to disseminate these data.

Prior to 2004 *iron and steel* consumption includes transformation of natural gas in *blast furnaces (transformation)*.

Biofuels and waste

General notes

Data for **biogases** are available from 2000; for **industrial waste** from 2003; for **biodiesel** production from 2007.

Supply

A 2012 change in **biogasoline** reporting methodology results in break in time series between 2011 and 2012.

Consumption

In 2019, increased consumption in the *non-metallic minerals* sector for **solid biofuels** and **municipal wastes** is related to fuel switching from coal.

In the 2018 edition, the Hungarian administration has revised **solid biofuels** consumption in other sectors back to 2005 based on the new survey from Hungarian Central Statistical Office (HCSO). This resulted in break in time series between 2004 and 2005.

A new reporting methodology for the direct use of **geothermal** energy was applied from 2014 resulting in break in time series between 2013 and 2014.

Electricity and heat

Supply

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 reported as previously sold may now be considered as used onsite.

Other sources electricity and heat production is available from 2013 and represents generation from residual tail gases from the manufacturing of soot as well as from hydrogen.

Geothermal heat production from main activity producer heat plants is available from 1995.

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

Transformation

In 2020, the efficiency of **blast furnace gas**- and **coke oven gas**-fired main heat plants was revised downwards back to 2017 to better reflect trade of coal gases and hot air between adjacent facilities.

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 authorization 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 to 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**.

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

For 2020 onwards, electricity consumption in *Road* also includes plug-in hybrid electric vehicles (PHEV).

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

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

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

Coal

General notes

Data on stock changes of **anthracite** and **coke oven coke** are not available. The statistical difference could include that flow.

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

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

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

Consumption

Anthracite is used as a carbon donor in silicon metal and ferrosilicon production plants. In the 2021 edition, the quantities involved in these processes were reallocated from TFC/Iron & Steel to Non-Energy Use Industry/Transformation/Energy for the period 2016-2018.

Coke oven coke is used as carbon donor for ferrosilicon production. In the 2021 edition, the quantities involved in this process were reallocated from TFC/Iron & Steel to Non-Energy Use Industry/Transformation/Energy for the period 2016-2018.

Final consumption increased in 2000 as a new iron and steel plant came on-line.

Oil

General notes

In the 2022 edition, some supply flows from 2015 to 2019 are estimated by the IEA Secretariat, in particular stock changes and imports.

Between 2015 and 2016, there are breaks for several products due to a change in the methodology by the Icelandic administration.

In 2014, the Icelandic administration revised petroleum coke data from 1990 to exclude imports of anodes for the aluminium industry.

Oil supply and consumption data for 2008 and 2009 are estimated by the IEA Secretariat.

Biofuels and waste

General notes

Data for 2019p have been estimated by the IEA Secretariat.

In the 2020 edition, the time series for **solid biofuels** was revised.

2013 is the first year of data availability for the supply and consumption of **solid biofuels**.

Consumption

Biodiesel consumption data for 2014 are estimated by the Icelandic administration based on 2013.

Biogases used for transport purposes were reported for the first time in 2007.

Electricity and heat

General notes

For the 2022 and 2021 editions, the Icelandic Administration revised data back to 2007 due to improved methodologies.

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 90MW 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.

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

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

In 1998, 60 MW of generating capacity was installed in the **geothermal** CHP plant at *Nesjavellir*. Since the plant was inoperable for four months, production of **geothermal** heat decreased compared to 1997. The extra electricity capacity caused electricity production from **geothermal** to almost double over the same period.

Electricity production from **geothermal** sources in main activity producer CHP plants is available from 1992.

Consumption

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.

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.

Direct use of **geothermal** 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.

Revisions in direct use of **geothermal heat** starting in 2013 create breaks in time series between 2012 and 2013.

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.

Coal

General notes

In the 2022 edition, the Irish administration modified the methodology to estimate supply of solid fuels. Consequently, revisions were made back to 2011 for **anthracite**, **other bituminous coal** and **BKB**.

In the 2021 edition, SEAI revised their methodology for **anthracite** imports. The figures for the years 2012 to 2018 were revised up and are now aligned with those from the Central Statistics Office of Ireland. The difference with the old values was assigned to the residential sector.

Due to confidentiality reasons, **anthracite** imports include **anthracite** and manufactured ovoids.

In the 2021 edition, SEAI revised **other bituminous coal** consumption by sector for the period 2005-2011. The same methodology that was used from 2012 was applied to the period 2005-2011 to align the time series.

Due to confidentiality issues **patent fuel** quantities are reported aggregated to **anthracite** figures.

Due to confidentiality reasons, inputs of **anthracite**, **other bituminous coal** and **peat briquettes** for patent fuel transformation are reported with residential consumption.

Prior to 1990, any imports of **BKB** were included with imports of **peat products**, as is the case for consumption.

The calorific value for **peat** production is weighted according to the origin: sod peat and milled peat. Sod peat has a higher calorific value than milled peat. In 2019, the production of milled peat decreased while sod peat stayed stable; this resulted in an overall higher weighted value.

Supply

Ireland stopped harvesting **peat** in 2020 and will phase out production of **peat briquettes** by 2024.

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

From 2018 the consumption of **other bituminous coal** decreases significantly as a result of the decline in coal-fired power generation. Imports of this product decrease accordingly.

A reclassification caused a break in the time series for peat consumption in the energy industry own use in BKB/peat product plants from 1989 to 1990.

The production of gas works gas ceased in 1987 due to fuel switching to natural gas.

Other bituminous coal inputs to main activity producer electricity plants increased from 1986 due to three new generating units at Moneypoint coming on-line.

Consumption

The decrease in residential consumption of anthracite in 2019 is consequence of warmer weather, among other reasons.

The consumption of **other bituminous coal** and **peat** in the food, tobacco and beverages industry stopped in 2019.

Oil

General notes

In the 2018 edition the Irish administration revised the methodology for reporting final consumption of oil products. This leads to some breaks in series between 2015 and 2016.

From other sources - natural gas of **other hydrocarbons** correspond to natural gas blended with refinery gas.

For confidentiality reasons, inputs of **petroleum coke** into patent fuel transformation are reported with residential consumption.

Supply

In the 2020 edition, the Irish administration revised **gas/diesel oil** and **fuel oil** consumption in *international marine bunkers* from 2006 onwards.

Consumption

In the 2021 edition, oil consumption data were revised back to 1990 by the Irish administration to incorporate the results of the Business Energy Use Survey (BEUS), which provided a level of detail not previously available.

In 2014, the drop of fuel oil consumption in non-metallic minerals sector is linked with the replacement of HFO boilers by natural gas boilers as the primary source of steam for alumina production.

In 2013 and 2014, bitumen consumption data are not available and calculated as residual.

Between 2008 and 2009, there is a break in time series for **gas/diesel oil**, **LPG**, **kerosene-type jet fuel** and **petroleum coke** due to a new methodology being applied to sectoral demand by Sustainable Energy Ireland (SEI). This change also explains breaks between 2006 and 2007 for **bitumen**, **lubricants**, **white spirit**, and **paraffin waxes**.

Between 1989 and 1990, breaks in time series appear for consumption of **gas/diesel oil**, **LPG**, **other kerosene** and **fuel oil** as a result of a detailed consumption survey done for 1993. Data for historical years back to 1990 were revised by the national administration based on the results of this survey.

From 1986, **gas/diesel oil** consumption in the agricultural sector is available.

From 1970 to 1977, the split between commercial and public services and agricultural use of **other kerosene** has been estimated by the Secretariat. Consumption in commercial/public services includes quantities used by state-owned agricultural companies.

Natural gas

General notes

Since April 2017 there is no gas storage facility in Ireland.

Supply

Natural gas production has been increasing since 2015, as the Corrib Gas field began production at the end of that year.

Since 1996, the increase in imports is due to the depletion of the Kinsale gas field and the availability of a new pipeline system to the United Kingdom.

Transformation

Since 2006, a different methodology for allocating unsold steam from *autoproducer CHP* is used.

Non specified transformation corresponds to **natural gas** blended with **refinery gas**.

Consumption

In the 2020 edition, the results of the Business Energy Use Survey (BEUS) from 2009 to 2017, published by the Central Statistics Office, were used as a new basis for the breakdown of energy use in the consumption sector. Additionally data was revised for the 2001 to 2009 period in order to avoid a timeseries break.

In the 2019 edition, the Irish administration revised the *distribution losses* based on new data coming from the Emissions Trading Scheme (ETS), which had a knock-on effect in the final consumption data, primarily for the *industry sector*.

In 2011 the increase in *non-ferrous metals* consumption is due to a fuel switch to **natural gas**.

Since 2009, the disaggregation of consumption into all the industry sub sectors excluding *non-ferrous metals* is done according to data from the Census of

Industrial Production (CIP). The last energy consumption data available from the CIP are from 2009 and therefore the 2009-2015 subsector breakdown is the same every year.

In 2007 the increase in *machinery* consumption is due to changes in industry sub-sector structure and fuel usage.

In 2004, there is a break in the time series in *food, beverages and tobacco* consumption due to a change in methodology.

In 2003, feedstock use in the *chemical and petrochemical* industry stopped due to the shutdown of a fertiliser plant.

In 2001, **natural gas** consumption in the *iron and steel* industry stopped due to the shutdown of Ireland's main steel plant.

Prior to 1986, detailed consumption figures for the use of **natural gas** in *industry* and *other sectors* are not available.

Biofuels and waste

General notes

Data for **municipal waste** are available from 2009.

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

Supply

In 2022 edition, **biogasoline** production figures were revised. The production started in 2017.

In 2020, a new **biodiesel** plant began to produce.

Due to increased demand from a second waste to energy electricity plant which began operation in 2017, production of **municipal waste** increased sharply starting in late 2017.

Prior to 2011, production and trade of **biogasoline** and **biodiesels** cannot be distinguished due to confidentiality issues.

Transformation

In 2022 edition, 2019 **solar PV** generation figures were significantly revised.

In 2020, **biogas** started to be blended with natural gas in the main network.

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 2012 and 2013, the renewable fraction of tyre-derived fuel (12%) used by a cement plant was reported by the administration under **renewable municipal waste**; the non-renewable fraction (88%) was reported under **industrial waste**.

Consumption

In the 2021 edition, there were revisions to the *residential sector* for **solid biofuels (excluding charcoal)**.

In the 2020 edition, Ireland started reporting Pipeline transport based on the Emissions Trading Scheme data, available since 2005. The increase in 2016 is due to the coming on stream of the Corrib gas field.

The Biofuels Obligation Scheme places an obligation on suppliers of mineral oil to ensure that 8.695% (by volume) of the **gas/diesel oil** they place on the market in Ireland is produced from renewable sources, e.g. **bioethanol** and **biodiesel**. The obligation was increased from the 1st January, 2017, from the previous level of 6.383%.

Despite the Biofuels Obligation Scheme, **bioethanol** consumption decreased in 2017 because there was a reduction in overall motor gasoline use and of fuel tourism.

Increases in **biodiesel** consumption in 2017 are related to the Biofuels Obligation Scheme and to increases in road freight, which is heavily dependent on **diesel oil**.

The consumption of pure **biodiesel** in the industry sector and in road transport refers to one site, which is no longer in operation since 2014.

Electricity and heat

Supply

In the 2019 edition, revisions were made by the Irish administration for the indigenous production of **solar thermal** for the years 2011 – 2016.

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.

Transformation

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

In 2017, a new **municipal waste**-fired main activity producer electricity plant (Dublin waste-to-energy) began operations.

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** following Turlough Hill, Ireland's pumped storage station, being taken offline in late 2010 up until February 2012. The 2011 values appear as zero due to rounding.

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.

Israel

Source

Israel Central Bureau of Statistics, Jerusalem.

General notes

Data are available starting in 1971.

The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli administration. The use of such data by the OECD and/or the IEA is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

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

Coal

Transformation

In 2018 (data year) the methodology for calculating consumption in the transformation sector (electricity and heat producers) was modified. This creates a break in the time series between 2017 and 2018.

Oil

General notes

Supply data for 2013 to 2020 have been provided by the Israel Central Bureau of Statistics. Demand data for 2013 to 2020 was revised and estimated based on Israel's national energy balance and the partial data made available by the Israel Central Bureau of Statistics. As a result, breaks in time series may appear between 2012 and 2013.

Israel's national energy balance aggregates bitumen, petroleum coke and other oil products. The split of these products was estimated by the IEA secretariat for all flows.

The split of refinery output and consumption between kerosene type jet fuel and other kerosene was also estimated by the IEA Secretariat.

Supply and consumption of kerosene type jet fuel for 2011 and 2012 have been estimated by the IEA Secretariat.

From 2007 to 2009, oil data are estimated by the IEA Secretariat based on information from the Ministry of National Infrastructures.

Supply

In 2018 the CDU 3 unit and hydrocracker facility at Bazan refinery was under maintenance. In 2017 the catalytic reformer unit underwent maintenance.

Quantities of **other hydrocarbons** represent **natural gas** used in refineries, including for the operation of the cogeneration power stations.

From 2010 onwards, white spirit is included in other products.

Transformation

In 2017 Bazan refinery underwent maintenance to upgrade its continuous catalytic reformer, isomerization units and the naphtha catalytic hydrotreating unit.

Consumption

From 2015, energy use of **gas/diesel oil** and **other kerosene** in Not elsewhere specified (Other sectors) are estimated by the IEA Secretariat.

From 2013, consumption data are based on a new and detailed classification system and on estimations made by the Israeli administration.

Natural gas

General notes

Data for 2020p are estimated by the IEA Secretariat.

The 2021 edition includes 2019 data and revisions in consumption based on the Energy Balances published by the Israeli Central Bureau of Statistics (CBS). As a result, breaks in time series appear between 2012 and 2013. More specifically, this revision impacted *oil refineries*, the *industry sector* and *other sectors*. Finally,

all *industry* is categorised as *non-specified industry* and all *other sectors* as *non-specified other*, because no disaggregation is available.

From 2012, all natural gas data, except inputs to electricity production and oil refineries, have been estimated by the IEA Secretariat.

Supply

Imports of **natural gas** began in 2008.

Transformation

In the 2017 edition, the Israeli administration revised *transformation sector* data back to 2013, introducing breaks in the series between 2012 and 2013.

In the 2019 edition, the *not elsewhere specified (transformation)* since 2013 refers to quantities of **natural gas** used for the generation of hydrogen, which is subsequently used for hydrodesulphurization in oil refineries. In the previous editions, these figures were reported as energy consumption of gas in *oil refineries*.

In the 2019 edition the 2016 and 2017 data for inputs to electricity production were estimated by the IEA Secretariat.

Biofuels and waste

General notes

Data for 2019p are estimated by the IEA Secretariat.

Data on imports and consumption of charcoal are estimated since 1992 using data from the Forestry Production and Trade database from the Food and Agriculture Organization of the United Nations.

Electricity and heat

Supply

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.

For 2020, transmission and distribution losses for electricity include losses incurred during the operation of **pumped hydro** facilities.

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 and 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 as well as 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 and 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.

Italy

Sources

Ministry of Economic Development, Rome.

Terna, Rome.

General note

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

Coal

General notes

The increase in production of **coke oven gas** in 2012 was the consequence of improvements in scope of reporting. As such, coke oven gas data in prior years should be viewed as under-representing production and consumption, and coke oven efficiencies will likewise appear lower than actual.

Due to a change in the survey system, breaks in time series may occur between 1997 and 1998 for final consumption.

From 1986 onwards, figures from **lignite** are given using the same methodology as in the *Bilancio Energetico Nazionale*.

Supply

In the 2018 edition, production of **coke oven coke**, **coke oven gas**, **coal tar** and **other recovered gases** was revised back to 2014 due to new available information. The revisions increased efficiencies of coke ovens and blast furnaces and led to breaks between 2013 and 2014.

Other bituminous coal production ceased in 2016 due to the closure of the one coal mine in 2015.

Transformation

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.

Prior to 2009, sub-bituminous coal used in main activity electricity plants was included with other bituminous coal consumption.

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.

Consumption

In 1991, all industrial activities were reclassified on the basis of ISTAT/NACE 91. This has implied some transfers of activities which may result in some anomalies between 1991 and earlier years.

Oil

General notes

For **crude oil**, statistical difference may arise as trade corresponding to stock held for Austria and Germany in the Port of Trieste are not included.

Inputs to electricity and heat generation have been estimated by the IEA Secretariat for the years 1984 to 1997 based on submissions of the Electricity and heat Questionnaire. All other data for the years 1992 to 1997 and the detailed consumption breakdown for other years have been estimated by the IEA Secretariat based on *Bilancio Energetico Nazionale*.

Supply

Due to an improvement of reporting by the Italian administration, indigenous production of **NGL** is reported separately from **crude oil** in 2020.

Indigenous production of **other hydrocarbons** in 2020 is from the Gorgoglione field in Basilicata.

In the 2021 edition, due to a new calculation methodology adopted by the Italian administration, product transfers appear for the first time in 2019 for **motor gasoline, kerosene type jet fuel, gas/diesel oil and fuel oil**.

In 2016 and 2017, the closure of the Val d'Agri oil centre lasting several months led to a decrease in production of **crude oil**.

From 2009 onwards, transfers of **lubricants** could not be disaggregated from refinery output data.

From 2004 onwards, increased production of **non-specified oil** products is due to methodological changes.

A new survey to determine the split between international marine bunkers and domestic navigation caused a break in time series for **gas/diesel oil** in 1999 and **fuel oil** in 1996.

Consumption

For **gas/diesel oil**, non-specified use is included in commercial/public services.

Between 1998 and 1999, due to new surveys, breaks appear in the consumption time series.

Natural gas

Transformation

Prior to 2008, inputs of **natural gas** to all heat production in *industry* were reported in final consumption.

Between 2003 and 2004 there are breaks in time series in *industry* and *transformation* due to a new data reporting methodology

From 2000 to 2002, for confidentiality reasons, autoproducers are included in main activity producer plants.

In 1996 the production of **gas works gas** from **natural gas** in *gas works (transformation)* ceased.

Consumption

In the 2021 Edition, following a new source of data and a change of methodology, the flows *oil and gas extraction* and *gas inputs to oil refineries* were revised from 2011 onwards.

Since 2007, a more detailed breakdown of consumption for *energy industry own use* is available.

Biofuels and waste

Supply

Biogasoline includes bio-ETBE.

From 2014, a distinction between trade and production became available for **other liquid biofuels**.

Transformation

In 2018, a new biomethane plant was installed leading to increases in **biogas** blending with **natural gas**.

2017 is the first year that biogas is blended with natural gas.

In 2008, data for biofuels and waste were reclassified, which results in several breaks in the time series for transformation.

Consumption

From the 2018 data onwards, the increase in **biodiesel** demand is related to blending obligations.

The final consumption of **biogas** has been constant from 2013 to 2015, as these figures are the result of a survey which is not carried out annually. Figures are expected to be revised after the next survey.

In the 2016 edition, the methodology used to calculate **solid biofuels** consumption in the residential sector for 2002 to 2014 was updated and this created a break in time series between 2001 and 2002. This also affects the indigenous production of **solid biofuels**. The revisions were limited backwards to 2002 because of reliability issues.

Electricity and heat

Supply

For 2021, electricity output from autoproducer **wind** was reported for the first time in several years due to a reclassification of the producer type.

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.

Due to the aggregation of rounded values, from 2007-2016, total **electricity** output may differ slightly from the sum of the output from the individual fuels.

Transformation

For 2018, the decrease in electricity output from **Solar PV** was due to lower than solar radiation.

Prior to 2000, **electricity** used for pumped storage (mixed plants) is included under used for pumped storage (pure hydro pumping plants).

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.

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.

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.

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. Additional details are given under each fuel.

From 1990, data are reported on a fiscal year basis (e.g. April 2015 to March 2016 for 2015).

Consumption data for commercial/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.

Coal

General notes

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 2019 edition, imports of **other bituminous coal** and **coking coal** –by partner country - have been estimated by the IEA Secretariat for data from 1990 to 2018, based on customs data and total imports by coal type.

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

Supply

In the 2020, revisions were made by the Japanese administration to the imports of other bituminous coal for the years 1991, 2015 and 2017.

Statistical differences for **hard coal** include stock changes since 2001. Large positive differences for several years since 2004 are partly due to stock build by final consumers.

Transformation

The inputs of **coke oven coke** to blast furnaces as well as the final consumption of **coke oven coke** in the iron and steel industry have been estimated by the IEA Secretariat since 1990.

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.

Coal injected in blast furnaces (PCI) is classified as **coking coal** in order to be consistent with Japanese trade statistics.

In 2016 the liberation of the power market resulted in electricity autoproducers becoming main activity producers.

Consumption

In the 2020 edition, **anthracite** consumption in *agriculture/forestry* has been revised.

In the 2020 edition, after investigation by the Japanese administration the **coal tar** previously reported under *total final consumption* in the chemical sector has been reallocated under the category non-energy use.

In the 2019 edition coal tar consumption in the *chemical and petrochemical industry* was estimated by the IEA since 1990.

Oil

General notes

In the 2021 edition, data for Japan were revised back to 1990 by the Japanese administration based on new methodology for the Energy Balance Table.

In the 2021 edition, the Japanese administration revised several NCVs of both primary and secondary **oil products** back to 1990 as a result of improved calculation methods. The Japanese administration reviews calorific values every five years.

In the 2020 edition, data for Japan were revised back to 1990 by the Japanese administration based on new methodology and coverage for the Energy Balance Table. The revisions mainly concern the demand side (in particular, consumption in road transport and chemical industry), resulting in improved statistical difference in the time series.

In the 2019 edition, data for Japan were revised back to 1990 by the Japanese administration based on new methodology for the Energy Balance Table.

In the 2016 edition, the Japanese administration revised several NCVs of both primary and secondary **oil products** back to 1990. The Japanese administration reviews calorific values every five years, with the other most recent revisions occurring in 2005 and in 2013.

Supply

In 2018 refinery runs were impacted by heavier than usual maintenance season.

The high statistical difference for **crude oil** in 2013 and 2014 is explained by large amount of stocks held on board incoming vessels in port or at mooring in March 2014 (end of Japan's 2013 financial year). These amounts are included in the stock change but not in the imports in 2013 annual data.

Orimulsion was imported for electricity generation between 1991 and 2006.

Transformation

Other hydrocarbons in *non-specified transformation* represents orimulsion burnt for power generation. Historical revisions are pending.

In 2016 the liberalisation of the power market resulted in electricity autoproducers becoming main activity producers.

Consumption

Due to the data being in fiscal years, the impact of COVID-19 is visible in 2019 as oil consumption in some sectors decreased between January and March 2020.

Oil consumption continued to fall in 2018 as more nuclear capacity came back online.

Demand for heating oil and other kerosene fell driven by a warmer than usual winter in 2018.

Road consumption, is based on the “Automobile fuel consumption survey” from the Ministry of Land, Infrastructure, Transport and Tourism (MLIT).

Lubricants consumption is estimated by the Japanese administration since 2000.

Natural gas

General notes

The 2022 edition contains minor revisions to time series which go back to 1990 for *imports* and *stock levels*. These reflect the revisions in the Energy Balance Table from the Ministry of Economy, Trade and Industry, which is the data source.

The 2019 edition contains major revisions to time series which go back to 1990. These reflect the revisions in the Energy Balance Table from the Ministry of Economy, Trade and Industry, which is the data source.

Since 1990 most of the **gas works gas** production and consumption has been included with **natural gas**.

Supply

In the 2019 edition, *indigenous production*, *receipts from other sources*, import data, *stock changes* and stock levels were revised back to 1990.

Transformation

In the 2019 edition, *main activity* and *autoproducer electricity* plants were revised back to 1990. Similarly, flows of the *energy sector* were revised back up to 1990.

Consumption

In the 2019 edition, own consumption in *electricity*, *CHP* and *heat* plants was subject to a major revision since 1990.

In the 2019 edition, all the *transport sector*, *industry sector* and *other sectors* flows were revised back to 1990.

Biofuels and waste

General notes

In the 2019 edition, data for Japan were revised back to 1990 based on new methodology.

There was a large revision in **municipal waste** data in the 2016 edition of this publication. This revision has removed data for **municipal waste** for the entire time series up to 2010.

For **municipal waste** data, the breakdown between renewable and non-renewable **municipal waste** is estimated by the IEA Secretariat assuming a 50% split in transformation and supply.

Transformation

Input data of **solid biofuels** to charcoal production are estimated by the IEA Secretariat assuming an efficiency of 40%.

The **industrial waste** consumption in the *non-specified transformation* sector surged in 2013, because of the increase in use of waste plastics for coke production.

Electricity and heat

Supply

In the 2019 edition, **electricity** data were revised back to 1990 to include additional autoproducer production previously excluded.

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.

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 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.

Net and gross 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.

Data for **electric boilers** include **heat pumps**. For this reason, calculated efficiencies exceed 100% for some years.

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 2019.

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.

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

In the 2020 edition, there are revisions in the consumption of **solar thermal** in the *commercial and public services* and *residential* sectors in 1990 - 2004.

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

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.

Coal

General notes

Data for **coal** and **coal products** from 1971 to 2001 are based on information provided by the Korean administration, as well as information from the *Yearbook of Energy Statistics 2002*, the *Yearbook of Coal Statistics 2001* (both from the Ministry of Commerce, Industry and Energy), and *Statistics of Electric Power in Korea 2001* (from the Korea Electric Power Corporation). During this period, import data by coal type were estimated by the IEA Secretariat, based on statistics of the exporting countries.

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

Transformation

Statistical differences for **manufactured gases** for 2012 are partly the result of classification issues. The Korean administration is working to improve reporting of coal-derived gases production and consumption.

Consumption

In the **anthracite** balance, the category Non-specified (Industry) includes manufacture of cement, lime, plaster and its products, and small businesses. Currently the breakdown of those is not available.

The consumption of **other bituminous coal** in the Food, beverages and tobacco industry stopped in 2018.

Data on **blast furnace gas** used for energy purposes in blast furnaces prior to 2007 are reported in the iron and steel industry.

Consumption of imported **coke oven coke** starting in 2002 is reported under *non-specified industry*.

Consumption of **manufactured gases** in the iron and steel industry starting in 2002 includes the consumption in blast furnaces, oxygen steel furnaces and other iron and steel processing plants.

Oil

Supply

There are breaks in transfers of several oil products in 2020 owing to a change in the reporting methodology of a refinery that expanded its chemical plant.

The production of heavy distillates has been declining due to the expansion of heavy oil upgrading facilities.

In 2017, due to constraints to imports of condensate, Korean refineries used **naphtha** into the refinery process.

From 1997, stock levels include vessel stocks.

Transformation

Inputs of **fuel oil** to autoproducer electricity and autoproducer CHP are included with final consumption.

Consumption

Due to the change in the reporting methodology of a refinery, some breaks may appear between 2019 and 2020, in particular for consumption in Chemical (including petrochemical) industry.

From 1990 to 1995, **kerosene type jet fuel** split between international civil aviation and domestic air transport has been estimated.

Natural gas

Supply

Since 2013, *receipts from other sources – oil is estimated using the historical relationship with the Oil Questionnaire and extrapolating.*

Korea reports production of **natural gas** since 2005.

The *receipts from other sources* from 2006 to 2012 represent the amount of **LPG** that are either blended with **natural gas** or are directly used in city gas distribution networks.

Consumption

Energy industry own use in liquefaction plants includes losses and measuring errors.

Prior to 2007, consumption of **natural gas** in *machinery* was included with *transport equipment*.

From 1987 to 1991, the breakdown of final consumption has been estimated by the IEA Secretariat, as well as the *residential* subsector for 1992.

Biofuels and waste

General notes

Due to the change of reporting methodology, breaks in time series may occur between 2013-2014 and 2014-2015.

Heat data are available starting in 1993.

Transformation

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.

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**.

Electricity and heat

General notes

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.

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 are available from 2008.

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 Wolsong 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.

Prior to 2009, autoproducer **heat** production includes amounts of unsold heat.

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.

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 publication World Energy Statistics.

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 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.

Coal

Supply

The increase of distribution losses for **peat** in 2003 is due to a fire in one of the warehouses.

Consumption

The drop in the iron and steel industry in 2014 is due to the bankruptcy of the major company in the market.

Oil

Supply

Other hydrocarbons data represent shale oil.

In 2020, changes in the national legislation mandated an increase in the minimum blending of **biofuels**.

In 2018, amendments to the legislation mandated a biofuel blending target of at least 4.5% of volume for **gas/diesel oil** used in temperate and severe winter conditions leading respectively to an increase of its consumption for *road* transport.

In 2018 one of the main players in marine bunkering at Latvia's largest port ceased operations. As a result deliveries of oil products to marine bunkers decreased in that year. As of 2019 the issues have been resolved and bunkering activity has resumed.

Consumption

In 2020, consumption of **LPG** in fishing is reported for the first time as a company changed its type of activity from NACE 1020 to NACE 0311.

Consumption of **LPG** and **bitumen** in mining/quarrying are reported for the first time as an asphalt concrete plant started operating in 2020.

Natural gas

Consumption

The consumption in the *iron and steel industry* decreased in 2014 due to the bankruptcy of the major company in the market.

Transformation

In 2017 there was a steep decrease/break reported in *main activity producer CHP* consumption and a respective increase/break in *main activity producer heat* consumption due to the classification of **natural gas** inputs according to the individual units of the plants instead of the plants as a whole that was previously used.

Biofuels and waste

Supply

For 2018 data, the increase in the indigenous production of **solid biofuels** is due to wood pellet production.

In 2017, a **biodiesel** producer exported amounts produced in 2017 and also some amounts from stocks.

Transformation

Due to a reclassification in 2004, there was break in time series of electricity production from autoproducer electricity plant fuelled by biogas between 2003 and 2004.

Consumption

The increase in consumption of **solid biofuels** in *not elsewhere specified (industry)* in 2018 is related to increases in the manufacture of furniture sector.

The increase in inland consumption of **biodiesel** in 2018 data is related to the implementation of favourable legislation (the “Biofuel Law”).

The increase in supply for **solid biofuels** from 2016 to 2017 is due to increased usage in the industry sector.

From 2014, **biodiesel** consumption has been decreasing due to policies which support the sale of arctic diesel fuel without renewable additives.

Electricity and heat

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 in 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

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 2018 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 publication *World Energy Statistics*.

Oil

Supply

In 2020, changes in the national legislation mandated an increase in the minimum blending of **biofuels**.

Natural gas

Supply

The export quantities since 2014 represent imported LNG which is regasified and subsequently exported to other countries.

Transformation

Not elsewhere specified (transformation) data represent **natural gas** used for methanol manufacture, which is used as input in oil refineries.

Consumption

Natural gas consumption for power generation has been falling significantly from 2010 onwards as gas-fired power and heating plants are being retired, largely replaced by biomass.

There is a break between 2010 and 2011 in the *not elsewhere specified (energy)* timeseries due to **natural gas** being consumed for heat that was used to destroy radioactive waste after the decommissioning of the only Lithuanian nuclear plant at the end of 2009.

Biofuels and waste

Supply

In 2019, the increase in the indigenous production of **industrial waste (non-renewable)** is the result of increased data availability.

The production of **charcoal** has been over-estimated prior to 2017 due to the fact that it was not possible to report data less than 1 kt.

Starting from 2016, some **industrial waste (renewable)** was collected via sorting. These wastes consist of non-recyclable paper, textiles and wood wastes and their production is included in **solid biofuels**.

Transformation

The *Fortum Klaipėda* CHP plant produces electricity and heat from **industrial waste (non-renewable)**, **municipal waste** and **solid biofuels** since the end of 2013. Since its inception, structural optimisation has been sought. Additionally, before 2016, calorific values of the fuels were calculated by taking samples of fuels and after this period, calculations were made from steam. For these reasons, there are fluctuations in fuel inputs, energy production and fuel ratios between **industrial waste (non-renewable)**, **municipal waste** and **solid biofuels** since 2013.

In 2013, an incinerator combusting **industrial waste (non-renewable)** and **municipal waste** began operations.

Electricity and heat

Transformation

In 2009, the *Ignalina* **nuclear** power plant, the only nuclear plant in Lithuania, closed down.

In March 2017, the *Geoterma* **geothermal** heat plant, the only geothermal heat plant in Lithuania, closed down.

Luxembourg

Source

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

Coal

General notes

For the 2011 edition, the Luxembourgian administration revised the time series from 2000 for most **coal** and coal products. Time series for **BKB** consumption were revised from 1990.

Prior to 1978, some **sub-bituminous coal** may be included in **hard coal**.

Steel production from blast furnaces ceased at the end of 1997.

Oil

Consumption

In the late 1970s, the reduction in consumption of **fuel oil** in the iron and steel industry was due to substitution by coal.

Natural gas

General notes

In 1982 there is a break in the time series in transformation and industry due to a change in methodology.

Transformation

In the 2017 edition a *main activity producer CHP* plant was reclassified as one *main activity electricity producer* plant and one *main activity producer heat* plant. Data were revised back to 2014.

Since 2002, the increase in the transformation sector is due to a new 350-MW combined cycle power plant.

The last *main activity producer electricity* gas-consuming plant closed in 2016.

Consumption

In 2015, Luxembourg integrated supplementary data from ETS companies and industrial consumption was revised back to the year 2000.

The breakdown of total final consumption for the latest year is preliminary and will be finalised in the next edition of the book.

Since 2012, the methodology to determine final consumption was changed in order to integrate basic data from National Accounts.

Since 2000, a more detailed breakdown of final consumption data is available due to a change in methodology.

Since 2000, consumption in the *non-ferrous metals* sub-sector is included in iron and steel for reasons of confidentiality.

Since 2000 consumption in *not elsewhere specified (Industry)* includes activity of companies reclassified to preserve the confidentiality.

Prior to 2000, *residential* consumption includes consumption in *commercial/public services* and *agriculture/forestry*.

Biofuels and waste

General notes

The Luxembourgian administration started including trade figure of wood chips in trade figure of **solid biofuels** from 2015 data. This creates breaks in time series between 2014 and 2015.

Data on **solid biofuels** are available from 1992.

Supply

There was a fire at the co-digestion plant Itzig in September 2018. The plant was not reopened until October 2019, causing a decrease in **biogas** production (specifically: **other biogases from anaerobic fermentation**).

Transformation

In the end of 2018, there was a fire in one of the main **biogas** plants and it has been off for most of 2019. The most notable effect has been on biogas blending.

In 2011, the blending of **biogases** with **natural gas** started.

Electricity and heat

General notes

Data for **solar thermal** are available starting in 2001 and for **solar PV** starting in 2000.

A revision in the classification of power plants by type and the production and consumption data for both **electricity** and **heat** back to 2000 causes breaks in the time series.

Supply

Most of the **hydro** production shown for Luxembourg is from the Vianden pumped storage plant and is exported directly to Germany.

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.

In the 2017 edition, following plant reclassification, **heat** production by main activity plants was revised from 2011 onwards.

Starting in 2005, data for **electricity** transmission and distribution losses were obtained from the network operator. Prior to that, they were estimated by the Luxembourgian administration.

For Main CHP, own use data are not available for **solid biofuels-** or **natural gas-**fired plants.

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* and *chemical and petrochemical* sectors lead 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.

Mexico

Source

Secretaría de Energía, Mexico City.

General notes

Data are available starting in 1971.

The Mexican administration submitted data directly by questionnaire for the first time with 1992 data. As a result, some breaks in time series may occur between 1991 and 1992. For prior years, data are partly estimated based on the publication *Balance Nacional - Energía*.

In the 2016 edition, the Mexican administration completed a major work on revisions of the time series back to 1990. Revisions for some products include reporting of new consumption flows, increased quantities of coal and higher calorific values, resulting in increases of total primary energy supply.

Coal

General notes

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.

Supply

Many coal mining units reduced production during 2019, specifically mines in Coahuilla (the largest coal producer state). This is reflected in the production figures of **coking coal** and **sub-bituminous coal**.

Imports by country of origin for other bituminous coal and coking coal for 2016 have been estimated by the IEA Secretariat, based on partner data.

Blast furnace gas production and consumption have been estimated by the IEA for 1990 to 2017 based on inputs of coke oven coke to blast furnaces.

Coke oven coke production was estimated by the IEA for some years between 1999 and 2012 based off historical and commodities data, as were inputs of coking coal to coke ovens between 1990 and 2012.

The methodology currently used by Mexico to estimate production of coal tar and coke oven gas for recent years uses coke oven coke production as a guide. This was extended to the time series from 1990 to 2001, and to the years where coke oven coke production was estimated by the IEA.

Consumption

The category Non-specified (Industry) in the **coking coal** balance includes the industries of transport equipment, chemical, food and glass. Disaggregated values are not available.

Use of pulverised coal injection in blast furnaces occurs in Mexico, but is not currently reported.

Oxygen steel furnace gas production and production of **other recovered gases** occur as by-products of heavy industry, but are not reported.

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.

Oil

General notes

In the 2022 edition, data from 2018 onwards are partly-estimated by the IEA Secretariat based on the Monthly Oil Statistics and the Mexican Secretaría de Energía (SENER) national energy balance.

In the 2021 edition, the 2018 and 2019 data are partly-estimated by the IEA Secretariat based on the Monthly Oil Statistics and the Mexican Secretaría de Energía (SENER) national energy balance.

In the 2016 edition, major revisions were carried by the Ministry of Energy on the time series back to 1990 based on updated information available from PEMEX, the Mexican Institute of Petroleum and the Federal Electricity Commission (CFE). Revisions include notably crude production, refinery output, gas separation plant production, autoproducer generation and road consumption.

New data reported as additives from 1990 correspond to methyl tertiary butyl ether.

From 1993, data for production *from other sources (natural gas)* of other hydrocarbons correspond to hydrogen used at the Minatitlán refinery, also represented as the output of *non-specified transformation* in the balances format.

The split between domestic and international aviation consumption of kerosene-type jet fuel is not available. By default, all kerosene-type jet fuel consumption is reported under international aviation.

Supply

In 2017 Minatitlán refinery was offline for several months and later operating well below capacity as a result of an accident on site. The refinery at Tula was also temporarily offline. Both these events impact refinery throughput in 2018.

Refinery intake of **crude oil** was estimated by the IEA Secretariat for the years 2016, 2017 and 2018 based on growth rates from SENER and PEMEX published data.

In 2017, production of **crude oil** and **NGL** was impacted by heavy maintenance at the Ku-Maloob-Zaap field and decline at the Cantarell field in the Gulf Mexico which was affected by several force majeure events.

For 2017 import data of **LPG**, **naphtha**, **road diesel** and **fuel oil**, the received data was supplemented with estimates by the IEA Secretariat based on published data from SENER.

2017 and 2018 imports of **petroleum coke** were estimated by the IEA Secretariat based on information from the U.S. Energy Information Agency.

From 2016 onwards trade information is based on daily customs data now available to the Ministry of Energy. Historical revisions are pending.

The large refinery losses from 2005 onwards are the result of the downward revisions to refinery output of **gas/diesel oil** carried out in 2017.

NGL production reported in the IEA publications may be different from what is reported in the Mexican energy publications as the IEA includes in its oil data liquids produced in conjunction with natural gas.

In the 2016 edition, main revisions were carried to **NGL**, **LPG**, **naphtha**, **ethane** supply. New data became available on input of NGL to refineries prior to 2011. Data on ethane production from gas separation plants (positive transfers from

NGL) was revised upwards for 1990 to 1998. LPG gas separation plant production was revised down. Naphtha refinery output was revised upwards from 1990.

Transformation

For several months in 2017, the Salina Cruz refinery was under extensive maintenance following operational problems and structural damage as a result of the September 2017 earthquake.

The Madero refinery closed for maintenance in August 2017 and remained close through the start of 2018.

2017 refinery gross output of **gas/diesel oil, bitumen, lubricants and paraffin waxes** was estimated by the IEA Secretariat based on SENER and PEMEX published data.

In the 2016 edition, data for crude oil refinery input and refinery output of **gas/diesel, naphtha, refinery gas, bitumen, paraffin wax and other products** were revised back to 1990 (see general notes).

Data for **fuel oil** and **gas/diesel** inputs to autoproducer CHP generation are available from 1999.

In 2003, a new facility was added to a refinery to produce **petroleum coke**.

Consumption

2017 consumption of **naphtha** for feedstock purposes in the chemical and petrochemical sector was estimated by the IEA Secretariat based on ethylene production figures.

Consumption of **motor gasoline** and **road diesel** was impacted by changes to fuel subsidies introduced on January 1, 2017.

Consumption of **lubricants** and **bitumen** for 2017 was estimated by the IEA Secretariat based on sales data from SENER.

In the 2016 edition, **naphtha** non-energy use consumption in the chemical/industry was revised significantly revised down from 1990 to 2008 based on PEMEX information.

In the 2016 edition, **gas/diesel** and **motor gasoline** road consumption data were revised back to 1990 based on updated information from the Mexican Institute of Petroleum and PEMEX.

Consumption of **lubricants**, **bitumen** and **paraffin waxes** are available from 1990 and **petroleum coke** from 1993.

Prior to 1987, the split of **LPG** consumption between residential and commercial/public services has been estimated by the IEA Secretariat.

Natural gas

General notes

Natural gas reported in the IEA publications may be different from what is reported in the Mexican energy publications, as IEA includes only dry gas and excludes natural gas liquids, which are considered as part of oil.

Transformation

The split of **natural gas** used for hydrogen manufacture and used in refineries is not currently available and it will be provided in the 2021 edition of this publication.

Consumption

Losses and pipeline transport have been included in oil and gas extraction.

From 1993 to 1999, part of energy industry own use and *non-specified industry* data were estimated.

Since 1993, the breakdown of the *energy sector* and of other sectors is available.

Biofuels and waste

General notes

For the 2020 July edition, new data supplied by the Mexican administration for 2018 and 2019 were incorporated in place of previous estimates.

The Mexican administration believes the fuels categorised as **industrial wastes (non-renewable)** are likely residual gas, however more investigation is needed. Revisions, if applicable, are expected next cycle.

Supply

Prior to 2017 data, some **bagasse** production has been attributed to **other vegetal materials and residues**. This causes a break in series between 2016 and 2017. Revisions prior to 2017 are expected in the future.

Data for **bagasse** production are available from 2008.

Consumption

Increased consumption in the industry and transformation sectors for **solid biofuels** in 2017 is attributed to **bagasse**.

Data for **solid biofuels** used in autoproducer electricity plants from 1991 to 2005 have been estimated by the Mexican administration.

Data on **biogases** consumption are available from 1997.

Electricity and heat

General notes

For the 2022 edition, due to data availability issues, some data provided by the Mexican administration for 2020 were equal to the values for previous years.

For the 2020 July edition, new data supplied by the Mexican administration for 2018 and 2019 were incorporated in place of previous estimates.

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.

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 braking in suburban trains.

The decrease in electricity produced from **wind** in 2017 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.

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.

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 three times; in 2005, 2011 and 2015. The 2005 revisions were to improve basic energy statistics, particularly with respect to carbon and CO₂ reporting, while the 2011 revisions were part of a harmonization program with international energy statistics. The 2015 revisions were the result of increased data collection, availability of new source information, and further alignment with international energy definitions. More details are available here: www.cbs.nl.

Coal

General notes

International trade into and through the hub ports of Amsterdam and Rotterdam is complicated by the capacity to purchase coal directly at these points. The majority of coal passing through these ports is intended for consumption in European countries other than the Netherlands, which is neither the country of origin or destination, therefore these data have been removed where possible. In the 2019 edition, the Central Bureau of Statistics proceeded to major revisions of trade and stock changes for anthracite, coking coal, other bituminous coal and lignite since 1990. Imports now should only relate to coal for inland consumption according to Eurostat's statistical regulation, thus eliminating transits to other countries and stock changes of trading companies.

Following revisions made in the previous edition to data for 1995 onwards, this edition includes further revisions made by the Dutch administration for the period 1990 to 1994. These revisions are the result of increased data collection, availability of new source information, and further alignment with international energy standards.

Supply

From 2013 onwards, trade reported by the Central Bureau of Statistics includes **coal** in transit, to align more closely with gross trade data.

In the 2013 edition, non-specified exports for 2011 were estimated by the Central Bureau of Statistics due to a lack of information from key market players.

For data prior to 2011, stock changes for primary coal types were estimated by the Dutch administration based on trade and consumption data.

For 1984 to 1986, production *from other sources* of **other bituminous coal** represents a stock of “smalls” washed for re-use.

Transformation

In the 2022 edition, revisions back to 2015 were made in the reporting of blast furnaces, coke ovens and iron and steel industry.

At the end of 2015 three low-efficiency plants running on bituminous coal input closed down. In the course of 2017 another two old installations ceased operating. These closures were part of the so-called Agreement on Energy for Sustainable Growth in the Netherlands agreed upon by the Social and Economic Council of the Netherlands (SER) and more than forty representative organisations and stakeholders.

Consumption

For the year 2020, consumption of **coking coal** in the industry sector was observed for the first time. Potential revisions and completion of the time series will be included in the next publication, Coal Information 2022 April Release.

In 2019, the consumption of **lignite** decreased significantly as result of a company partly ceasing activities. That company totally ceased its activities in 2020.

Prior to 1989, non-energy use is included with industry consumption.

Oil

General notes

In 2017, large amounts of **fuel oil** were reclassified as other products due to their chemical properties.

Data for gas/diesel road consumption become more difficult to collect in 2013, as the distinction in taxation between road diesel and gasoil was abolished.

Following revisions made in the previous edition to data for 1995 onwards, this edition includes further revisions made by the Dutch administration for the period 1990 to 1994. These revisions are the result of increased data collection, availability of new source information, and further alignment with international energy definitions

Motor gasoline includes other light oils until 1990.

Some breaks in time series occur in 1990 when the Dutch administration started to report the petrochemical industry according to IEA methodology.

From 1990 onwards, naphtha includes aromatics, naphtha and other light oils.

Supply

Trends in the supply of **other oil products** in 2020 are confirmed by the Dutch administration to be the result of companies sometimes reporting highly-aromatic **fuel oil** into this category.

In the 2021 edition, stock changes of **bitumen** for 2018 and 2019 are estimated by the IEA Secretariat.

Data for deliveries of fuel oil to international marine bunkers were revised downwards in the 2019 edition back to 2015. This was due to an improvement in the underlying data and figures available to CBS Statistics Netherlands.

In 2017 the main plant producing **lubricants** closed as a result there is no more refinery gross output of this product.

Consumption

Consumption of **fuel oil** for fishing in 2020 is zero as fishing boats switched to **gas/diesel oil**.

In the 2019 edition several revisions were introduced to flows relating to the chemical and petrochemical industry. Energy consumption in the chemical industry has been revised upwards back to 2012, following an internal audit of the data that revealed gaps in coverage. Non-energy consumption in the chemical industry has been revised downwards back to 1990 following a review of the data submitted by one of the main companies.

Refinery gas includes chemical gas and is included in chemical industry consumption.

Natural gas

General notes

In the 2018 edition, the Dutch administration revised the supply side data for 1990-2016 in order to (i) better account for flows from underground storages which used to be incorporated in the *indigenous production* data, and also (ii) handle inflows/outflows of **natural gas** stored in Germany as imports/exports.

In the 2019 edition, the Dutch administration re-vised the *opening and closing stock levels* based on a dedicated questionnaire used. Additionally, industrial consumption was revised since 2012 based on inputs coming from the Emissions Trading Scheme (ETS) data

Between 1981 and 1982, and between 1983 and 1984 there are breaks in time series due to the introduction of more comprehensive surveys on end-use consumption.

Supply

A production cap of **natural gas** was set by the government in 2015, which has been extended and gradually tightened for 2016, 2017 and 2018.

Dutch trade figures include transit volumes.

In the past, the amounts reported under *indigenous production* also included quantities coming from *stock changes*. The reason was that the Dutch administration could not distinguish between quantities of **natural gas** falling under marketable production and amounts being moved from offshore fields to onshore fields without undergoing any purification and/or other necessary production processes. From 2015, the data reported distinguish between amounts to be reported as production and amounts that should be classified as stock changes.

International marine bunkers were reported for the first time in the 2019 edition.

Transformation

Data for *non-specified (energy own-use)* represent **natural gas** combusted by the distribution operator for the purpose of operating the gas distribution grid.

The 2009 increase in input to *main activity electricity producer* consumption is due to the opening of a new plant in the second half of 2008.

Consumption

In the 2018 edition, the Dutch administration provided data for the *non-specified (other) non-energy use* flow for the years 2007-2014, which represent the volume of gas injected as *cushion gas* in a new underground storage.

Biofuels and waste

Supply

Increases in **biodiesel** production for 2017 are related to increased capacity of existing plants and increased demand.

From 2009 to 2012, and again from 2014 the production and trade of pure **biogasoline** were confidential; net imports were estimated by the Dutch administration based on consumption.

Transformation

The imports of **wood pellets** are up in 2018 due to the renewed subsidy for co-firing of biomass at energy plants.

In 2017, the increase in heat production from **solid biofuels** in main activity CHP plants is because there were two additional companies reporting data.

Trade data for **municipal waste** are available from 2011.

Consumption

In the 2020 edition, there was a revision from 1990 to 2017 of the consumption of **solid biofuels** in the residential sector.

From 2014, a better allocation of heat own-use was available for **biogas** digester prewarming, and in **municipal waste** burning plants for flue gas cleaning.

The final consumption of **solid biofuels** in the residential and agriculture sector increased in 2014 and again in 2016 due to the results of new surveys and parameters.

Electricity and heat

General notes

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.

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.

For 2018, the declines in heat generation from **municipal waste**, and heat used for electricity generation, and also 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 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 being 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.

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.

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.

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 and 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.

New Zealand

Source

Ministry of Business, Innovation and Employment, Wellington.

General notes

Prior to 1994, data refer to fiscal year (April 1993 to March 1994 for 1993). From 1994, data refer to calendar year.

Coal

General notes

In the 2021 edition, the New Zealand administration provided revisions for some flows back to 2009.

In the 2020 edition, the New Zealand administration has done historical **revisions** on the data as a new data system and methodology was implemented.

In the 2020 edition, some high **statistical differences** can be found for many types of coal in various time periods.

Peat, although produced in New Zealand, is not used as a fuel, and is used for agricultural purposes only.

In the 2014 edition, the definition of **hard coal** was aligned with the International Recommendations for Energy Statistics. Prior to this, **hard coal** for New Zealand from 1960 to 1977 had contained **sub-bituminous coal**. The portion of **sub-bituminous coal** production and residential consumption has been estimated by the IEA Secretariat for this period and moved to **brown coal**.

In the 2011 edition, the New Zealand administration has revised some of the **coal**, natural gas, oil, renewable and electricity time series back to 1990.

Supply

In the 2021, a mine was reclassified from **other bituminous coal** to **sub-bituminous coal**. The time series was revised accordingly.

In 2018 a mine of **other bituminous coal** that was not in production in 2017 restarted activity.

In 2017 the underground mine producing coking coal switched to opencast operation.

The decrease of **other bituminous coal** production in 2015 is due to a temporary shutdown in one of the coal mines at the beginning of 2015 and another one at the end of 2015.

A detailed breakdown of exports of **coking coal** by country of destination between 2001 and 2011 is estimated by the IEA, based on secondary sources and partner data.

Transformation

Sub-bituminous coal inputs into coke ovens refers to coal that is merged with iron sands and limestone to form the inputs for the multi-hearth-furnaces, kilns and melters that produce direct reduced iron (Glenbrook Steel Site), with off-gases and supplemental and natural gas driving CHP plants. This method, while not the typical iron and steel process, produces similar by-products. The **sub-bituminous coal** inputs are reported under coke oven coke transformation and the resulting off-gases are reported as production of **coke oven gas** and **blast furnace gas**.

Blast furnace gas production and distribution losses prior to 1998 are IEA Secretariat estimates. Portions of this gas will have been used for energy purposes in the multi-hearth furnaces or elsewhere in the plant. Some transformation efficiencies will appear higher than normal due to non-reporting of certain inputs, including some confidential data.

Consumption

In the 2020 edition, some quantities of **sub-bituminous coal** that were previously reported under **other bituminous coal** were moved under **sub-bituminous coal**. This reclassification led to a break in the consumption time series between 2018 and 2019 as the new classification starts in 2019.

In 2018, some **other bituminous coal** quantities previously reported under non-specified were reallocated into industry sectors.

In final consumption, some industry data are reported in *non-specified industry* for confidentiality reasons.

In 2014, the increase in consumption of **sub-bituminous coal** in mines included the combustion of some unsold coal fines for safety reasons.

Prior to 2010, the construction sector is included with commercial/public services.

Prior to 2009, mining and quarrying is included in agriculture.

Oil

General notes

In the 2021 edition, breaks appear between 2018 and 2019 for **other oil products** as a result of improved reporting infrastructure by the New Zealander administration.

For 2016, the following data were estimated by the IEA Secretariat: consumption of **lubricants**; imports of **bitumen**; and refinery output, and interproduct transfers of **other oil products**.

For 2015, the following data were estimated by the IEA Secretariat: stock changes and consumption of **lubricants**; consumption of **bitumen**, and all figures for petroleum coke and **other oil products**.

From 1998, **gas/diesel oil** includes light fuel oil. Until 1997, light fuel oil is under fuel oil.

Until 1997, other hydrocarbons from natural gas sources correspond to synthetic gasoline production (ceased in February 1997).

For reasons of confidentiality, beginning in 1994, the New Zealand administration no longer reports data on the production of methanol.

Supply

In the 2022 edition, receipts from renewables of **biodiesel** for blending with transport fuels are not available for 2019 and 2020 according to the New Zealander administration. This can result in unexpected supply values. Revisions are expected next cycle.

In the 2021 edition, the New Zealander administration revised stock changes for several primary and secondary oil products for as early as 2014 onwards.

In 2019, New Zealand no longer produces **lubricants**.

Between 2013 and 2014, the jump in imports of **kerosene-type jet fuel** can be explained by an anticipated strike at the refineries.

Transformation

In 2020, **gas/diesel oil** inputs for electricity production are confirmed by the New Zealander administration to be higher than usual due to generator testing. Furthermore, input of **gas/diesel oil** for CHP production in 2020 is zero.

Consumption

Between 2009 and 2010, a break in time series appears for demand of **gas/diesel** as the administration changed its methodology for commercial/public services

For 1960 to 1973, Consumption data have been estimated by the Secretariat.

Natural gas

General notes

2018 data were estimated based on monthly data submitted to the IEA Secretariat.

Supply

There are neither imports nor exports of **natural gas** for New Zealand.

Transformation

The large 1998 increase in input to *autoproducer CHP* plants is due to two new autoproducer CHP plants.

In February 1997, production of synthetic **gasoline** from **natural gas** ended.

Consumption

Between 2012 and 2013 there are breaks in time series for the final consumption breakdown due to the introduction of a new survey.

In 2005, the decline in *chemical and petrochemical* industry consumption was due to the closure of the Motunui methanol production plant, which was then reopened in late 2008.

Prior to 2003, gas consumed in industry includes some gas for *energy industry* own-use. Since 1990, detailed consumption breakdown for industry is available. From 1977 to 1979 and from 1986 to 1989, losses are included in *statistical differences*.

Biofuels and waste

General notes

In the 2022 edition, **biodiesel** data are not available between 2007 and 2008 and 2016 and 2020. The administration is working on improving liquid biofuels statistics and revisions will be made in future editions.

In the 2020 edition, extensive revisions were made for the time series back to 1990. The majority of the revisions were related to transiting the New Zealand data system from excel based to R based.

For the 2019 edition, the New Zealand administration submitted extensive revisions back to 1990 following an internal review of their systems and methodologies.

Due to improved wood data collection starting with 2016 data, increases in **solid biofuels** in transformation, supply and consumption may not be a true increase but more representative of increased data survey respondents. This results in a break in time series between 2015 and 2016.

Transformation

In the 2022 edition, data on fuel input and electricity generation from **solid biofuels** CHP auto-producers were revised thanks to a multi-year programme of work that the administration undertook to improve solid biofuels statistics.

In the 2019 edition, data on electricity production from **biogases** were significantly revised by the New Zealand administration following an internal review of systems and methodologies.

Consumption

In the 2020 edition, the repetition of data is an estimate by the New Zealand administration for the consumption of **biogases** in the *food, beverages and tobacco* sector for the years 1990 to 2018 due to unavailability of data. The same is true for the consumption of **biogases** in the *commercial and public services* sector from 2007 to 2018.

Electricity and heat

General notes

For the 2020 and 2019 editions, the New Zealand administration submitted extensive revisions back to 1990 following an internal review of their systems and methodologies. For **solar PV**, the source data, Electricity Market Information, changed their entire time series. Data may be further revised in future editions.

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.

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.

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.

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, revisions in electricity production in **hydro** plants back to 2002 are related to a change in methodology. This results in a break in time series between 2001 and 2002.

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 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.

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”.

Coal

General notes

Other bituminous coal includes lignite.

Production of **coking coal**, **coke oven coke** and **coke oven gas** ceased in the late 1980s.

Supply

A downward trend of **other bituminous coal** production started in 2017.

The decrease of **other bituminous coal** production in 2015 is due to a temporary shutdown in one of the coal mines.

The decrease of **other bituminous coal** production in 2005 is due to a fire in one of the coal mines; this entailed a break in the production for a large part of the year.

Oil

General notes

In the 2022 edition, as part of the continuing efforts for data improvement, the Norwegian administration introduced revisions back to 2010 due to methodological changes and new sources. There may be breaks for some

products and flows between 2009 and 2010. Additional revisions are expected in the next edition.

In the 2021 edition, in continuation of the efforts related to the new system for energy balances and energy accounts introduced in the previous edition, the Norwegian administration further revised back to 2010. Additional revisions are expected in the next edition.

In the 2018 edition, the Norwegian administration made widespread revisions to their data 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.

A major project is being carried by Statistics Norway in order to reduce the statistical differences observed between calculated supply and demand of oil. Starting with 2014 data, new methodologies have been introduced for reporting **crude oil**, **NGL** and **naphtha** (see details below). Balances for **motor gasoline**, **gas/diesel oil**, **kerosene-type jet fuel** and **fuel oil** are also under investigation. Further improvements are expected in future editions.

The IEA Secretariat estimates the net calorific value for Norwegian **crude oil** based on the oil product outputs of the oil refineries.

Prior to 1990, **ethane** is included with **LPG**.

Supply

Due to refinery maintenance, refinery output of several oil products decreased in 2019.

In the 2021 edition, indigenous production of **additives/oxygenates** decreased due to a change in reporting methodology by the Norwegian administration.

In 2017 the Goliat field was offline from September through October for planned and unplanned maintenance.

Crude oil production includes condensates.

Starting with 2014 data, Statistics Norway has changed the source for annual **crude oil** exports to include shipping information collected by the National Petroleum Directorate.

Starting from 2014 data, there is a break in **naphtha** supply time series due to a change in reporting methodology adopted by Statistics Norway.

Prior to 2002 data, a part of **LPG** exports was reported as **NGL** exports.

Since 1986, imports of **refinery feedstocks** are reported under the relevant oil product imports.

Transformation

In 2016 the Slagen refinery underwent maintenance which led to a decrease in refinery throughput for that year.

In 2014, the strong decrease in **crude oil** refinery intake is linked to heavy maintenance work carried in the refineries in fall 2014.

Starting with 1990 data, **gas/diesel oil** used for autoproduced electricity on oil and gas platforms are reported under energy industry own use.

From 1970 to 1975, **gas/diesel oil** for electricity generation has been estimated by the Secretariat.

Consumption

In the 2022 edition, the Norwegian administration revised consumption data for several sub-sectors, most notably for **gas/diesel oil**, **motor gasoline** and **kerosene type jet fuel**, from 2020 onwards.

Use of oil products for heating in households is no longer allowed; hence, the consumption of oil products in the residential sector declined in 2019.

Data on **naphtha** consumption in Norway are currently unavailable.

Consumption of lubricants is reported within industry, as no further breakdown is available.

In 2005 data, breaks in **petroleum coke** consumption time series appear due to reallocation in the industry sector. Refinery fuel is reported from 2001 data.

In 2003 and 1993 data, breaks in time series appear for consumption in the chemical/petrochemical industry due to newly available information.

Prior to 2000, **gas/diesel oil** used in fishing is included in agriculture/forestry.

Natural gas

General notes

For Norway, the supply of **natural gas** is the residual of two very large and opposite amounts: *indigenous production* and *exports*. As a result, large *statistical differences* in some years may lead to discrepancies in the growth rates of supply and demand of natural gas.

Supply

Since 2008 data on *opening and closing stock levels* are available.

Transformation

Since 2007, **natural gas** inputs to all electricity and CHP plants are included in *autoproducer electricity plants* for confidentiality reasons.

The last main activity electricity producer closed down in 2016.

Consumption

Prior to 2008, **natural gas** amounts used in gas extraction by offshore platforms were not included in production data.

Since 2002 domestic navigation is included under *non-specified transport*.

The 2007 increase in *non-specified transport* is due to the wider use of gas-powered sea vessels.

Before 2000, energy use in *oil and gas extraction* also included some final consumption amounts.

In 1992 the increase in *oil and gas extraction* is due to the start-up of new fields.

Consumption for *pipeline transport* is included in energy industry own use.

Biofuels and waste

General notes

The Norwegian administration expects to revise 2017 data for **biogases** in the next reporting cycle.

Some of the data reported under **solid biofuels excluding charcoal** includes **charcoal**. Efforts are being made by the Norwegian administration to separate this data in the future.

Prior to 2007, equal shares of renewable and non-renewable **municipal waste** were estimated because the actual split was not known.

Data for **industrial waste** and **biogases** are available from 1991.

Supply

The data for the indigenous production of **biogases** is based on consumption data.

In 2014, the **biodiesel** production facility closed.

Data for **liquid biofuels** imports are available starting in 2006.

Transformation

Increased heat production from **biogases** and **other liquid biofuels** in 2018 is related to replacing fossil fuels.

Consumption

From 2019, data for **solid biofuels** in the *industry sector* replaces coal/coke as a reductant. This is seen in the *chemical/petrochemical* and *iron and steel* sectors.

Decreases in the consumption of **solid biofuels** in the *chemical/petrochemical*, *non-metallic minerals* and *food, beverages and tobacco* in 2018 are related to the fact that **charcoal** was included before but now it has been deducted.

Distribution losses for **biogases** are included in commercial/public services prior to 2003.

Electricity and heat

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.

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 industry sub-sector was expanded in 1992, reclassified in 1994 and collected by a new reporting system in 1997.

Poland

Source

Central Statistical Office, Warsaw.

Coal

General notes

Other recovered gases which appear in the balances as output from blast furnaces also include off-gases from zinc and copper smelting, ceramics kilns and steel production, thus artificially increasing the overall efficiency of blast furnaces when calculated.

The decrease in exports and consumption of **coking coal**, as well as the stock built in 2019 are consequence of a reduction of the external and internal demand of iron and steel, which was impacted, among other factors, by the carbon and electricity prices.

Patent fuel trade data may include transit trade.

Prior to 2016 data, other bituminous coal includes anthracite.

Transformation

In 2019 the use of **other bituminous coal** for electricity generation decreased as consequence of high CO₂ prices and high mining costs, which made more competitive other generation technologies such as natural gas or renewables, as well as electricity imports.

The decrease in the consumption of **lignite** in Main Activity Producer CHP Plants in 2019 is a result of the shutdown of a large power unit for renovation.

For the year 2015, there is production of **gas works gas** but no reporting of any input to that process. The LPG input was too small to be appeared (less than 0,5); until 2016, the reported numbers were rounded to the nearest whole number in the Joint Annual Questionnaires.

For the 2018 and 2019 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.

Consumption

In the 2022 edition, revisions were made in for 2017-2019 **coke oven coke**. This product is used as a reducing agent for the production of zinc concentrates. In previous years, it was treated as energy use. The values are currently shown as non-energy use

Introduction of anti-smog resolution led to reduction of **hard coal** consumption in households in 2019.

Inputs of **coke oven coke** into blast furnaces and consumption in the iron and steel sector were estimated in 2019 so as to keep the efficiency of blast furnaces at 40%. Part of the large decrease in the iron and steel sector consumption can be explained by that estimation.

Consumption in agriculture/forestry for **BKB**, and own use in power stations for **lignite** are residual flows, so may contain statistical differences and other consumption not reported elsewhere. As a consequence, changes in these time series may not be wholly representative of the activities shown.

Prior to 2010, own use in coal mines included workers' take home allowance, which should be included in residential consumption.

Oil

General notes

From 1997, production *from other sources (natural gas)* of **other hydrocarbons** corresponds to hydrogen used in refineries, also represented as the output of *non-specified transformation* in the balances format.

Supply

Output of **petroleum coke** is produced from a new refinery plant installed at the end of 2019.

Between 2016 and 2017, a break in series for stocks of **refinery feedstocks** results from a change in reporting methodology.

In 2018 new legislation introduced a biofuel blending obligation for liquid fuels. The effects of this policy can be seen throughout 2017, as companies prepared for the implementation of the new directive, and in 2018 once the directive came into force.

Transformation

In 2017 lower refinery activity is linked to maintenance activities at several refinery installations across the country.

Prior to 1998, inputs of **gas/diesel oil** and heavy **fuel oil** to autoproducer CHP in petroleum refineries have been included in the transformation.

Consumption

In 2016 regulatory changes affecting the customs and tax authorities meant that consumption of fuel in the informal economy decreased.

In 2015, a new flue-gas desulphurisation unit was installed. As this unit facilitates high sulphur fuel oil burning in place of natural gas, this explains the increase in **fuel oil** consumption in oil refineries.

Natural gas

Supply

Exports include all the **natural gas** sold by companies operating in Poland (these are mainly re-exports).

Natural gas reported in *associated production* contains some heavier hydrocarbons. This results in a high gross calorific value for production.

Transformation

Non-specified transformation data represent **natural gas** used for hydrogen manufacture. This hydrogen is used for hydrodesulphurization in oil refineries.

In 2013 and 2014 some CHP plants were used as backup reserve plants, resulting in a decrease in consumption under main activity producers CHP plants.

In 2004 and 2005 small amounts of **natural gas** were used to start up main activity electricity plants.

In the 2017 data, local small-CHP & heat plants were reclassified from the *commercial/public services* to the *transformation sector* and the *residential* sub-sector.

Consumption

Distribution losses may include some statistical differences.

Non-specified energy includes gas used for heating and pumping operations in the distribution network.

Biofuels and waste

General notes

Several breaks in the **industrial waste** time series are caused by difficulties in the classification of wastes.

In the 2018 edition, **solid biofuels** were corrected for 2015 data.

There is a break in time series between 2015 and 2016 for **biogases** due to reclassification from autoproducer to main activity plants.

The increases in **municipal wastes** starting in 2016 are related to two new plants.

Data on **biodiesels** are available from 2005; **biogasoline** data from 2003; and **other liquid biofuels** data from 2009.

In 2008, a new questionnaire was launched which increased the coverage of renewable and waste data.

Supply

Under current Polish law, only producers and importers of **biodiesel** are obliged to fulfil the National Indicative Target of share of biofuels in the total usage of transportation fuels. Since the regulation is currently not applied to retail distributors they, for economic reason, rather export the **biodiesel** than sell it domestically. This results in low domestic consumption and increase of exports in 2016.

Production of **other liquid biofuels** increased in 2015 because new companies started to report their biofuels production to the Polish administration.

Transformation

In 2017, heat production from autoproducer CHP and heat plants burning **municipal wastes** increased due to two new plants.

Before 2000, industrial waste was used interchangeably with light fuel oil in some plants, which might result in breaks in the time series.

Consumption

The decrease in the consumption of **biodiesel** in the road sector in 2017 is related to an unfavourable pricing scheme on the domestic market, causing consumers to choose **diesel** and producers to export or blend the **biodiesel** they produced.

The consumption of **solid biofuels** in non-metallic minerals decreased in 2017 because modern clinker ovens have been replacing **solid biofuels** with **municipal wastes**.

Increases in consumption of **biodiesel** in 2016 are related to a policy change in the middle of the year.

Data for **biogases** refer only to the gas from fermentation of biomass.

Until 1998, data for **industrial waste** include **other recovered gases** which have to be reported in Coal questionnaire, causing a break between 1997 and 1998.

Between 1992 and 1993, due to data availability, there is a large increase in **solid biofuels** for residential, commercial/public services and agriculture/forestry.

Electricity and heat

General notes

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 2004. Prior to that they are included in consumption.

Heat production from heat pumps is available from 2009.

Transformation

For 2019, the increase in electricity output from **industrial waste** was in part due to the opening of a new waste-to-energy plant in late 2018.

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.

For the 2017 edition, the Polish administration revised electricity production data from power plants run by combustible fuels, reclassifying those that were previously reported as main activity CHP as main activity electricity plants. These revisions mainly affected **coal**-fired power plants and created breaks in time series from 2004 onwards.

In the 2017 edition, the Polish administration reclassified some amounts of electricity consumption from *chemical and petrochemical* sector to *oil refineries*, following access to improved survey methods.

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.

Prior to 2013, electricity used for pumped storage (mixed plants) is included under used for pumped storage (pure hydro pumping plants).

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.

Heat consumption in energy industry own use includes process heat not sold before 1995.

Data for **electricity** production in autoproducer electricity plants are available from 1986.

Consumption

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.

Coal

General notes

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

Consumption

Between 1997 and 2001 **gas works gas** was gradually replaced by **natural gas** in the *commercial/public service* and *residential* sectors.

The production of pig iron ceased in the first quarter of 2001, leading to decreases in supply and consumption of **coking coal**, **coke oven coke**, **coke oven gas** and **blast furnace gas** in 2001.

Oil

General notes

The increase in refinery throughput in 2015 is a result of increased refinery capacity linked to the expansion of the Sines refinery.

A new hydrocracking unit started operations in Sines Refinery in April 2013. This explains the 2013 increase in **refinery feedstock** imports, as well as middle distillate production.

Supply

Production *from other sources (natural gas)* of **other hydrocarbons** corresponds to hydrogen used in refineries, also represented as the output of *non-specified transformation* in the balances format.

Scheduled refinery maintenance lasting two months in 2018 affected the production and exports of secondary oil products.

Consumption

Due to an investment to increase capacity, petrochemical plant operations were stopped for almost five months, thereby decreasing the consumption of **naphtha** and **LPG** for non-energy use in 2018.

Consumption of **gas/diesel oil** in industry and commercial/public services represents diesel use in mobile fleets.

Natural gas

Supply

In February 1997, Portugal started to import **natural gas**.

The surge in 2017 *imports* is attributed to the consumption of gas-fired power plants that filled in the gap of decreased hydro-generation due to a drought.

Transformation

Since 2012, data reported for *non-specified transformation* represent **natural gas** used for hydrogen manufacture. Prior to this year, these quantities are reported under *oil refineries*.

The 2002 decrease in natural gas used for *gas works (transformation)* is due to the closing of the Lisbon gas works plant in May 2001.

Biofuels and waste

General notes

Charcoal data for 2018 (indigenous production and residential sector) are delayed. Revisions are expected in the future.

Data for **solid biofuels** were revised in a previous publication by the National administration from 1990 to 2001, which may result in breaks in time series between 1989 and 1990.

Data are available from 1994 for **biogases**, from 1999 for **municipal waste** and from 2003 for **industrial waste**.

Consumption

The use of **biogasoline** for blending decreased in 2017 because it is no longer compulsory to use biofuels in gasoline.

Data for **solid biofuels** were further revised based on a new survey on industry, resulting in breaks in sub-sectoral consumption for 2012.

Between 2009 and 2010 a new survey on energy consumption in households creates a break in time series in the **solid biofuels** consumption in residential time series.

Electricity and heat

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.

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.

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.

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 electricity production by autoproducers include production from combustible fuel sources only.

Electricity production from **other oil products** refers to methanol.

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.

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.

Coal

General notes

BKB includes peat products.

In 2019 there is a general decrease in coal supply affecting all products, which is driven by less coal-fired power generation and reduced operation in the *iron & steel* sector.

Data for **anthracite**, **patent fuel** and **coal tar** all begin in 2005. Prior to this, **anthracite** was included with other hard coals, and **patent fuel** and **coal tar** data were not reported.

Since 2005, data for **coal tar** and **patent fuel** are based solely on trade receipts. Production of **coal tar** which is consumed within the national boundary is not reported. Consumption of **patent fuel** adopts the residual methodology for statistical differences described above.

Breaks in time series may exist between 2000 and 2001 as the result of the implementation of a new survey system.

Commercial/public services also includes statistical differences for **other bituminous coal**, **lignite**, **patent fuel** and **coke oven coke** from 1980 onwards and **BKB** from 1989 onwards.

Supply

Coal mining is scheduled to end in the Slovak Republic by 2023.

Oil

General notes

Starting with 2016 data **ethane** is included with **refinery gas**.

From 2001 onwards, **kerosene type jet fuel** includes small amounts of **other kerosene**.

Transformation

In 2018, one of the companies changed its status from main activity producer CHP plant to autoproducer CHP plant, resulting in a decrease in **refinery gas** and **fuel oil** consumption for main activity producer CHP.

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.

Consumption

In 2018, one of the companies changed its status from main activity producer CHP plant to autoproducer CHP plant, resulting in an increase in **fuel oil** consumption in the chemical and petrochemical industry.

For **gas/diesel** oil, road data include rail use.

Small quantities of **kerosene-type jet fuel** used for domestic aviation are included in international aviation bunkers data.

Data for energy use of **white spirit** are not available.

Natural gas

General notes

Data for losses were not available between 2009 and 2013.

Between 1970 and 1971 and between 1978 and 1979, there are breaks in time series due to a revision of data for 1968-1969 and 1979-92 made in 2003. Data for 1970 were estimated by the Secretariat.

Supply

In 2002 the gross calorific value (GCV) of production increased significantly as extraction from a field with a low GCV ended.

Imports include gas used for pipeline compressor stations.

Transformation

In 2014, the decrease in *autoproducer CHP* plants consumption was due to a plant closure.

Autoproducer electricity plants stopped operation in 2016.

Amounts in *non-specified transformation* represent **natural gas** used for hydrogen manufacture. This hydrogen is used for hydrodesulphurization and for hydrocracking in oil refineries.

Consumption

In 2018, following a change in the nature of its economic activity (as per the NACE classification), a big consuming company is now accounted for in the natural gas consumption for the mining sector, leading to a substantial increase.

In 2016, non-energy use of natural gas in the *chemical and petrochemical* industry decreased due to a two-month stoppage in ammonia production.

In 2001, there is a break in time series for energy use in *oil and gas extraction* due to the application of the IEA's definition starting that year.

There are inconsistencies in the time series of *commerce/public services* as this sub-sector was computed as a residual.

Biofuels and waste

General notes

Prior to 2001, the data reported as **industrial waste** include **biogases** and **municipal waste**.

Consumption

Consumption of **solid biofuels** in the *commercial and public services* sector increased because there were many new reporting units.

Electricity and heat

General notes

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 2020, electricity generation reported under main activity **nuclear** electricity-only plants is prior years, is reported under main activity CHP plants. To improve consistency, data may be reallocated between plant types in a future cycle.

For 2020, no **municipal waste** use is reported at autoproducer electricity plants or autoproducer heat plants, as the plants reported the production under autoproducer CHP.

For 2020, the efficiency of production using **other bituminous coal** at main activity CHP plants is above the expected range. Conversely, for 2020 and 2019, the efficiency of heat production using **biogas** at main activity plants is far below the expected range. The Slovak Administration is investigating these issues. Revisions are pending.

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.

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.

Slovenia

Source

Statistical Office of the Republic of Slovenia, Ljubljana.

General notes

Breaks in the time series appear for inputs to and outputs from electricity generation between 2017 and 2018 due to a change in methodology. This is most notable for lignite-fired *main activity producer CHP* and electricity-only plants. Data for 2018 onwards are reported on a unit basis, whereas data for previous years are reported on a plant basis.

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.

Coal

Transformation

From 2018, there is a change in methodology for reporting CHP generation which reflects in new figures in only-electricity production. Revisions prior to 2018 are not expected.

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

Oil

Supply

Between 2013 and 2014, a break in imports and exports time series for **kerosene-type jet fuel** and **fuel oil** appears due to improvements in reporting methodology. New trade corresponds to imports that are first stocked on Slovenian territory and later re-exported.

Consumption

In the 2021 edition, there is a break between 2017 and 2018 for **white spirit** whereby consumption is reported for various industry sub-sectors due to a change in reporting methodology by the Slovenian administration.

Time series for **motor gasoline** and **gas/diesel** consumption in road fluctuate as they are computed by the Slovenian administration as residual between the supply and the total consumption of all other categories.

Natural gas

Transformation

In 2014, improvements in a *main activity producer CHP* plant resulted in a substantial reduction of **natural gas** consumption in this sector.

Consumption

In 2011, the decrease in the *chemical and petrochemical* sector non-energy use consumption is due to minimal use of gas for production of methanol.

There are inconsistencies in the time series for *commercial/public* services as this sub-sector is computed by the Slovenian administration as a residual.

Biofuels and waste

Consumption

Increases in consumption of **biodiesel** starting from 2017 are the result of an amended energy policy, which went into effect in mid-2017.

The break in time series between 2008 and 2009 for **solid biofuels** is due to revisions based on a new household survey which is to be carried out on an annual basis.

Breaks in total final consumption for **industrial waste** prior to 2008 are a result of a sectoral reclassification.

Electricity and heat

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**.

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 future editions.

Coal

General notes

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.

Supply

Since 2019, capacity of coke oven coke production has decreased in Spain. As a consequence, the imports of **coke oven coke** have increased and the imports of **coking coal** have decreased.

Hard coal mining ceased in Spain at the end of 2018. Consequently, the production figures for **other bituminous coal**, **sub-bituminous coal** and **anthracite** are zero from 2019.

Import and exports figures include transit trade. This affects specially anthracite. There is ongoing work to improve this situation.

The main **coke oven coke** producer closed in 2019, which meant a significant reduction of the quantities of coke oven coke produced. This also affected the coking coal imports.

Lignite mining ceased in 2008.

Underground production of sub-bituminous coal ceased in 2016.

Transformation

Half of the coal power plants closed in Spain in June 2020. Due to this great reduction of the coal plants in Spain, figures in transformation have decreased greatly, especially in Main Activity Producer and **other bituminous coal**.

The main Main Activity Producer plant consuming **coke oven gas** has had several stops within 2020, which have affected the consumption and the efficiency figures.

In 2018 edition, a reclassification of plants from autoproducer to main activity has led to breaks between 2015 and 2016.

Consumption

Iron & steel production slowed down in 2019. As a result, energy consumption has decreased this year in electricity, natural gas and all coal products related to this sector (coking coal, coke oven coke, coke oven gas, blast furnace gas)

In the 2021 edition, blast furnace (energy) consumption has been revised back to 2003.

Oil

General notes

A change in the reporting system occurred mid-1996 resulting in some breaks in time series.

Supply

The rise in crude production in 2013 is linked with the development of the Montanazo-Lubina deep off shore field.

Consumption

Gas/diesel oil is no longer used in coal mines due to the cessation of coal mining production in 2020.

A more detailed breakdown in some consumption time series appears between 2012 and 2013 due to an update and improvement in the reporting methodology.

Natural gas

General notes

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

Starting in 2020, Spain was able to obtain information about *international marine bunkers*, which led to a re-allocation of export flows initially included in *Non-elsewhere Specified* for the period of 2015 to 2019.

Transformation

The increase in the *transformation sector* consumption for 2017 comes from more gas-fired plants being used to compensate decreased hydro generation due to a drought.

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.

In 1997, the increase in input to *main activity producer electricity* is due to two main activity producer electricity producers running on **natural gas**.

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.

Since 1990 the decrease of **natural gas** inputs into **gas works gas** production is due to the substitution of **natural gas** by manufactured gas.

Consumption

Since 2001, the final consumption breakdown is estimated by the Spanish administration.

Between 2005 and 2006 there are some breaks in time series for the energy industry own use and for final consumption due to a change in the estimation methodology.

Since 1988 the increase of **natural gas** used as feedstock is due to a substitution of **naphtha** for the production of fertilisers.

Prior to 1982 **natural gas** consumption in textiles and leather, transportation equipment and machinery has been included in non-specified industry.

Biofuels and waste

General notes

Prior to 2018 data, **other liquid biofuels** data were included with **solid biofuels**. A revision of the historical time series is expected in the future.

As of the 2020 edition, the reporting methodologies for **solid biofuels** and **biogases** are under review by the Spanish administration. Revisions are expected next cycle.

Transformation

In the 2022 edition, thanks to a split of paper **industrial waste** between renewable and non-renewable, some units reports industrial waste in electricity autoproducers. For this reason, in 2020 the electricity generation increased greatly. In addition, in 2020 a CHP plant reported generation from hydrogen produced through membrane systems using salt water reservoirs. This product has been allocated to industrial waste since non-renewable electricity is used. It might be revised in future editions.

Heat production from renewable sources is mostly not sold to third parties but rather, used for industrial purposes or consumed by heat production facilities. Revisions are expected next cycle which include some heat production.

2017 is the first year that data are available for the blending of **biogas** with natural gas. An update to the time series is expected in the future.

Based on studies from the Institute of Cork, Wood and Charcoal (IPROCOR), the efficiency of **charcoal** production plants is assumed to be 20%.

From 2013 data, a revision of the industry sector of some companies causes breaks in time series for **solid biofuels**, **municipal waste** and **biogases**.

Consumption

Increased consumption of **biofuels** from 2016 to 2017 is a result of increased demand for motor gasoline/diesel.

Prior to 2006, inputs of **biogases** used to generate process heat were erroneously included as inputs to transformation when they should have been reported in the appropriate industry in final consumption.

The breakdown of **solid biofuels** direct use in the industry sector prior to 1999 is not available.

Electricity and heat

Supply

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

As of the 2020 edition, the reporting methodologies for **solid biofuels**, **biogases** and **solar thermal** are under review by the Spanish administration. Revisions are expected next cycle.

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

Industrial waste inputs to autoproducer CHP plants include **hydrogen** generated from processing brine.

Heat production from renewable sources is mostly not sold to third parties but rather, used for industrial purposes or consumed by heat production facilities. Revisions are expected in the 2021 edition which include some heat production from renewable sources.

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.

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.

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.

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).

Sweden

Sources

Statistics Sweden, Örebro.

Swedish Energy Agency (Energimyndigheten), Eskilstuna.

Coal

General notes

Peat products data may be reported under the category of **peat**, particularly for imports.

In the 2021 edition, there was a revision of the products included under **gas works gas**. As a result, the figures for the years 2011 to 2018 were put to zero. Previously this product included some mixture of **LNG** with air to form a lower calorie product.

Autoproducer inputs to waste heat production that are sold are reported in the respective final consumption sectors and not in transformation.

Supply

Other bituminous coal production until 1992 is coal recovered during the quarrying of clay.

Transformation

The figures in the *Transformation* section for the products **coke oven gas** and **blast furnace gas** were estimated until 2018; from 2019 onwards the data is obtained from surveys.

Oil

General notes

In 2017 Statistics Sweden added more companies to their new data collection system; these have been progressively included in the reporting through 2018 reference year data.

Swedish stock data include peacetime crisis stocks. Since these stocks may be held in **crude oil** instead of oil products, there may be occurrences of negative stock levels for products.

Data are available from 2003 for **refinery gas** and from 2000 for **additives** and **ethane**.

Beginning in 2002, Sweden has changed some of the conversion factors for some products. That explains the small breaks in time series between 2001 and 2002.

Supply

In 2019, outputs of several oil products decreased as a result of refinery shutdowns lasting two months.

In 2018, due to a new data collection survey rolled out by Statistics Sweden which has a higher level of detail available, transfer of **refinery gas**, **naphtha** and **fuel oil** appear for the first time. Consequently, transfer of **other products** in 2018 dropped to zero.

Quantities of receipts from other sources of **other hydrocarbons** correspond to **natural gas** used by refineries.

Transformation

In 2014, **gas/diesel oil** inputs to main activity CHP electricity plants are confidential and aggregated with **fuel oil**.

In 2013 data, the drop in **crude oil** refinery intake is related with maintenance in August and September 2013 at the Swedish refineries.

From 2011, the country's gas works plants stopped using **naphtha**.

Consumption

In 2020, the Swedish administration confirmed that all **refinery gas** is consumed as refinery fuel. This change in reporting methodology possibly extends to 2018 and revisions are expected.

Starting from 1995 data, Sweden has changed its standard classification of industry sub-sectors

Between 1985 and 1986, there are breaks in consumption time series of **fuel oil** due to more detailed reporting.

In 1984 data, consumption of **other kerosene** in the road sector is discontinued due to product re-classification.

Natural gas

Supply

From Other Sources – Renewables estimated in 2022 edition using data from the renewables questionnaire.

Natural gas consumption in *international marine bunkers* are available for the first time for the year 2017.

Transformation

In the 2021 edition, there was a revision of the products included under **gas works gas**. As a result, the figures for the years 2011 to 2018 were put to zero. Previously this product included some mixture of **LNG** with air to form a lower calorie product.

Autoproducer inputs to waste-heat production that are sold are reported in the respective end-use sectors and not in the transformation sector.

Consumption

For 2013, data for the energy use of gas by *oil refineries* have been estimated by the IEA Secretariat.

For 2008, data for total final consumption and its breakdown have been estimated by the IEA Secretariat based on other Statistics Sweden publications.

For years prior to 1993, *road transport* is included in *commercial/public services*.

Biofuels and waste

General notes

In the 2022 edition, the administration adopted a new data source for energy consumption in industry. This has caused breaks in the time series and the presence of new flows in 2020 in particular for **solid biofuels**, **other liquid biofuels** and **biogases**.

New data in the 2020 edition for **biodiesel** in *industry*, *transport* and *other sectors* for 2005 – 2017 are related to a new survey.

There are some breaks in time series between 2015 and 2016 in pumped hydro, **industrial waste** and **other liquid biofuels** figures due to the lack of data. The figures are expected to be modified in the 2018 edition.

From 1990 to 2006, **municipal waste** was reported as 60% non-renewable and 40% renewable. In 2007, reanalysis of the waste revealed the content was 40% non-renewable and 60% renewable. This was re-analysed again starting from 2016 data, when the result of the analysis revealed the split should be 52% renewable and 48% non-renewable. This results in breaks in the time series between 2006 and 2007 and also 2015 and 2016 for both renewable and non-renewable **municipal waste**.

In the 2018 edition, data for **biodiesels** were revised from 2006 to 2015 while **biogasoline** and **bioethanol** were revised from 2005 to 2015. The revisions affected indigenous production due to increased information about net trade, as well as the transformation sector, for blending with motor gasoline/diesel/kerosene and consumption in the road sector.

Supply

In the 2022 edition, for **industrial waste** data the administration adopted the figures from the survey “Quarterly Fuel Statistic” while in the past the “Energy use in manufacturing industry” was used. This led to a break in the time series between 2019 and 2020.

Due to a change of tax regulations in 2017, it was no longer profitable to produce fatty acid methyl ester (FAME) in the same capacity as before, so there was a drop in **biodiesel** production. This drop in production was substituted by imports to meet increased demand.

In the 2018 edition, trade data were added for **primary solid biofuels** starting from 2012. As the net trade used to be reported together with indigenous production, this has resulted in a downward revision of indigenous production for 2012-2015.

Transformation

In the 2022 edition, electricity generation from **industrial waste** is reported but no capacity installed is shown. This is because industrial waste is a secondary product used in other non-specified plants.

Consumption

In the 2022 edition, **industrial waste** consumption in the industry sector non-specified flow appears for the first time. Disaggregated data will be available in future editions.

In the 2021 edition, there are revisions in the consumption of **solid biofuels** in the agriculture/forestry sector starting in 2005 resulting in a break in series between 2004 and 2005. These revisions remove double counting with the residential sector.

Increased consumption of **biogases** in the industry sector in 2018 was because several industries switched from **natural gas** to **biogases**.

Changes in tax regulations as of 1 July, 2018 has contributed to decreased consumption of **biodiesel** in 2018 data.

Due to confidentiality issues, **solid biofuels** consumption in food, beverages and tobacco is reported with paper, pulp and printing for 2014 data.

Consumption data by sector for **biogases** are available from 2011.

In 2011 data, there was a change in the reporting methodology for consumption of solid biofuels and waste in the residential sector, which is responsible for breaks in time series between 2010 and 2011.

For **biogases**, the *residential* sector is used as a residual.

Electricity and heat

Supply

For 2020, the cessation of electricity output from autoproducer **hydro** was due to the plant no longer being classified in that category.

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 inputs 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).

Ambient heat is shown as the indigenous production of **heat**.

Information on heat for sale produced in **heat pumps** and **electric boilers** is available starting in 1992.

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** is due to the closure of two reactors, one in late 2019, and another in late 2020.

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 bio-methanol 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** are 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

Disaggregated data for industrial **heat** demand became available from 2020, due to a change of underlying data source. This led to an increase in reported demand compared with previous years. The Swedish Administration hopes to revise the historical timeseries in a future cycle.

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.

Switzerland

Sources

Swiss Federal Office of Energy (SFOE), Ittigen.

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

General notes

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

Coal

General notes

Stock changes figures are not available for any product for 2019p. This data will be published in the following edition of this publication.

Calorific values for **anthracite**, **other bituminous coal** and **coke oven coke** are taken from a common default figure. Calorific values for **lignite** are also default, but are based on dried **lignite** fines which have a higher calorific value.

Consumption

From 1985, industrial consumption of **gas works gas** is reported in *non-specified industry* to prevent the disclosure of commercially confidential data.

The allocation of consumption between certain coal types is estimated by the Swiss administration.

Natural gas

General notes

Since the 2019 edition, the *non-specified other* flow is calculated as residual flow for **natural gas**. Prior to this, the statistical differences used to be absorbed by *agriculture/forestry*.

Transformation

Since 2013 there are fluctuations in gas consumption of main activity producers CHP plants due to the fuel flexibility of a plant.

In 1996, the increase of gas input to main activity CHP plants is due to more complete accounting for all producing entities.

Consumption

Between 1977 and 1978, there are breaks in time series due to the introduction of a new survey by industry type.

Oil

General notes

The statistical differences for **gas/diesel oil** are partly due to changes in consumer stocks.

In 2004, petroleum coke production started due to the installation of a cracking unit in a refinery

As of 1993, the Swiss administration has reported figures for naphtha that are net of quantities used for blending into motor gasoline. For 1994, 1995, 1997, 1999, 2001 and 2002 this reporting has led to negative production numbers for naphtha. For these years, the IEA Secretariat has moved the data into transfers and reduced the production of motor gasoline by corresponding amounts.

Supply

There is a break in stocks between 2017 and 2018 for **refinery feedstocks** as more detailed information of refinery activity is collected by the national administration.

In 2015, low refinery throughput is due to maintenance in May and June and to an unplanned outage in October due to a leak in a heat exchanger at the Cressier refinery. The closure of the Collombey refinery from March 2015 also contributed. As a result, imports of many oil products increased in 2015.

The Collombey refinery remained closed in 2016, resulting in decreased refinery throughput and increased imports in this year. Refinery output of **petroleum coke** stopped as this product was only produced at the Collombey refinery.

Data for refinery losses at the remaining Cressier refinery are low and are under investigation.

Since 2013 oil importers are obliged to compensate parts of the CO₂ emission that are produced by the transport fuels they sell. The biofuel components are exempt from this obligation, which together with tax exemptions on biofuels, partly explains the increase in biofuel blending since.

Transformation

Gas/diesel oil non-specified transformation represents inputs to mobile and stationary power generators, of which the electricity output is unknown at this stage.

In 2012, low refinery intake is due to the temporary shutdown of the refinery in Cressier in the first semester of 2012 and maintenance at Collombey refinery.

In 1988, the reduction in refinery intake of refinery **feedstocks** in 1988 is partly due to a switch to crude oil and partly to a shutdown for maintenance of a refinery.

Consumption

In the 2022 edition, the Swiss administration revised data from 2012 onwards for **road diesel** consumption in rail and domestic navigation and **motor gasoline** consumption in domestic navigation.

In the 2019 edition the Swiss administration revised data back to 1990 for **road diesel** consumption in rail and domestic navigation, and **motor gasoline** consumption in domestic navigation.

In 1994, the increase in consumption of **gas/diesel oil** is due to consumer stock-building prior to the introduction of a value-added excise tax on heating fuels as of 1 January 1995.

Biofuels and waste

Supply

Due to favourable taxation in Switzerland, the imports of **biodiesel** and **bioethanol** intended to be blended with oil products increased significantly from 2016 to 2017.

Due to a new program launched in September 2014 in which CO₂ emissions due to traffic can be compensated by substituting fossil gasoline and diesel by biofuels, the imports and road consumption of **biodiesels** and **biogasoline** increased sharply starting in 2015.

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.

Consumption

Starting in 2018, several agricultural **biogas** plants installed a system to measure heat production. Previously, it was estimated. Due to measurements, they realised they produce much more heat than estimated. This creates a break in series between 2017 and 2018 data.

Consumption data for **biogases** in the transport sector are available from 1996 to 2012 as a biogas fuel station had stopped selling biogas in 2013.

Electricity and heat

Supply

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

Data for electricity production from wind are available from 1996.

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

Transformation

In the 2020 edition, some significant revisions were made to input of **industrial waste (non-renewable)** to autoproducer CHP plants, for 2013 to 2015, 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.

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 shutting down 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.

The breakdown of **electricity** and **heat** generation from autoproducers by sector is only partially available from 1990-1999, and is not available 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.

Turkey

Sources

Ministry of Energy and Natural Resources (Enerji ve Tabii Kaynaklar Bakanlığı), Ankara.

Petrol İşleri Genel Müdürlüğü, Ankara.

Coal

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 2017 edition, historical revisions on **coal tar** data were conducted by the Turkish administration due to new available information.

Data from 2012 onwards utilised the latest census data, causing breaks in time series between 2011 and 2012.

Data from 2008 are provided from the results of an improved questionnaire. Significant changes occur in consumption patterns within the iron and steel industry, coal mining as well as across industry, residential and commercial/public services for **other bituminous coal**.

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.

Production of **gas works gas** declined in 1989 due to plant closures; the last plant closed in 1994. Use of **gas coke** and **gas works gas** ceased in 1994.

Due to government regulations in industry and residential, in particular, there has been a shift from the use of domestically produced **coal** to imported **coal** and **natural gas**.

Transformation

In the middle of 2014, most autoproducer plants in Turkey were reclassified as main activity producer due to a change in the legislation. Amongst other things, this brought the reporting of unsold heat and prorated inputs in line with IEA methodology.

Consumption

In the 2018 edition, revisions on industrial coal consumption were conducted by the Turkish administration back to 2010 due to new available information.

Privatisation of state owned coke ovens in recent years results in incomplete information on **coke oven gas** distribution.

In the 2017 edition, consumption of **sub-bituminous coal** in construction has been reclassified by the Turkish administration as consumption in the non-metallic minerals industry.

In 2015, a new survey was introduced by the Turkish administration to collect more detailed industrial consumption data, resulting in breaks in time series between 2014 and 2015.

Oil

General notes

A project to upgrade the İzmit refinery was completed in 2015. This resulted in considerably higher refinery throughput in 2015, compared to previous years. The project included a new unit to convert high sulphur fuel oil into higher grade products, such as gas/diesel oil and motor gasoline, and producing petroleum coke as a by-product.

In the 2016 edition, the Ministry of Energy revised time series for **kerosene-type jet fuel** from 2013. Sales to foreign airlines, previously accounted for under exports, are now reported under international aviation according to the IEA methodology. Data could not be revised for prior years. Exports of **jet kerosene** up to 2012 years may include international aviation consumption.

In the 2016 edition, the Ministry of Energy revised crude oil net calorific values from 2010 due to a new methodology for calculating them.

Production *from other sources (natural gas)* of **other hydrocarbons** corresponds to hydrogen used in refineries, also represented as the output of *non-specified transformation* in the balances format.

From 2013, marine fuels are reported under **fuel oil** instead of **gas/diesel oil**.

From 2012, **petroleum coke** data are reported.

Supply

In 2019, the increase in refinery throughput is due to the start-up of the new STAR refinery.

In 2018 Izmir refinery underwent maintenance for several months impacting the overall throughput quantities.

In 2014, the drop in **lubricants** imports and consumption is related to a legislation change effective 1st of January 2014 regarding base oil imports.

From 2012, new information on **additives** imports (MTBE) data became available.

From 2012, no exports breakdown is available for **white spirit, lubricants, bitumen** and **other products**.

From 2010 data, more accurate NCVs for crude oil are available due to the implementation of a new survey.

For the years 1978, 1980, 1981, 1983, 1984, international marine bunkers are included in exports.

Transformation

Gas/diesel oil and **fuel oil** consumed to produce electricity are used in both oil and coal-fired plants.

Consumption

Consumption of **biodiesel** for *road* transport increased in 2018 due to legislation coming into effect on 1 January 2018, which enforced a 0.5% blending obligation for **gas/diesel oil**.

In the 2019 edition consumption of **petroleum coke** was reclassified from non-energy to energy use.

For the 2015 data, new surveys were used to create a more detailed breakdown of the industry and other sectors. This led to breaks in time series between 2014 and 2015.

From 2014, information on gas/diesel consumption in fishing is available.

From 2013, additional information on **petroleum coke** cement consumption is available.

Prior to 2012, consumption of **other oil products** in the chemical sector was included under *non-specified industry*.

Between 2010 and 2011, breaks in consumption time series for **LPG**, **motor gasoline** and **gas/diesel oil** appear due to improved survey methods.

Between 1977 and 1978, the end-use classification of **gas/diesel oil** and **fuel oil** were changed in the Turkish national statistics resulting in breaks in time series.

Natural gas

Supply

Exports reported by the Turkish administration represent transit gas.

In 2008, there is a break in time series for *stock changes* due to a revision of storage capacity data.

In December 2016, the first Floating Storage and Regasification Unit (FSRU) terminal started to work, allowing thus greater import quantities and stock levels.

Transformation

Non-specified transformation of **natural gas** represents amounts used to produce hydrogen for hydrocracking in refineries.

In the 2018 edition, Turkish administration revised 2014 and 2015 data, as some main activity producing plants in Turkey were reclassified as autoproducers.

Consumption

In 2015, a new survey was introduced by the Turkish administration to collect industrial consumption data, resulting in a substantial decrease of consumption reported under *non-specified industry*.

In 2013, energy use of **natural gas** in *blast furnaces* was zero, as gas was replaced by coal and coke.

From 2009, there are some breaks in time series across all sectors, as consumption data started being collected by a different institution, the Turkish Energy Market Regulatory Authority.

In 2006, there is a break in time series for non-energy use in *chemical and petrochemical* industry due to improvements in the classification.

Prior to 2000, data for *commercial/public services* were included in the *residential* sector.

Between 1999 and 2001, the decrease in **natural gas** *chemical and petrochemical* feedstocks is linked to the activity of the fertiliser industry.

Since 1988, data for **natural gas** consumption in the *chemical and petrochemical* industry (for fertilisers) and in *non-specified industry* (dye industry) are available.

Non-specified industry includes the natural gas distributed by OIZ (Organised Industrial Zones).

Biofuels and waste

General notes

The Turkish administration only intermittently surveys **renewables and waste** used for power and heat. Due to this fact, some breaks may appear in the **biofuels and waste** time series.

Transformation

Biodiesel blending with **diesel** increased in 2018 because there was a new policy requiring that **diesel** be blended with 5% **biodiesel**.

In 2017, the increase in electricity production in main activity producers burning **solid biofuels** is related to new plants.

Consumption

Starting with 2018 data, new sub-sector data in the industry sector for **industrial waste (non-renewable)** and **solid biofuels** is available as a result of a new survey. Backward revisions will not be available in the future.

Prior to 1998, consumption in the **wood and wood products** sector includes that of the paper, pulp and printing industry.

Electricity and heat

Supply

Other sources **heat** production represents recovered waste heat (steam) from 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 2020, the decline in electricity production from **lignite** was 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 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.

In 1995, the Turkish administration reclassified autoproducer plants by type and source to be consistent with IEA definitions. This causes breaks between 1994 and 1995 for electricity production, most notably in plants fuelled by **biogases**.

Consumption

Prior to 2014, 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.

United Kingdom

Source

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

Coal

General notes

In the 2021 edition, BEIS revised the coal production by type (**other bituminous coal** and **coking coal**) as a result of an update of their models. The revisions go back to 2016 and reallocate some production quantities from **other bituminous coal** to **coking coal**. Some adjustments were done on TFC/Industry/ Not elsewhere specified to adjust the statistical difference to the new production figures.

Oxygen steel furnace gas data are reported with **blast furnace gas** rather than as **other recovered gases**.

In the 2017 edition, calorific values of **other bituminous coal** were revised for the period 2002-2015 due to a change in the methodology, impacting all flows.

Prior to 1994, the consumption of substitute natural gas is included with **natural gas** while its production is included with **gas works gas**.

Supply

Underground production of **coking coal** increased in 2019 as Aberpergwm mine came back into operation in September 2018.

Underground production of **other bituminous coal** in 2016 decreased due to the closure of Hatfield, Thoresby and Kellingley mines.

Transformation

The consumption of **solid biofuels** increased in 2015, as the largest power station in the UK converted a further unit from **coal** to **biomass** midyear, and the previously converted unit had a full year of operation in 2015 rather than just the last few months of 2014.

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.

Consumption

Consumption shown for the commercial/public services includes consumption of some of *non-specified other*.

Oil

General notes

There is a break in series between 2015 and 2016 due to a change in methodology and estimation process applied by the UK administration in the 2020 edition, which involves including data from trade body members and major suppliers.

Breaks in time series occur for **LPG** between 2007 and 2008 due the inclusion of additional information from the petrochemical sector.

For international marine bunkers and domestic navigation, a different bunkers methodology is applied from 2008, in line with UK's National Atmospheric Emissions Inventory. From 2013 onwards, improved data are available for international marine bunkers. Deliveries to international marine bunkers may be underestimated in previous years.

For consumption of oil products, the UK administration revised its methodology from 2008 to better track consumption of imported oil products and domestically refined oil products sold through third parties to final consumers.

Breaks in time series appear in 2013 for **ethane, naphtha, white spirit, lubricants, bitumen, petroleum coke** and **other oil products**, as new information became available on the energy use of these products.

Supply

In the 2021 edition, the UK administration revised the stock levels (national territory) of **motor gasoline** and **gas/diesel oil** from 2015 onwards, resulting in a stock break between 2014 and 2015.

Refinery output of **ethane** decreased in 2019 due to the closure of the Mossmorran NGL plant.

Biodiesel blending notably increased in 2019 per the requirement of the Renewable Transport Fuel Obligation.

Indigenous production of **crude oil** and **natural gas liquids** increased in 2018 primarily due to multiple new projects coming online at the end of 2017.

Refinery output of total oil products decreased in 2018 due to relatively high levels of maintenance throughout 2018.

From 2008 data on **naphtha** and **motor gasoline** better reflects the blending of these products. Breaks in series may appear between 2007 and 2008.

Between 2007 and 2008 breaks in time series appear for **NGL** as a result of the UK administration obtaining additional information on the destination of some upstream **NGL**. Previously classified as exports, these amounts now appear as transfers, mainly to **LPG**, then as consumption in the petrochemical sector.

Between 2002 and 2004 products transferred include backflows and interproduct transfers. From 2005 onwards backflows are estimated by the UK administration.

Condensates are reported in **NGL** from 1980 and in crude oil until 1979.

LPG includes ethane until 1980.

Other hydrocarbons, reported until 1994, correspond to bitumen production from coal.

Consumption

Breaks in time series may occur in the consumption of **gas/diesel oil** between 2011 and 2012, following the UK's administration improved access to customs trade data, in particular duty figures for demand in agriculture.

Natural gas

General notes

In the 2020 edition, revisions were made to years 2017 and 2018 to align with the DUKES publications.

Since 1992, *distribution losses* include metering differences and losses due to pipeline leakage.

Supply

In the 2018 edition, UK administration revised the supply balance back to 2008 to update Norwegian imports from two terminals previously reported as *indigenous production*.

In 2002, the increase in *imports* is due to increased supplies from the Norwegian sector of the North Sea through the Vesterled pipeline, which was commissioned in the 4th quarter of 2001.

In 2017 data the decreased *closing stock level* is related to the cessation of storage operations in Rough, UK's single largest storage facility.

Transformation

The **natural gas** reported in *coke-oven (transformation)* is used to form synthetic **coke oven gas** rather than undergoing a coking process.

Consumption

In the 2018 edition, **natural gas** consumption in the sectors of *industry, residential, commercial/public services*, was revised back to 2008 to include information from other data sources such as the Purchases Inquiry, EU ETS and ONS Index of Services and Production.

In the 2019 edition, the UK administration proceeded to revisions back to 2015 based on improved data from the Purchases Inquiry annual survey of the Office of National Statistics (ONS).

Before 2008, the commercial sector consumption is included in *non-specified other*, while that of public services is shown separately.

Between 2007 and 2008 there are some breaks in time series in sectoral consumption due to a new methodology of data estimation.

Natural gas consumption includes substitute natural gas made at gas works and piped into the natural gas distribution system.

Non-specified industry represent to sales by independent gas suppliers unallocated by category.

Consumption by the mining and quarrying and the wood and wood products sectors is included in non-specified industry.

Non-specified energy includes gas used for heating and pumping operations in the distribution network.

Biofuels and waste

General notes

In the 2021 edition, revisions from 2015 onward in **municipal wastes** were reflect a reclassification from **non-renewable** to **renewable** based on the renewable portion of tires.

In the 2017 edition, the UK government revised the data time series for **municipal waste** and **solid biofuels** back to 2001. As a result, breaks in time series may occur between 2000 and 2001.

Transformation

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 consumption of **solid biofuels** has increased in 2015, as the largest power station in the UK halfway through the year converted a further unit from coal to biomass, plus the previously converted unit had a full year of operation in 2015 rather than just the last few months of 2014.

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.

Consumption

In the 2022 edition, **solid biofuels** data were revised back to 2008. This causes breaks in time series between 2007 and 2008.

In the 2021 edition, **solar thermal** reclassifications from residential to commercial and public services in 2016 – 2018 represent new data on heating for public swimming pools.

In the 2020 edition, there are some unusual patterns in the *industry* sector for **municipal wastes** and **solid biofuels**, however revisions are expected in the following cycle.

In the 2018 edition, following a review of the consumption of **biogases** and **municipal wastes** for 2015 and 2016 data, data that were allocated to other sectors have been reallocated to the industry sectors. This has caused a break in time series between 2014 and 2015.

Electricity and heat

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 this 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** are available from 1989.

Transformation

In the 2022 edition, electricity generation from autoproducer wind plants was revised between 2018 and 2019. In 2019, a peak is visible because a large plant was recorded as an autoproducer and in 2020 it was classified as a main activity producer. The reason for this is that the plant was not covered by the survey of major power producers until 2020, therefore administrative data were used in 2019.

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.

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

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

Heat production from autoproducers is available starting in 1999.

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

Consumption

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*.

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.

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.

Coal

General notes

The statistical difference for **anthracite** is significant for some parts of the time series as some consumption falls below the reporting thresholds, such as *residential* usage. Additionally, some anthracite is exported blended with other bituminous coal, and reported with the other fuel.

From the 2022 edition, **coke oven gas** and **blast furnace gas** production and most consumption data are no longer available due to confidentiality.

Since the Energy Information administration (EIA) and the US Department of Commerce do not collect separate data on **patent fuel** exports by country, total exports data of **patent fuel** are included in the exports of **other bituminous coal**.

Coal tar as a by-product of coke ovens is not currently reported.

In 2002, the United States reported “synfuel” production as **patent fuel** for the first time. Prior to 2002, the consumption of this fuel was reported with **other bituminous coal**. Production ceased in 2007 for economic reasons.

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

Supply

Other sources coal production represents coal production that does not have a Mine Health and Safety Administration (MSHA) identifier.

Other bituminous coal exports could include some **anthracite** quantities. Anthracite is often blended with bituminous coal when exported.

Transformation

Anthracite calorific values for Main Activity & Other Uses is mainly Anthracite waste coal. As such heat content is much lower than expected for this product.

Coking coal calorific values for coke ovens and blast furnaces are reported by most data providers on an “dry heat content” basis rather than on an “as is” or “as received” basis. As such, they are on the higher end of the range expected for this product.

Oil

General notes

In the 2018 edition, the US administration revised data back to 2011 for several products owing to the introduction of a number of methodological changes. This results in a number of breaks in the time series between 2010 and 2011, particularly in the consumption data.

From 2011 onwards, olefins are reported under **other oil products** instead of **LPG**.

Breaks in time series due to methodology improvements and newly available information to the US administration also appear in historical data: in 1990 for fuel oil (new methodology for marine bunkers); in 1992 for LPG/NGL (specific densities); in 1993 for oxygenates (new collection system to accommodate the revised Clean Air Act); in 1994 for motor gasoline (new model from the US Department of Transportation); in 1999-2000 for industry consumption (new

available data from the 2002 MECS survey); in 2001 for fuel oil (changes in methodology for classifying imports of unfinished oils) and in 2011 for refinery gas (new density).

Supply

The US administration reports stocks of **crude oil** held in the United States on behalf of Australia under official agreement in 2020.

Receipts (from non-specified sources) and trade of **additives/oxygenates** in 2020 are not available as the EIA no longer collects information on ETBE and MTBE.

In the 2021 edition, receipts from other sources and total exports of **additives/oxygenates** have been estimated by the IEA Secretariat for 2019 based on information in the IEA Monthly Annual Oil Statistics.

In the 2021 edition, the refinery gross output of **motor gasoline** has been estimated by the IEA Secretariat for 2019 based on information in the IEA Monthly Annual Oil Statistics.

In the 2021 edition, deliveries of **gas/diesel oil** for international marine bunkers have been estimated by the IEA Secretariat for 2019 based on information provided by the EIA.

Deliveries to international marine bunkers of **gas/diesel oil** have been estimated by the IEA Secretariat for 2016 and 2017 based on information provided by the EIA.

In the 2018 edition, the breakdown of exports by destination of low sulphur fuel oil and high sulphur fuel oil is not available. The time series was revised back to 2011.

Completion of the Utopia pipeline from Ohio to Ontario has facilitated more **ethane** exports to Canada in 2018.

High statistical differences for **crude oil** represent “unaccounted for crude oil”, the difference between the supply and disposition of crude oil.

From 2013, the US administration reports exports of **refinery feedstocks**, some of which were previously reported under **white spirit and SBP**.

Stocks changes for **gas/diesel oil**, **fuel oil** and **petroleum coke** were estimated by the IEA Secretariat from 1996 onwards to include stock changes at utilities.

Transformation

From 2002 onwards, the IEA Secretariat has estimated the amounts of refinery gas used for autoproducer electricity production.

Consumption

In the 2021 edition, consumption of **motor gasoline** for road transport and of **gas/diesel oil** for rail transport have been estimated by the IEA Secretariat for 2019 based on information provided by the EIA.

In the 2021 edition, non-energy use of **gas/diesel oil** in the chemical (including petrochemical) sector has been estimated by the IEA Secretariat for 2019 based on information provided by the EIA.

In the 2021 edition, consumption of **petroleum coke** in industry – not elsewhere specified has been estimated by the IEA Secretariat for 2019 based on information provided by the EIA. In 2018 demand for petrochemical feedstocks derived from oil products increased following new ethylene production capacity coming online and the ramp up in polyethylene capacity. This trend is expected to continue through 2019 as further ethylene capacity comes online.

Between 2010 and 2011, end-use energy consumption data for the United States present a break in time series due to a change in methodology. For the period 2011-2016, quantities of non-energy use of LPG in chemical and petrochemical, and of other oil products in non-specified industry have been estimated by the IEA Secretariat.

From 2013 onwards, road use lubricants are reported under non energy consumption in transport equipment, machinery, and wood and wood products. Previously, such quantities were reported under non-specified industry.

From 1995 onwards, **LPG** inputs to gas works are included in industry.

Natural gas

General notes

Puerto Rico is currently not included in US data for **natural gas** with the exception of gas consumed for electricity generation. LNG imports into Puerto Rico are reported in the Other non-OECD Americas regional aggregate.

Supply

In the 2017 edition of this publication, the *indigenous production* data for 2014 was revised by the US administration creating a break in the time series between 2013 and 2014 due to a change in the methodology. In addition, this increased the *statistical difference* that remained high in 2015 and 2016.

The exports have been increasing since 2015, due to new liquefaction capacity (i.e. Sabine Pass) coming online at the end of that year.

Transformation

Since 2012, data reported under *non-specified transformation* represent **natural gas** used for hydrogen manufacture. Prior to 2012, these quantities are reported under the *chemical and petrochemical* sector.

Between 1999 and 2000, there are some breaks in time series for the transformation subsectors due to a new data reporting method.

Between 1990 and 2002, the amounts of **gas works gas** that are blended with **natural gas** have been estimated on the basis of the output efficiency of the process.

Since 1989, 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*.

Consumption

In the 2019 edition, revisions were made to the *industry sector* from 2015 onwards, by reallocating **natural gas** consumption to the *chemical and petrochemical* sub-sector from other industrial sub-sectors.

Due to revisions made to the iron and steel model, there is a break in the time series between 2014 and 2015 for the consumption in *blast furnaces (energy)*.

Until 2001, *agriculture/forestry* consumption is included under *industry*.

From 1995 to 2001, the detailed breakdown of *industry* consumption is estimated by the Energy Information administration using the Manufacturing Energy Consumption Survey (MECS), which is conducted quadrennially.

Prior to 1995 a detailed breakdown of industry consumption is not available (between 1990 and 1994, chemical consumption is estimated by the American administration).

In 1991 data on **natural gas** use in the *road* sector were collected for the first time, and are not available for previous years.

Non-specified energy industry own use represents **natural gas** consumed for the production of **ethanol**.

Consumption in fisheries is included under *industry*.

Biofuels and waste

General notes

The EIA assumes all **industrial waste** is non-renewable.

Due to the change in reporting methodology for **liquid biofuels**, breaks in time series occur between 2009 and 2010. This is especially noticeable in the **biodiesel** time series.

Supply

Data for indigenous production and domestic supply of **industrial waste** have been estimated by the IEA Secretariat for 2019p.

Data for production of **industrial waste** have been decreasing since May 2014 due to reclassification, resulting in a break in series between 2013 and 2014.

Indigenous production of **biodiesel** is estimated in 2010 based on the EIA's Monthly Energy Report.

Transformation

The EIA collects generation and consumption data from all plants 1 MW or more in capacity.

Consumption

Due to an improved estimation, there are some breaks in time series of the industry sector and other sectors between 2009 and 2010: for industry, **geothermal**, **biogases** and **industrial waste** (paper, pulp and printing); for other sectors, **geothermal** and **solar thermal**.

Electricity and heat

General notes

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.

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. There is an additional break in series between 2018 and 2019e data for **geothermal** direct use, as the methodology has reverted to the previous one.

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.

Offshore wind production began in 2016.

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.

For 2016, **electricity** and **heat** generation from some types of **coal** and 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 \$20 to \$25 USD per tonne, and while intended to deal with coal liquefaction and similar technologies, it had spawned an industry of cosmetic upgrading as a tax minimisation vehicle.

From 2004 to 2013, the EIA reported electricity and heat production from **anthracite** under **other bituminous coal**. The Secretariat estimated the split of generation output by fuel type based on the assumption that the plant efficiencies of the aggregate are equal to that of each part.

Starting in 2002, autoproducer electricity output for **oil** includes generation from **refinery gases** with a low average calorific value. Prior to 2002, this output was not accounted for.

Prior to 2001, some data on plants consuming **sub-bituminous coal** and **lignite** have been estimated by the Secretariat using information provided in the EIA's Annual Electricity Generator Report – Utility.

Data for **peat** are confidential between 1994 and 1998 and from 2000 are not reported.

Prior to 2000, autoproducers include small and independent power producers which under IEA definitions are considered as main activity producers. Production from these small and independent power producers accounts for about 25% of reported production of electricity by autoproducers in the United States. This reclassification causes breaks between 1999 and 2000.

In the 2003 edition, the United States administration reclassified some plants to autoproducers. This reclassification causes more breaks between 1998 and 1999.

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.

Prior to 1989, there are no generation data available from autoproducers.

Sub-bituminous coal inputs for electricity and heat production are included in **hard coal** before 1983.

Consumption

Consumption breakdown data for **electricity** are modelled based on data obtained from the Annual Energy Outlook and conversion factors. These data are based on fiscal values rather than physical tonnage, so if commodity prices increase or decrease between AEO versions and the conversion factors are not updated, derived changes in consumption may appear that are not supported by physical changes in production, or actual changes in consumption. For example in 2016, production of steel in electric arc furnaces increased by 6%, however consumption of electricity in the *iron and steel* industry was reported as declining by 17%. 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, 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*.

No data are available for **heat** sold that is consumed in the *residential* and *agriculture/forestry* sectors for any year.

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.

Non-OECD countries

General notes

In the references below, both the statistical year (2020) for which data are being published in this edition, as well as publication dates of the many documents which have been consulted during the development of this publication are mentioned. As a general rule, where specific documents or personal communications have been used, the date that is referenced is the date of publication of the document or the date of the communication, whereas, where data received through the completion of questionnaires are mentioned, the date that is referenced is the statistical year for which data are being published in this edition, namely 2020.

Data may not include all informal and/or illegal trade, production or consumption of energy products, although the IEA Secretariat makes efforts to estimate these where reliable information is available.

General references

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Note:

EU4Energy is a 5-year (2016-2021) EU-funded programme working to support evidence-based energy policy and decision making in the areas of energy security, energy markets and sustainable development in 11 focus countries - Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Tajikistan, Turkmenistan, Uzbekistan and Ukraine. The IEA is responsible for the programme's energy-data management and data use in policy design.

The OLADE database was used for several Non-OECD Americas countries.

The UN database was used for a number of countries as a complementary data source.

Albania

General notes

Data for Albania are available starting in 1971.

Before 1993, large quantities of oil, widely reported to have moved through Albania into Former Yugoslavia, are not included in oil trade. Although they might have represented up to 100% of domestic consumption levels, no reliable figures for this trade are available.

Starting from 2011, motor gasoline consumption is reported in the residential sector. This consumption corresponds to motor gasoline used in electricity generators.

Sources

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Joint IEA/Eurostat/UNECE annual energy questionnaires.

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The United Nations Energy Statistics Database, United Nations Statistical Division, New York.

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IEA Secretariat estimates.

Argentina

General notes

Data for Argentina are available starting in 1971.

In the 2022 edition, disaggregated industrial consumption of natural gas is estimated as data is not available.

In the 2021 edition, new use of customs information led to revisions of coal imports between 2002 and 2018.

In the 2020 edition, Argentina's 1971-2017 time series were revised across all products after communication of revised historical balances from Secretaría de Energía. Most of the revisions are based on those revised energy balances; others are based on revisions from the IEA Secretariat after analysis of available historical balance series. In detail:

Coke oven coke, coke oven gas and blast furnace gas data are estimated by the IEA Secretariat from 2006 onwards.

Petroleum coke demand is estimated by the IEA Secretariat from 2006 onwards, and trade is sourced from Instituto Nacional de Estadística y Censos de la República from 2006 onwards.

Data on electricity demand by industrial sub-sector is available since 2015. However, it reflects fixed shares of demand by sub-sector and does not reflect variation of demand trends between sub-sectors over time. Electricity generation by fossil source is estimated by the IEA Secretariat based on information of fuel inputs and generation by technology.

Biogas data includes biogases from thermal processes in the paper industry up to 2013, and electricity generation data reported by CAMMESA from 2012. Refinery feedstocks data is available from 1999.

Additives data contains MTBE from 1994 and other octane improvers from 2010 onwards. A structural break may exist between 2009 and 2010. Natural gas data contains trade of wet gas and own use of wet gas in oil and gas extraction. This can lead to statistical differences in the time series.

The Secretaría de Energía is developing its statistical system to collect further data on final consumption data and its disaggregation by activity. This could lead to data revisions or breaks in time series in future editions.

Since 2010 a different methodology was adopted by Argentina for reporting refinery flows leading to more detailed information (e.g. reprocessing of some oil products). This may result in breaks in time series between 2009 and 2010. Breaks in time series may also exist between 1993 and 1994 due to the start of the data series coverage of such refinery flows.

Sources

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Armenia

General notes

Data for Armenia are available starting in 1990. Prior to that, they are included in Former Soviet Union.

Armenia is one of the 11 EU4Energy focus countries.

In the 2021 edition, nuclear power efficiency data from 2014 onwards reported by Armenia were used to calculate primary energy equivalent of nuclear power generation. In previous years, IEA standard efficiency was used. As a result, the time series of nuclear electricity generation in energy units were revised from 2014 to 2018.

In the 2021 edition, natural gas consumption was reclassified from not elsewhere specified (other) to agriculture/forestry from 2017 onwards. Prior to 2017, consumption by not elsewhere specified (other) may include the consumption by agriculture/forestry. In the 2020 edition, the National Statistical Service of Armenia changed the methodology of classification of final sectors for natural gas. This might lead to breaks in time series for 2017-2018.

In the 2020 edition, the National Statistical Service of Armenia changed the methodology for electricity breakdown by consuming sectors. This might lead to breaks in time series for 2017-2018.

In the 2020 edition, the National Statistical Service of Armenia revised primary solid biofuels data from 2015 onwards. This might lead to breaks in time series between 2014 and 2015.

From the 2017 edition onwards, more accurate data on electricity and CHP plants became available. This might lead to breaks in time series for 2014-2015.

From the 2017 edition, survey data on the consumption of energy products in Armenia became available. Partial data were already available for 2014 for some products as Armenia ran a pilot survey. Prior to 2014, consumption data were not available and have been estimated by the IEA Secretariat based on supply. Therefore, breaks in time series occur between 2013 and 2014, as well as 2014 and 2015; 2015 should be used as reference year.

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Azerbaijan

General notes

Data for Azerbaijan are available starting in 1990. Prior to that, they are included in Former Soviet Union.

Azerbaijan is one of the 11 EU4Energy focus countries.

Field condensates from Azerbaijan's Shah Deniz field are reported together with NGLs.

Azerbaijan natural gas data are reported at temperature and pressure of 20°C and 101.325 kPa, respectively.

Natural gas production data may differ from Azerbaijan national energy balance. Natural gas produced and used in the oil and gas extraction industry is counted by the IEA Secretariat in natural gas production.

In the 2021 edition, net calorific values (NCVs) reported by Azerbaijan for oil were used to convert physical data to energy units. In previous years, IEA standard NCVs were used. As a result, the time series of primary and secondary oil products were revised for varying periods between 1990 and 2018.

Breaks in time series appear for inputs and outputs of electricity, CHP and heat plants in Azerbaijan between 2006 and 2007 due to an improved data collection methodology in the country from 2007 onwards.

For the purpose of calculating CO₂ emissions, an allocation between domestic and international aviation consumption of jet kerosene was estimated by the IEA Secretariat for 1990-2006 based on total aviation consumption reported by Azerbaijan and the 2007 allocation.

A break in time series may be observed between 2015 and 2016 consumption data due to a household consumption survey.

Sources

Sources 1990 to 2020:

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Sources for biofuels and waste:

Joint IEA/Eurostat/UNECE annual energy questionnaires on renewables, 2000-2020.

Before 2000: IEA Secretariat estimates.

Belarus

General notes

Data for Belarus are available starting in 1990. Prior to that, they are included in Former Soviet Union.

Belarus is one of the 11 EU4Energy focus countries.

Belarus natural gas data are reported at temperature and pressure of 20°C and 101.325 kPa, respectively.

Belarus exports of other bituminous coal include re-export volumes.

In the 2022 edition, there are breaks in the time series of biogases between 2019 and 2020 for indigenous production, main activity producer electricity and commercial and public services, due to new administrative data from the Ministry of Energy.

In the 2022 edition, trade, stock change and final consumption of charcoal were revised from 2008 onwards based on new available information.

In the 2021 edition, for crude oil, jet fuel kerosene and other kerosene the IEA secretariat substituted the standard net calorific values (NCVs) used in previous years with the ones reported by Belarus. As a result, the time series in energy units of these products were slightly revised between 1991 and 2018.

In the 2021 edition, some quantities of peat products were reclassified from autoproducer to main activity producer heat plants in the period 1996-2011 due to newly available information.

In the 2020 edition, the whole time series for natural gas liquids (NGL) was revised to include the volumes of gas obtained in the process of oil stabilization.

In the 2020 edition, wood waste from furniture was reallocated to industrial waste in primary solid biofuels from 2016 onwards. This may lead to breaks in the industrial waste time series between 2015 and 2016.

In the 2019 edition, coke oven coke use between 1998 and 2017 was revised as non-energy use was formerly reported in the food, beverage and tobacco sector.

In the 2018 edition, several producers' electricity plants were reclassified according to the transition to a new classifier of economic activities. This might lead to breaks in time series of autoproducers' electricity plant and autoproducers' CHP plant between 2016 and 2017.

In the 2016 edition, methane produced as a by-product during the petrochemical transformation of naphtha was re-classified by Belarus for the period 1998-2011 from industrial waste to refinery gas. This may lead to breaks in time series between 1997 and 1998.

Imports of refinery feedstocks were recorded for the first time in 2015.

Jet kerosene was reported under "other products" until 2012.

Breaks in time series appear in gas/diesel and fuel oil between 2011 and 2012 as a result of a new classification of industrial products (heating oil re-classified under high sulphur fuel oil).

Oil trade in 2010 shows a significant drop due to higher customs fee of imported quantities of crude oil from Russian Federation.

Since January 2010, Belarus became a member of a Customs Union with Russia and Kazakhstan. Breaks in trade time series and statistical differences appear from 2009 to 2011 as the Customs progressively shifted from one accounting system to another. Belarus reports all inputs and outputs to CHP and heat autoproducer plants including those corresponding to own use of heat.

Sources

Sources 1990 to 2020:

Direct communication with the National Statistical Committee of Belarus, Minsk.

Joint IEA/Eurostat/UNECE annual energy questionnaires.

Sources for biofuels and waste:

Joint IEA/Eurostat/UNECE annual energy questionnaires on renewables.

IEA Secretariat estimates.

Bosnia and Herzegovina

General notes

Data for Bosnia and Herzegovina are available starting in 1990. Prior to that, they are included in Former Yugoslavia.

In the 2022 edition, disaggregated coal data became available between anthracite, other bituminous coal and coking coal. This also includes break down information on consumption flow data such as energy industry own use of blast furnace gas. This led to a break in the time series between 2019 and 2020.

In the 2022 edition, there was a break in the time series between 2019 and 2020 data for the input of combustible sources and its electricity and heat production from autoproducers. This was a result of an error in recognition of autoproducer from industry in the chemical and petrochemical sector that was corrected in C2022 for 2020 with the plan for analysis and correction/revision of historical data.

In the 2021 edition, the net calorific values (NCVs) of crude oil reported by Bosnia and Herzegovina were used to convert physical data to energy units. In previous editions, IEA standard NCVs were used. As a result, the time series of crude oil in energy units was revised from 2014 onwards.

In the 2021 edition, crude oil and oil products data are affected by the overhaul works in the refinery of Brod. This might result in breaks in time series between 2018 and 2019.

In the 2020 edition, solid biofuels modelling by the Ministry of Foreign Trade and Economic Relations led to new data starting in 2018. A break in time series may occur between 2017 and 2018. Revisions for historical data may be communicated in the future.

In the 2019 edition, data on electricity, CHP and heat were submitted by the Agency for Statistics of Bosnia and Herzegovina.

In the 2018 edition, data on blast furnace gas and coke oven gas production became available for 2016. Also, the calorific values of coking coal and coke oven coke were revised for 2014-2016. This may result in breaks in time series on the efficiencies of blast furnaces and coke ovens between 2013 and 2014.

In 2018, BHAS received technical expertise from the IEA Secretariat and reallocated inputs of sub-bituminous coal to electricity, CHP and heat plants to lignite for the period 2014-2016. This may lead to breaks in time series between 2013 and 2014.

In 2015, BHAS conducted their first household survey on biomass consumption. Due to this newly available data, breaks in time series may occur between 2013 and 2014. In order to further improve the biomass data quality, they revised data for the period 2014-2016.

In 2014, BHAS conducted their first survey on oil product consumption. Breaks in time series may occur between 2012 and 2013.

Until 2012, the source for crude oil and secondary oil products data is the publication “Industrial Production Bosnia and Herzegovina 2012” and “Oil Trade Data” both produced by the Agency for Statistics of Bosnia and Herzegovina.

Energy statistics are available from the Agency for Statistics of Bosnia and Herzegovina (BHAS) from 2008 for electricity and heat and from 2009 for coal and natural gas. As a consequence, breaks in time series may occur between 2007 and 2008 for electricity and heat and 2008 and 2009 for other products.

Sources

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Sources 2006 to 2008:

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Energy Outlook, Federal Ministry of Energy, Mining and Industry, Sarajevo, December 2001.

The United Nations Energy Statistics Database, United Nations Statistical Division, New York.

Brazil

General notes

Data for Brazil are available starting in 1971.

Brazil joined the IEA as an Association country in October 2017.

Although IEA's balance is based on Brazil's national statistics, differences with the national energy balance can be observed due to the different methodologies adopted for reporting nuclear, chemical heat, natural gas, NGL production, non-energy use and production process of liquid biofuels, renewables, blast furnaces and coke ovens.

Crude oil data includes small amounts of oil shale.

The split between domestic and international marine bunkers is done based on flag (nationality) of ships.

In the IEA balance for Brazil, "Biogasoline" refers to anhydrous ethanol while "Other liquid biofuels" refers to hydrated ethanol. The national energy balance of Brazil shows bioethanol as two separate products: anhydrous ethanol ("álcool anidro", i.e. nearly pure ethanol, containing less than 1% of water) and hydrated ethanol ("álcool hidratado", i.e. a blend of ethanol and water, in the proportion of about 95% to 5%, generally obtained from conventional distillation). While anhydrous ethanol is blended with gasoline (the blend sold at the pump generally contains 20-25% of ethanol), hydrated ethanol is sold at separate pumps as a product by itself (álcool) to be used in flex fuel cars, i.e. vehicles that can run on any mix of gasoline and ethanol.

Allocation of consumption to subsectors in national energy statistics is done according to the National Classification of Economic Activities (CNAE). Energy consumption in the tobacco, construction, transport machinery and machinery sectors is included in "other industries" in national data, which is allocated in the IEA Balance to non-specified industry. As such, consumption in the food and tobacco sector excludes the tobacco sector.

In the 2022 edition, close cooperation with the Ministry of Mines and Energy led to a revision in biogasoline and other liquid biofuels losses. These are now exceptionally taken into account with the objective of reducing statistical difference. The key changes are that they now include losses in evaporation,

leaks, accidents during the process of production and storage in addition to distribution losses.

In the 2021 edition, close cooperation with the Ministry of Mines and Energy also led to a series of revisions affecting oil and gas data, enhancing harmonization of IEA data with national energy balances. The quantities of refinery input and output now reflect those reported by the Ministry of Mines and Energy more accurately. Wet gas losses in gas separation plants are now excluded from NGL production, leading to revisions from 2011. Production of LPG and motor gasoline was also revised to exclude the quantities resulting from naphtha processing by the petrochemical industry, which are now included in transfers. The calorific values of natural gas, other non-specified oil products and natural gas liquids have also been revised. As a result of these changes, production and transfers have been revised for LPG, motor gasoline and other non-specified oil products since 1971. Refinery feedstocks have also been revised from 1971, with significantly lower levels of refinery input.

The national energy balance of Brazil reports quantities of “Other non-renewable” energy consumed by the chemical, cement, iron and steel, and other sectors for both final consumption and autoproducer CHP generation. This combines a series of energy sources, such as tyre scrape, clay, blast furnace dust, tail gas, residual gases, sulphur gases and other residues. Starting with the 2021 edition, these products and their corresponding electricity generation are allocated to industrial waste, except for the power inputs of the chemical sector, which are allocated to heat from chemical sources. This leads to a structural break in 2017, as generation from such energy sources in the iron and steel was not separated from blast furnace gases before 2017.

In the 2021 edition, biogases from thermal processes include the amount of blast furnace gases from charcoal, and the corresponding electricity generated from those gases, from 2012 onwards.

In the 2020 edition, new information became available, leading to revisions to 2016, 2017 and 2018 data in coal, gas oil and electricity. Data on biogas in transformation processes has been revised since 2008, oil product densities since 2014, and biodiesel and diesel data since 2011. Transfers of fuel oil and lubricants have been revised since 2012.

In the 2015 edition, new information became available which explains the types of product transfers within Brazilian refineries. The IEA attempted to reflect these transfers as accurately as possible.

Brazil produces a large share of its pig iron in blast furnaces that are fuelled and fed with charcoal. The blast furnace gases produced when charcoal is used as a reagent in the blast furnaces are renewable products and they have been reported in this publication under the product “Biogases from thermal processes”. Additionally, only the part of these gases consumed for power generation (i.e. energy purposes) has been accounted for in the transformation sector. The remaining charcoal consumed in or used to heat the blast furnaces is reported in final consumption under the iron and steel industry with no distinction between transformation and final consumption.

Prior to the year 2000 blast furnace gases data availability is limited to the input to auto producer electricity plants. Therefore, from 1971 to 1999, the other flows (e.g. production, consumption etc.) are IEA Secretariat estimates.

The Itaipu hydroelectric plant, operating since 1984 and located on the Paraná River (which forms the border of Brazil and Paraguay) was formed as a joint venture between Eletrobrás and the Paraguayan government. Production is shared equally between Brazil and Paraguay.

Sources 1971 to 2020:

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Sistema de Informações Energéticas (SIE Brasil), Ministério de Minas e Energia, Brasília, accessed in February 2022, <https://www.mme.gov.br/SIEBRASIL/>

Solar Heat Worldwide, AEE - Institute for Sustainable Technologies, Gleisdorf, IEA Solar Heating & Cooling Programme various editions up to 2021.

Bulgaria

General notes

Data for Bulgaria are available starting in 1971.

In the 2022 edition, useful heat produced by nuclear plants was reclassified from CHP to heat only. Therefore, all nuclear main activity producer CHP plant input and output has been moved to nuclear main activity producer heat plants for the entire time series (1994-2019).

In the 2021 edition, the status of Bulgaria's crude oil indigenous production data was changed to confidential. A break in the time series may occur between 2018 and 2019.

In the 2021 edition, net calorific values (NCVs) reported by Bulgaria were used to convert physical data to energy units. In previous years, IEA standard NCVs were used. As a result, the time series of primary and secondary oil products were revised for varying periods between 1991 and 2018. Coal NCVs were also revised from 2015 to 2018. Breaks in the time series may occur.

Data on the use of refused derived fuel (RDF) are included in Bulgaria's waste statistics since the 2020 edition. Thereby, the renewable part of this fuel is allocated to renewable municipal waste, while the non-renewable part is allocated to industrial waste. In the 2021 edition, more information on these renewable waste components became available from 2018, resulting in the reclassification of some non-renewable industrial waste. As the combustion of waste for power generation in Bulgaria is experimental, breaks in the time series may occur. The National Statistical Institute is currently reviewing their methodology for this reporting.

Non-specified transformation of natural gas to other hydrocarbons corresponds to hydrogen used in refineries.

Bulgaria has re-classified black liquor from industrial waste to solid biofuels and the renewable portion of tyres from industrial waste (non-renewable) to solid biofuels (industrial waste – renewable part) from 2008. Breaks in time series may occur between 2007 and 2008.

A break in the time series for natural gas stock changes may occur between 2003 and 2004 as cushion gas is excluded from 2004 onwards.

Sources

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Sources for biofuels and waste:

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The United Nations Energy Statistics Database, United Nations Statistical Division, New York.

People's Republic of China

General notes

Data for the People's Republic of China (China) are available starting in 1971.

China joined the IEA as an Association country in November 2015.

In the 2021 edition, following results from the economic census, NBS supplied the IEA with revisions to their 2014 – 2017 energy data, as well as their 2018 data. The IEA Secretariat revised its data accordingly. All revisions showed rather small changes both on the supply and demand side for a number of energy products.

Between September 2015 and early 2016, NBS supplied the IEA with revised energy balances for 2000 to 2013 and the IEA revised its data accordingly.

All revisions showed significant changes both on the supply and demand side for a number of energy products, resulting in breaks in time series between 1999 and 2000.

Coal

NBS and IEA collaborate to provide additional detail on energy production, transformation and consumption of all five different types of coal (e.g. anthracite, coking coal, other bituminous, sub-bituminous and lignite). At the moment NBS only provides quantities of raw coal and washed coal (split between cleaned coal and other washed coal) in their energy balances and the IEA Secretariat has attributed these quantities to coking coal and other bituminous coal. It is expected that the continuing work to provide disaggregated data on the five different coals will result in greater detail in future editions.

In the 2018 edition, NBS changed the definition of cleaned coal and other washed coal. Only the coal used for coking is called cleaned coal. This might result in breaks in time series in coking coal between 2015 and 2016. As this change of methodology resulted in uncertainty on the use of cleaned coal, the IEA Secretariat estimated the use of coking coal in transformation and final consumption sectors.

In the 2018 edition, based on new information, coal consumption in rail was revised for the whole time series to reflect the fact that coal is used for other usages than transport in the rail sector. The IEA Secretariat has allocated part of

the coal reported under rail to other non-specified sectors for the period 1990-2003. For the period 2004-2016 the IEA Secretariat allocated the total amount of coal reported under rail to other non-specified sectors.

In the 2018 edition, based on new information, coal inputs to main activity heat plants and part of coal inputs to main activity electricity plants were allocated to main activity CHP plants for the period 2005-2016.

Net calorific values (NCV) for coal inputs to power generation from 2000 are estimated by applying assumptions used by China on the average thermal efficiency of coal-fired power stations in these years. NCVs are also estimated for bituminous coal production from 2000 as well as for inputs to main activity CHP plants from 2008.

Since 2000, imports and exports of cleaned coal are no longer reported in the national energy balance of China. The IEA Secretariat has used secondary sources of information to report this coking coal trade and corresponding quantities have been removed from bituminous coal trade. Consumption of this coking coal is assumed to be in coke ovens.

The IEA data of coal stocks for the years 1985 and 1990 as well as coal production for the years 1997-1999 are estimates and do not represent official data released by the Chinese government. Those estimates were based on the assumption that coal consumption statistics are more reliable than coal production statistics and that the production-consumption relationship should maintain a balance over time. In recent years, China has reported large increases in stocks for different types of coal. These stock increases are seen as consistent with trends in economic growth and development in China; however, information is currently lacking on the scale of the infrastructure available for this magnitude of stock increases.

Data for coal trade in this publication may not match data from secondary sources of information.

Oil

Starting with 2010 data, NBS increased the level of detail of the national energy balance regarding oil products and coal gases. Breaks in time series may occur between 2009 and 2010.

In 2012, new information became available on how NBS accounts for international aviation and marine bunkers in the China's national energy balance. Previously international flights by Chinese airlines and ships had been excluded.

A revised methodology was implemented that includes fuel use for international airplanes and ships, regardless of whether they are foreign- or China-owned.

Coal to liquids output was estimated based on projected production slate of operational coal-to-liquid plants.

In recent years, China has reported large increases in stocks for crude oil and oil products. These stock increases are seen as consistent with trends in economic growth and development in China; however, information is currently lacking on the scale of the infrastructure available for this magnitude of stock increases.

In the 2022 edition, a new methodology was developed to adjust refinery yields to crude oil inputs to refinery. The refinery losses have been revised with this implementation.

In the 2022 edition, jet kerosene international aviation bunkers were adjusted in line with the decrease in emissions observed for international flights. Similarly, jet kerosene consumption in the domestic aviation sector was also adjusted to mirror the decrease observed in emissions from domestic flights.

Natural gas

In the 2018 edition, based on new information, natural gas inputs to main activity heat plants and part of natural gas inputs to main activity electricity plants were allocated to main activity CHP plants for the period 2005-2016.

In the 2012 edition, information became available on natural gas consumption in public transportation in China. This consumption was added to the natural gas time series to ensure proper coverage of the transport sector.

Coal to gas output is estimated based on operational capacity of coal-to-gas plants.

Biofuels and waste

In 2016, the IEA has been working with the Institute of Built Environment of Tsinghua University, Beijing, to improve its data on biomass consumption in the residential sector in China. Biomass figures have therefore been revised in the 2016 edition back to 1997 to reflect the results of their study and of IEA analysis.

Information became available in 2012 from NBS on the production and consumption of gangue, a mining waste product that has been classified as industrial waste in the IEA energy balances. This quantity of industrial waste is

not likely to represent the only combustion of industrial waste in China; however, information is not available to provide more complete data on this activity.

Time series for liquid biofuels and biogases are based on secondary sources of information and IEA Secretariat estimates. None of these time series are reported in the national energy balance of China.

Electricity and heat

In the 2018 edition, based on new information, heat production from main activity heat plants using coal and natural gas and part of electricity production from main activity electricity plants using coal and natural gas were attributed to main activity CHP plants from 2005 onwards.

Estimates on the electricity consumption in road transportation are included, starting with 2001 data.

Electricity production from pumped storage hydro is reported from 2010 onwards.

Time series for wind (prior to 2010), geothermal, solar photovoltaic and solar thermal generation are based on secondary sources of information and IEA Secretariat estimates. None of these time series are reported in the national energy balance of China.

Sources

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IEA Secretariat estimates.

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Sources for biofuels and waste:

Direct communication with the Institute of Built Environment of Tsinghua University, Beijing.

IEA Secretariat estimates.

Croatia

General notes

Data for Croatia are available starting in 1990. Prior to that, they are included in Former Yugoslavia.

Non-specified transformation of natural gas reported from 2007 refers to natural gas used by refineries for hydrogen production.

Breaks in time series may appear between 2007 and 2008 as transit data of electricity trade are not available for years prior to 2008.

The 2021 publication includes revisions to oil products consumption and to electricity and heat data across the whole time series based on new information available.

Sources

Sources 1990 to 2020:

Direct communication with the Energy Institute “Hrvoje Požar”, Zagreb.

Direct communication with the Central Bureau of Statistics, Zagreb.

Joint IEA/Eurostat/UNECE annual energy questionnaires.

IEA Secretariat estimates.

Cuba

General notes

Data for Cuba are available starting in 1971.

Figures for crude oil include additives added to reduce viscosity.

The IEA Secretariat did not obtain all official data for Cuba for 2020. As a consequence, some data points for 2020 are based on the Latin American Energy Organization's (OLADE) balances or the IEA Secretariat's estimates.

Official data updates for 2019 were integrated in the 2022 edition, leading to revisions of 2019 data.

In the 2022 edition, revisions have been made to fuel oil inputs to main activity producer electricity plants in order to utilise published data since 2014.

In the 2021 edition, revisions were made to crude oil transformation inputs from 2009 to utilise published data. Revisions were also made to fuel oil estimates for international marine bunkers between since 2009. In addition, estimates for wood consumption from 2006 have been revised across the time series.

In the 2018 edition, new information became available that led to revisions of the wind and solar PV data from 2000 to 2015.

Breaks in time series in the early 90s are assumed to be due to the codification into law of the embargo imposed on Cuba in 1992.

Sources

Sources up to 2020:

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IEA Secretariat estimates.

Cyprus

General notes

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 recognizes 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 recognized 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.

Data for Cyprus are available starting in 1971.

In the 2022 edition, the entire time series (2007-2019) of geothermal indigenous production and final consumption in the residential sector were reclassified from geothermal energy to ambient heat by Cyprus. Consequently, these data are no longer represented in the energy balance or statistics.

In the 2021 edition, net calorific values reported by Cyprus were used to convert physical data to energy units. In previous years, IEA standard net calorific values were used. As a result, the time series of liquefied petroleum gases, kerosene type jet fuel excluding biofuels, other kerosene, gas/diesel oil excluding biofuels, fuel oil, lubricants, bitumen, and petroleum coke were revised from 1990-2018. Breaks in the time series may occur between 1989 and 1990 for these products.

In the 2020 edition, the time series of primary solid biofuels were revised from 2009-2010 based on newly available information. Breaks in the time series may occur between 2008 and 2009 for these products.

Sources

Sources 1994 to 2020:

Direct communication with the statistical service of Cyprus, Nicosia.

Joint IEA/Eurostat/UNECE annual energy questionnaires.

Electricity Authority of Cyprus Annual Report 1996, Electricity Authority of Cyprus, Nicosia, 1997.

Sources up to 1993:

Electricity Authority of Cyprus Annual Report 1988, 1992, Electricity Authority of Cyprus, Nicosia, 1989 and 1993.

Industrial Statistics 1988, Ministry of Finance, Department of Statistics, Nicosia, 1989.

Sources for biofuels and waste:

Joint IEA/Eurostat/UNECE annual energy questionnaires on renewables.

IEA Secretariat estimates.

Egypt

General notes

Data for Egypt are available starting in 1971.

Data are reported on a fiscal year basis. Data for 2020 correspond to 1 July 2020 - 30 June 2021.

Stock changes may include informal trade.

In the 2022 edition, electricity output from natural gas plants was revised for the period 2008-2019 as new information regarding private sector power plants was collected by the IEA Secretariat.

In the 2022 edition, natural gas final consumption in road transport was revised for years 2018 and 2019 using new information provided by EGAS.

In the 2022 edition, due to improvements in the IEA Secretariat estimations, fuel oil inputs to main activity electricity plants have been revised for years 2018 and 2019.

In the 2021 edition, new information became available to the IEA Secretariat, leading to revision of trade and production for primary solid biofuels and charcoal for the whole time series.

In the 2021 edition, due to a more accurate use of official data, gas condensate data have been revised from 2014 to 2018.

In the 2020 edition, the IEA Secretariat revised primary solid biofuel data back to 1971. Data are now based on the Food and Agriculture Organisation (FAO), growth of solid biofuels production and consumption. Charcoal production, trade and use have been estimated based on FAO data.

In the 2020 edition, importation and consumption of other bituminous coal have been revised for the years 2014 to 2017, as new information became available. This may lead to break in time series between 2013 and 2014.

In the 2020 edition, input of natural gas to power plants as well as natural gas final consumption in 2017 were revised based on new data received from CAPMAS and EGAS.

In the 2014 edition, the IEA Secretariat has revised marine bunkers back to 2004. Data from 2004 are now based on data received from the Egyptian Authorities.

Sources

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IEA Secretariat estimates.

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IEA Secretariat estimates.

Georgia

General notes

Data for Georgia are available starting in 1990. Prior to that, they are included in Former Soviet Union.

Georgia is one of the 11 EU4Energy focus countries.

Energy data for Georgia do not include Abkhazia and South Ossetia, except for the electricity questionnaire. Part of the electricity generated in the Enguri HPP is transferred to Abkhazia and accounted for in the electricity balance as non-specified consumption.

In 2015, a refinery started operating in Georgia.

For the period 2015-2017, trade of crude oil includes a share of crude oil blended with fuel oil. This explains breaks in time series from 2014.

In 2015, trade of natural gas for the year might include re-export.

Between 2014 and 2015, a break in stock level time series appears for some oil products as the National Statistical Office (GEOSTAT) received more detailed information on stocks of oil products.

Between 2012 and 2013, breaks in time series may appear for some products, as data collection and submission to the IEA became the responsibility of the National Statistical Office (GEOSTAT), whereas it used to be done by the Energy Efficiency Centre.

For the period 1990-2012, natural gas data are reported at temperature and pressure conditions of 20°C and 101.325 kPa, respectively.

Since 2011, heat production has stopped due to the shutdown of combined heat and power plants.

Sources

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Direct communication with GEOSTAT, Tbilisi.

Joint IEA/Eurostat/UNECE annual energy questionnaires.

Sources 2013 to 2014:

Direct communication with GEOSTAT, Tbilisi.

Joint IEA/Eurostat/UNECE questionnaires.

IEA Secretariat estimates.

Sources 2008 to 2012:

Direct communication with the Energy Efficiency Centre Georgia, Tbilisi.

IEA Secretariat estimates.

Sources 1990 to 2008:

Official Energy Balance of Georgia 1990-1999, 2000-2008, Ministry of Economy and Ministry of Energy, Tbilisi.

IEA Secretariat estimates.

Hong Kong, China

General notes

Data for Hong Kong, China are available starting in 1971.

Due to lack of available data, the input of biogas to CHP plants may include biogas used for industrial heat.

In the 2021 edition, the 2000 to 2019 time series for fuel oil and diesel input to main activity plants was revised to include new information available on the split of the two fuels. Breaks in time series may occur between 1999 and 2000. Prior to 2000, fuel oil input to power plants may include some quantities of diesel.

In the 2021 edition, consumption data for coal were revised over the whole time series to take into account information received from the Hong Kong Electrical and Mechanical Services Department. The revisions result in higher use of coal for electricity production, and very little use of coal in the industry sector.

In the 2021 edition, the naphtha time series was revised to represent the blending to town gas more accurately.

Information on the solid biofuels and waste data was received from the local contacts, which led to the revision of the fuelwood time series to zero as Hong Kong, China, only uses charcoal.

The IEA Secretariat added data for solar PV electricity generation data from auto producers in the 2021 edition, as available from APERC.

In the 2021 edition, stock changes data for 2019 were estimated.

In the 2020 edition, official data for stock changes of coal and oil products became available for 2018. This may lead to breaks in time series between 2017 and 2018.

In the 2020 edition, data for electricity losses and own use breakdown became available from 1996 onwards. For the period 1971-1995, electricity losses include electricity own use.

In the 2016 edition, trade data for various petroleum products were revised based on newly available information. Breaks in time series may occur between 2000 and 2001.

Imports of non-specified oil products used for non-energy purposes are estimated by the IEA Secretariat based on fixed shares of the total imports reported.

Sources

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Hong Kong Energy Statistics - Annual Report 2003.

IEA Secretariat estimates.

India

General notes

Data for India are available starting in 1971.

India joined the IEA as an Association country in March 2017.

Data are reported by India on a fiscal year basis. Data for 2020 correspond to 1 April 2020 – 31 March 2021. This convention is different from the one used by Government of India, whereby 2020 data would refer to fiscal year 1 April 2019 – 31 March 2020.

Coal

In the 2021 edition several transformation and consumption flows are based on growth of total energy supply for a given product, as official data are not yet available.

In the 2015 edition, significant revisions of the net calorific values of the different types of coal were made for the whole time series, based on official data as well as IEA and other experts' estimates. As a result, there have been significant changes for the coal data when presented in energy units, as well as in the calculated efficiency of coal fired power generation. Data on the production and consumption of secondary coal products may have also been revised as a result.

The net calorific values of coking coal, sub-bituminous coal and other bituminous coal, were revised again in the 2018 edition to take into account more detailed information on imports and IEA Secretariat experts estimates.

From 2008, due to a notable discrepancy between official coal imports from India and coal exports to India as reported by trade partners, imports of coking coal and non-coking coal are estimated by the IEA Secretariat, based on trade partners' data. The breakdown of non-coking coal imports between bituminous coal and sub-bituminous coal is estimated from 2008. This could lead to breaks in time series between 2007 and 2008.

Coking coal figures for India do not align with IEA definitions as they include production of non-metallurgical coking coal reported by India.

Due to data limitations, IEA Secretariat estimates are used for some products and flows, including supply and demand of coke oven gas and blast furnace gas. Coke oven coke production is estimated from 2006 based on growth of blast

furnace iron production, as official production data do not include production from small private producers.

Oil

In the 2020 edition, input to autoproducers of electricity were revised from 2008 onwards based on data on their power generation reported by the Central Electricity Authority. In parallel, several final consumption flows were revised to incorporate sales from retailers.

In the 2018 edition, petroleum coke consumption by the non-metallic mineral industries was revised based on information on cement production estimated by the IEA Secretariat based on United States Geological Survey Mineral Industry Report on India. This may lead to breaks in time series as well as differences with previous editions.

In the 2014 edition, information on stock changes of crude oil and oil products, available from the JODI database from April 2011, was added. Breaks in time series may appear in stock changes between 2010 and 2011.

In the 2014 edition, refinery intake was split between crude oil and refinery feedstocks from 1999 based on data available by the Ministry of Petroleum and Natural Gas. The refinery feedstocks reported by the IEA Secretariat correspond to the quantities officially reported as “other inputs” to Reliance Refineries. They do not include additives and refinery feedstocks to other Indian refineries. These missing inputs could reach up to 2.5 million tonnes.

Data for diesel consumption from 2008 are partially based on an official survey on the end use of diesel retail sales. The IEA Secretariat classifies the diesel used in mobile phone towers and non-industry power generators as input to autoproducer electricity generation. A corresponding electricity output is estimated.

No NGL production is officially reported by India. The NGL production estimated by the IEA Secretariat corresponds to the production of oil products from gas separation plants, known in India as “fractionators”. In the IEA methodology, the output of oil products from gas separation plants comes from an input of NGL and the separation process is shown in the transfer row. Prior to 2005-2006, the split of fractionator output between petroleum products is estimated by the IEA Secretariat.

No breakdown of refinery fuel by products is currently officially available. Refinery gas production is estimated based on expected refinery output for the

years where using official data would lead to refinery gains. Due to notable breaks in official data for fuel oil, consumption of fuel oil in international marine bunkers is estimated between 1990 and 2002 based on industry sources and from 2003 onwards based on Ministry of Shipping cargo data; final consumption of fuel oil is estimated from 2004 based on 2003 data and official trends from Ministry of Petroleum and Natural Gas.

Natural gas

In the 2020 edition, inputs to main activity producers of electricity were revised from 2010 onwards, based on data reported by the Ministry of Petroleum and Natural Gas. Before 2010 inputs to main activity power plants are estimated by the IEA Secretariat.

In the 2020 edition, use of natural gas in oil refineries was added from 2008 onwards based on data reported by the Ministry of Petroleum and Natural Gas. Before 2008 there is no data reported for this flow.

In the 2020 edition, total final consumption of natural gas was revised from the start of the time series based on data reported by the Ministry of Petroleum and Natural Gas.

Natural gas imports for India from 2008 onwards are based on Indian Customs data, in order to include all LNG importers.

No data are officially available on the sectoral consumption of re-gasified LNG and city gas. The breakdown is estimated by the IEA Secretariat.

Biofuels and waste

In the 2021 edition, changes of methodology were implemented to revise the data of solid, liquid and gaseous biofuels, thanks to a study by The Energy and Resources Institute "TERI", funded by the Clean Energy Transition Programme. The scope of data collection for certain products is increased. Full time series were revised for fuelwood, agricultural residues, bagasse, biogases and bioethanol. For solid biofuels, the magnitude of the revision is stronger for the historical data: from 20% in the 1970s to less than 5% in the last five years.

Fuelwood supply is estimated using data from Forest Survey of India, especially looking at fuelwood used for energy usages. Residential consumption is estimated based on households' reliance of fuelwood for cooking.

Transformation of fuelwood into charcoal is estimated based on an updated efficiency factor expressed in mass unit, and is then converted to energy unit.

The demand for charcoal is revised from 2001 onwards, creating a break in time series. The revision takes into account residential consumption of charcoal for cooking, estimated using households' reliance on charcoal for cooking. Charcoal not consumed by households is allocated to industry consumption. Industry consumption of charcoal is not estimated before 2001.

Vegetal materials and residues' supply is estimated using both data on agricultural crops production from the Reserve Bank of India and the surplus availability factor published by the Technology Information Forecasting and Assessment Council of India. Agricultural residues consumption by households is estimated based on their reliance of the latter for cooking.

Bagasse production of combined heat and power is estimated by recouping two sources of information. Bagasse production is estimated based on sugarcane production considering both sugar processing units and jaggery units. As electricity and heat are a by-products of these facilities, they are reported under the category auto-producer CHP plants. Electricity generation is estimated using CEA data and recouped with MNRE data on installed on-grid and off-grid capacity. From 2016 onwards, surplus and non-surplus electricity generated are estimated. Up to 2015, non-surplus electricity is estimated to ensure continuity of the time series. Electricity used to power the plants and electricity used for sugar processing are estimated in the balance by considering an average bagasse-based processing unit. The heat produced from bagasse and directly used by the sugar industry is tracked by its bagasse input, measured as the residual bagasse not used for electricity generation.

Biogas production scope is widened in the 2021 edition, covering not only the biogas used in power production, but also estimating direct final consumption. Anaerobic and thermal technologies to produce biogas are taken into account, using data published in the Annual Report of the Ministry of New and Renewables Energy. Data includes the family scale biogas program, the community scale biogas program, the bio-CNG and the biogas produced in industry. Thermal gasification processes are also covered, based on installed capacity data published by MNRE and IEA Secretariat estimation.

In the 2021 edition, bioethanol production figures are based on official data published by the Ministry of Petroleum and Natural Gas. Demand figures are based on United States Department of Agriculture estimates for the calendar year.

Biodiesel demand and supply are based on the data published by the United States Department of Agriculture estimates for the calendar year.

Electricity and heat

Data for total electricity generation include estimates for electricity generation from diesel by non-industrial autoproducers as well as off-grid electricity generation from renewable energy. 2020 data on the electricity consumption by industrial sub-sector are estimated by the IEA Secretariat.

Only information on total on-grid generation from renewables is officially available. The breakdown between sources was estimated by the IEA Secretariat from 2007 using official data on capacities from MNRE. Total off-grid generation and split by sources are estimated based on capacities from 2007 onward.

Solar power generation data reported by CEA include both solar photovoltaic (PV) generation and concentrated solar power generation. It is currently reported in the solar PV commodity balance. The IEA Secretariat solar thermal data only include what derives from heat systems.

Output of biomass power generation and bagasse co-generation is reported altogether as output of autoproducer electricity plants. Up to 2015 data, it only includes the surplus power generation sold to the grid. From 2016 onwards, capacity data reported by MNRE include non surplus capacity; the output of electricity estimated by the IEA Secretariat therefore corresponds to the total output of electricity. Breaks in time series occur between 2015 and 2016.

Estimates of solar thermal output up to 2012 may include systems that were out of operation. For this reason, a break in time series might occur between 2012 and 2013.

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Indonesia

General notes

Data for Indonesia are available starting in 1971.

Indonesia joined the IEA as an Association country in November 2015.

The production and allocation of coal among the various coal types and products are estimated by the IEA Secretariat due to data collection limitations.

The IEA Secretariat estimates coking coal production for the period from 2014 onwards. Breaks in time series may appear between 2013 and 2014. From 2011 onwards, coal exports data from BPS are used. This results in breaks in time series for 2010-2011.

Indonesia has started operating blast furnaces again in 2016. However no information is available to the IEA Secretariat to accurately report these transformation processes; the coal used in blast furnaces is therefore included in the iron and steel sector.

In the 2022 edition, data reported for coal consumption in non-metallic minerals industry might also include coal consumed in the textile and fertilizers sectors. This may create breaks in time series.

In the 2021 edition, new information on the use of biodiesel was available. This allowed the Secretariat to estimate the part blended with diesel and allocate it to biodiesel for 2019. In the time series up to 2018 included, some biodiesel consumption data could still be included under gas/diesel. This leads to breaks in time series between 2018 and 2019.

In the 2021 edition, the ministry of Energy and Mineral Resources was able to retrieve information to split the electricity generation from biofuels and waste into the different sources. This leads to breaks in time series between 2018 and 2019.

In the 2020 edition, new information on coal sales has led to revisions of the coal consumption in industry, as well as to coal production, for both other bituminous coal and sub-bituminous coal. This leads to breaks in time series between 1999 and 2000 as well as 2010 and 2011.

In the 2020 edition, the IEA Secretariat integrated new information on the classification of power plants for the year 2018. This might lead to breaks in time series between 2017 and 2018.

Further, the Ministry of Energy and Mineral Resources has, for 2018 data and for the first time, provided the Secretariat with estimates for Indonesia's off-grid electricity production. This information has been added to the 2018 electricity data and leads to breaks in time series, foremost but not exclusively for solid biofuels data.

In the 2019 edition, the IEA Secretariat came across new information regarding the use of coal in Indonesia's industry sector. First estimates of this use may lead to breaks in time series between 2015 and 2016, as well as between 2016 and 2017.

In the 2018 edition, the Ministry of Energy and Mineral Resources allocated power generation from solid biofuels and waste to waste power plants according to new information received from PLN. This leads to a break in time series between 2016 and 2017.

The data on electricity generation from other vegetal materials and residues includes some electricity generation from waste until the year 2016.

In the 2015 edition, data reported for coal consumption in pulp and paper industry might also include coal consumed in the textile and fertilizers sectors. This may create breaks in time series.

Electricity consumption for the agricultural sector is estimated by the IEA Secretariat from 2000 onwards. This may lead to breaks in time series between 1999 and 2000.

Sources

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Direct communication with the Data Centre and Information Technology (PUSDATIN), Ministry of Energy and Mineral Resources, Jakarta.

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IEA Secretariat estimates.

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The United Nations Energy Statistics Database, United Nations Statistical Division, New York.

Direct communication with Indonesian Biofuel Producer Association (APROBI), Jakarta.

IEA Secretariat estimates.

Kazakhstan

General notes

Data for Kazakhstan are available starting in 1990. Prior to that, they are included in Former Soviet Union.

Kazakhstan is one of the 11 EU4Energy focus countries.

In the 2022 edition, data on final consumption of oil products in the domestic aviation sector is not available for 2020. Furthermore, data on final consumption of natural gas in the residential sector in 2019 was revised by the Committee on Statistics of Kazakhstan.

In the 2020 edition, in the framework of the EU4Energy project, a methodological review was conducted by the IEA Secretariat in cooperation with the Committee on Statistics of Kazakhstan. This review led to revisions and to a break in time series between 2013 and 2014, in particular for coking coal, lignite, primary solid biofuels and electricity. Domestic production of biodiesel, jet gas and other kerosene was revised to zero. In future cycles, revisions to historical time series can be anticipated. The IEA Secretariat is working with the Committee on Statistics of Kazakhstan on the data collection forms to identify the origin of the large statistical differences observed in the national official energy data.

In the 2016 edition, the Committee on Statistics of Kazakhstan introduced changes in the forms used to collect energy data to align more closely with the International Recommendations for Energy Statistics. In order to reduce burden on enterprises, questions on supply were removed and supply data are now taken from administrative sources. As a consequence, breaks in time series appear for many product and flows, both for supply and demand between 2014 and 2015 data.

From 2012 onwards, as a result of important work carried out jointly by the Committee on Statistics and the Ministry of National Economy of the Republic of Kazakhstan, the IEA Secretariat was able to switch to the Joint IEA/Eurostat/UNECE questionnaires as a primary source for Kazakhstan's data. Breaks in time series appear between 2011 and 2012 as a result of this change.

Some data for fuel inputs to CHP plants are estimated by the IEA Secretariat.

Kazakhstan's coal data are normally not disaggregated by coal type. The disaggregation presented in the IEA energy balances is achieved by considering

the typical end uses for different types of coals. This may lead to large statistical differences for some types of coal.

Other bituminous and coking coal production data includes not marketable production.

In 2010, Kazakhstan became a member of a Customs Union with Russia and Belarus. Breaks in trade time series appear from 2009 to 2012 as the Customs shifted from one accounting system to another.

Natural gas production excludes re-injection but, due to data limitations, may include gas vented or flared. As a consequence, the data for natural gas use in oil and gas extraction may also include these amounts.

In order to be consistent with the Customs Union agreements between Russia and Kazakhstan, natural gas production and exports data include raw gas production from the Karachaganak field (not marketable gas as per IEA definition).

Natural gas trade data have been revised by Kazakhstan leading to large statistical differences for 2012 and 2013.

Revisions in aviation gasoline cause breaks in time series between 2014 and 2015.

Sources

Sources 2012 to 2020:

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IEA Secretariat estimates.

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IEA Secretariat estimates.

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IEA Secretariat estimates.

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Forestry Statistics, Food and Agriculture Organisation (FAO), Rome, 2000.

IEA Secretariat estimates.

Kosovo

General notes

Data for Kosovo are available starting in 2000. Between 1990 and 1999, data for Kosovo are included in Serbia. Prior to 1990, they are included in Former Yugoslavia.

In 2011, electricity transit trade data became available. As a result, a break in time series occurs between 2010 and 2011.

In 2011, a desulphurization unit operated in Kosovo for a few months only. As a result, breaks in time series occur in 2011 for transfer and refinery input of refinery feedstocks as well as transfer and production of kerosene, gas/diesel oil and fuel oil.

A break in time series between 2015 and 2016 may be observed in biofuels and waste due to a survey conducted on household consumption.

Sources

Sources 2011 to 2020:

Direct communication with the Kosovo Agency of Statistics, Pristina, since 2014.

Direct communication with the Ministry of Energy and Mining, Pristina, up to 2014.

Joint IEA/Eurostat/UNECE annual energy questionnaires.

Sources 2003 to 2010:

Kosovo National Energy Balances, Ministry of Energy and Mining Department of Strategy, Standards and Statistics, Pristina, 2003 to 2010.

IEA Secretariat estimates.

Sources 2000 to 2002:

IEA Secretariat estimates.

Kyrgyzstan

General notes

Data for Kyrgyzstan are available starting in 1990. Prior to that, they are included in Former Soviet Union.

Kyrgyzstan is one of the 11 EU4Energy focus countries.

From 2013 onwards, the main data sources for Kyrgyzstan are the annual IEA/Eurostat/UNECE joint questionnaires sent by the National Statistical Committee of Kyrgyzstan.

Several missing data points are estimated by the IEA Secretariat. The crude oil input to refineries is estimated based on the refinery output. The output of electricity and heat production from combustible fuels is estimated based on previous years' efficiencies.

Motor gasoline and Gas/diesel consumption reported in other sectors than road might include road transport.

In the 2014 edition, time series data for electricity, oil products, and coal products for 2005 to 2011 were revised based on newly available information. This may lead to breaks in the time series for some products.

Sources

Sources 2013 to 2020:

Direct communication with the National Statistical Committee of Kyrgyzstan, Bishkek.

Joint IEA/Eurostat/UNECE annual energy questionnaires.

Fuel & Energy Balances, National Statistical Committee of Kyrgyzstan, Bishkek.

CIS and East European Energy Databook, Eastern Bloc Research Ltd, Tolsta Chaolais, 2013 to 2014.

IEA Secretariat estimates.

Sources 2007 to 2012:

Direct communication with the National Statistical Committee of Kyrgyzstan, Bishkek.

Direct communication with the Interstate Statistical Committee of the Commonwealth of Independent States, Moscow.

Fuel & Energy Balances, National Statistical Committee of Kyrgyzstan, Bishkek.

Joint IEA/Eurostat/UNECE annual energy questionnaires for 2012.

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The United Nations Energy Statistics Database, United Nations Statistical Division, New York.

IEA Secretariat estimates.

Sources 1993 to 2006:

CIS and East European Energy Databook, Eastern Bloc Research Ltd, Tolsta Chaolais, various editions up to 2007.

Joint IEA/Eurostat/UNECE annual energy questionnaires, 1993 to 2006.

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IEA Secretariat estimates.

Sources 1990 to 1992:

IEA Secretariat estimates.

Sources for biofuels and waste:

Joint IEA/Eurostat/UNECE annual energy questionnaires on renewables (2013-2020).

The United Nations Energy Statistics Database, United Nations Statistical Division, New York.

IEA Secretariat estimates.

Malta

General notes

Data for Malta are available starting in 1971.

In the 2022 edition, gross electricity generation from Solar PV autoproducers and several data points in electricity final consumption were revised for the years 2018 and 2019, using new data provided by the National Statistics Office.

In the 2020 edition, biodiesel use was reclassified by the Central Office of Statistics as transformation from 2016 onwards. This may lead to breaks in time series of transport, industry and other sector final consumption between 2015 and 2016.

In the 2020 edition, for several oil products, the final consumption in transport, industry and commerce, services and other sectors was also revised, for the period 2013-2016.

In 2017, Malta imported LNG for the first time. It is used in power generation engines that have been upgraded to operate on natural gas, from heavy fuel oil previously. 2015 and 2016 data reflects this transition with high imports of electricity via the interconnector with Italy.

In the 2019 edition, oil products consumption data have been revised following the results of a fuel survey conducted by the country in 2018.

In 2017, Malta carried out a household energy survey which led to revisions of the solar thermal data series for 2010-2016. This may lead to breaks in time series between 2009 and 2010.

In 2011, a new power generation station fuelled by biogas became operational in Malta. This may lead to breaks in time series for some products and flows.

Sources

Sources up to 2020:

Direct communication with the National Statistics Office, Valletta.

Joint IEA/Eurostat/UNECE annual energy questionnaire on oil, 1995 to 1998, 2000, 2001, 2005 to 2020.

Joint IEA/Eurostat/UNECE annual energy questionnaire on electricity and heat, 1994 to 1998, 2000, 2001, 2003, and 2005 to 2020.

Joint IEA/Eurostat/UNECE annual energy questionnaire on renewables, 2011 to 2020.

Joint IEA/Eurostat/UNECE annual energy questionnaire on gas, 2020.

Joint IEA/Eurostat/UNECE annual questionnaire on coal, 1994, 1995.

Solar Heat Worldwide, AEE - Institute for Sustainable Technologies, Gleisdorf, IEA Solar Heating & Cooling Programme, various editions up to 2010.

IEA Secretariat estimates.

Mauritius

General notes

Data for Mauritius are available starting in 1971.

In the 2021 edition, minor revisions were made to LPG imports (2017-2018), LPG exports (2016), and stock changes of LPG, motor gasoline, gas/diesel oil, kerosene, and fuel oil (2010-2018). Revisions were also made to domestic navigation for motor gasoline, gas/diesel oil, and fuel oil (2012-2018), and to international aviation bunkers, stock changes and domestic aviation for kerosene type jet fuel (2016-2018).

Sources

Sources 1971 to 2020:

Direct communication with the Ministry of Public Utilities, Statistics Unit, Port Louis.

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Energy and Water Statistics, various editions up to 2020, Statistics Mauritius, Port Louis.

Industrial Policy and Strategic Plan for Mauritius 2020-2025, Ministry of Industrial Development, SMEs and Cooperatives (Industrial Development Division), Port Louis.

Moldova

General notes

Data for Moldova are available starting in 1990. Prior to that, they are included in Former Soviet Union.

Moldova is one of the 11 EU4Energy focus countries.

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.

In the 2022 edition, 2019 and 2020 natural gas imports data was estimated due to data confidentiality.

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.

The National Bureau of Statistics has revised time series when possible to align with International Recommendations for Energy Statistics. As a consequence, breaks in time series may occur in 1993 for heat, in 2012 for aviation bunkers and in 2005 for other products. More survey data on solid biofuels, including wood, animal waste and other plant residues are available since 2010. As a consequence, breaks in time series may occur in 2010 for primary solid biofuels.

Sources

Sources 2008 to 2020:

Excluding the districts from the left side of the river Nistru and municipality Bender:

Direct communication with the National Bureau of Statistics of the Republic of Moldova, Chisinau.

Joint IEA/Eurostat/UNECE annual energy questionnaires.

Related to the districts from the left side of the river Nistru and municipality Bender:

Direct communication with State Statistics Service of Ukraine for natural gas imports.

Website of Ministry of Economic Development of Transnistrian Moldovan Republic, accessed in February 2022, mer.gospmr.org.

IEA Secretariat estimates.

Sources 1992 to 2008:

Joint IEA/Eurostat/UNECE annual energy questionnaire on electricity and heat, 1991 to 2008.

Joint IEA/Eurostat/UNECE annual energy questionnaire on natural gas, 1991 to 2008.

Joint IEA/Eurostat/UNECE annual energy questionnaire on coal, 1992 to 2008.

Joint IEA/Eurostat/UNECE annual energy questionnaire on oil, 1993 to 1998, 2001 to 2008.

Direct communication with the Ministry of Industry and Energy, Chisinau.

CIS and East European Energy Databook, Eastern Bloc Research Ltd, Tolsta Chaolais, various editions up to 2011.

IEA Secretariat estimates.

Sources 1990 to 1991:

IEA Secretariat estimates.

Sources for biofuels and waste:

Joint IEA/Eurostat/UNECE questionnaire on renewables.

The United Nations Energy Statistics Database, United Nations Statistical Division, New York.

IEA Secretariat estimates.

Montenegro

General notes

Data for Montenegro are available starting in 2005. Between 1990 and 2004, they are included in Serbia. Prior to 1990, they are included in Former Yugoslavia.

In the 2022 edition, 2020 electricity trade data include transit of electricity, which was not considered for previous years. This led to breaks in the time series of imports and exports of electricity between 2019 and 2020.

In the 2021 edition, lignite calorific values from 2016 to 2018 were revised due to new information becoming available.

In the 2020 edition, the whole time series of solid biofuel transformation were revised due to new information becoming available.

Charcoal imports data might include minor quantities of charcoal produced domestically until the year 2017.

Breaks in time series appearing in solid biofuels between 2010 and 2011 can be explained by a new survey carried out by Montenegro in 2013.

A survey on energy consumption in industry was conducted by Montenegro in 2014. Breaks in time series may therefore occur between 2004 and 2005.

Sources

Sources 2005 to 2020:

Direct communication with the Statistical Office of Montenegro (MONSTAT), Podgorica.

Joint IEA/Eurostat/UNECE annual energy questionnaires.

Morocco

General notes

Data for Morocco are available starting in 1971.

Morocco joined the IEA as an Association country in November 2016.

Morocco started filling the five Joint IEA/Eurostat/UNECE questionnaires for the year 2015. This may lead to breaks in time series between 2014 and 2015.

In the 2022 edition, revisions were made to disaggregate autoproducer electricity production from main activity electricity production for wind (2013-2019) and fuel oil electricity only plants (2019). Breaks in time series may occur.

In the 2019 edition, revisions in solar thermal electricity production were made for 2015 and 2016. This may lead to breaks in time series.

In the 2018 edition, revisions in biofuels were made for the period 2004-2014. This may lead to breaks in time series between 2003 and 2004.

In the 2018 edition, revisions in autoproducer electricity from combustible fuels and electricity production from heat from chemical sources were made and a break in time series may be observed between 2012 and 2013.

The Samir-Mohammedia refinery expansion was completed in 2009, accommodating new feedstocks and additives. This may lead to breaks in time series between 2009 and 2010.

In August 2015, refinery activity stopped, causing significant decreases in refined oil products production and breaks in time series between 2014, 2015, and 2016.

Sources

Sources 2015 to 2020 :

Joint IEA/Eurostat/UNECE annual energy questionnaires.

Sources 1992 to 2014:

Direct communication with Ministère de l'Energie et des Mines, Direction des Mines, Rabat.

Annuaire Statistique du Maroc, Haut-Commissariat au Plan, Direction de la Statistique, Rabat, 1980, 1984, 1986 to 2011.

Electricity consumption by economic sector from direct communication with Office National de l'Electricité, Casablanca.

Sources up to 1991:

Rapport d'Activité 1992, Office National de l'Electricité, Casablanca, 1993.

Le Maroc en Chiffres 1986, Ministère du Plan, Direction de la Statistique, Rabat, 1987.

Rapport Annuel, Office National de Recherches et d'Exploitations Pétrolières, Rabat, 1984.

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Rapport sur les Données Energétiques Nationales 1979-1981, Ministère de l'Energie et des Mines, Rabat, 1982.

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Joint IEA/Eurostat/UNECE annual energy questionnaire on renewables (2015-2020).

Direct communication with Ministère de l'Energie et des Mines, Direction des Mines, Rabat.

The United Nations Energy Statistics Database, United Nations Statistical Division, New York.

IEA Secretariat estimates.

Republic of North Macedonia

General notes

Data for North Macedonia are available starting in 1990. Prior to that, they are included in Former Yugoslavia.

North Macedonia changed the methodology for reporting autoproducer heat consumption for own use in 2010, which can lead to breaks in time series between 2009 and 2010.

The refinery OKTA in North Macedonia was shut down in 2014. This may lead to breaks in time series between 2013 and 2014.

The State Statistical Office revised the energy balances from 2005 to 2014 in accordance with the survey conducted in 2014 on household energy consumption.

Sources

Sources 1990 to 2020:

Direct communication with the State Statistical Office of North Macedonia, Department for Environment, Energy and Transport, Skopje.

Joint IEA/Eurostat/UNECE annual energy questionnaires.

IEA Secretariat estimates.

Paraguay

General notes

Data for Paraguay are available starting in 1971.

The Itaipu hydroelectric plant, operating since 1984 and located on the Paraná River (which forms the border of Brazil and Paraguay) was formed as a joint venture between Eletrobrás and the Paraguayan government.

In the 2021 edition, revisions to 2018 kerosene and jet kerosene data have been made. In addition, 2006-2009 data has been revised to reflect revisions on national energy balances. These have led to changes to charcoal, gasoline, diesel, fuel oil and ethanol flows. The 2021 edition also revises electricity data to include small imports of electricity in 2005 and 2006.

In the 2020 edition, 2015 data on coal and fuel wood were revised, as well as 2013 data on electricity demand and 2012 data on diesel oil, due to revision of national energy balances. Data was revised for lubricants from 2003, bitumen from 1994 and petroleum coke between 2013 and 2015 due to new information from Banco Central del Paraguay. This may lead to break in time series.

Paraguay's cement industry underwent a fuel switch from fuel oil to petroleum coke. The consequent increase in petroleum coke imports and use is reflected in the data. In the 2020 edition, imports data for 2014 and 2015 were revised based on new trade information.

In the 2020 edition, new information on the industrial consumption of solid fuels led to a reallocation of industrial consumption of charcoal and anthracite to the iron and steel industry. Paraguay is continuing to developing its statistical system further and additional data and sectoral disaggregation is likely to be available in the future and taken into account in future editions. At present, there is no available information on the capacity and generation of solar and wind power.

In the 2019 edition, wood data was revised for 2016 due to a revision of the wood density used by the source. This led to a break in time series between 2015 and 2016.

In the 2019 edition, new information became available on the split between international and domestic use of jet kerosene from 2005 onwards. The consequent data revision may lead in break in time series between 2004 and 2005.

In 2015, Paraguay surveyed the charcoal production plants. The results allowed to correct the efficiency of the process down to 49%. This change is implemented in the data from 2015 onwards and leads to a break in the time series of wood input to charcoal production plants.

From 2006 onwards, there has been no output of oil products, due to refinery closure.

Sources

Sources up to 2020:

Balance Energético Nacional, 1971-2020, Viceministerio de Energía y Minas, Ministerio de Obras Públicas y Comunicaciones, San Lorenzo.

Direct communication with Ministerio de Obras Públicas y Comunicaciones, San Lorenzo.

Serie detallada de Comercio Exterior, Banco Central del Paraguay, Asunción, accessed in October 2021: www.bcp.gov.py

Boletín de Comercio Exterior – Trimestral, Banco Central del Paraguay, Asunción, accessed in October 2021: www.bcp.gov.py

OAG (2018), *Origin-Destination of Commercial Flights (database)*, OAG Aviation, Luton, www.oag.com/analytics/traffic-analyser.

Romania

General notes

Data for Romania are available starting in 1971.

Romania's methodology for estimating indigenous production of geothermal energy differs from the one that IEA has adopted. Therefore, data comparisons between Romania and other countries might be misleading.

Data on quantities of coke oven coke used in blast furnaces do not correspond to the official submission of the national administration, as they have been estimated by the IEA Secretariat to ensure a carbon balance in the blast furnace transformation.

In the 2021 edition, net calorific values (NCVs) reported by Romania were used to convert physical data to energy units. In previous years, IEA standard NCVs were used. As a result, the time series of primary and secondary oil products in energy units were revised for varying periods between 1990 and 2018. Furthermore, the NCVs for coal products have been aligned to the reported ones, leading to revisions especially for the coal data in energy units used in power plants.

Sources

Sources 1992 to 2020:

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Joint IEA/Eurostat/UNECE annual energy questionnaires.

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IEA Secretariat estimates.

Saudi Arabia

General notes

Data for Saudi Arabia are available starting in 1971.

Crude oil production and export data do not include field condensate. Field condensate quantities are included with natural gas liquids.

Data for crude oil production include 50 per cent of the output of the Neutral Zone, shared with Kuwait. Similarly, crude oil production includes 50% of the output of the Abu Safa field shared with Bahrain.

Natural gas consumption for oil and gas extraction may include quantities used in oil refineries.

In the 2022 edition, exports and non-energy use data for LPG and naphtha have been revised from 2000 onwards due to new available information. This might lead to breaks in both the time series between 1999 and 2000.

In the 2022 edition, bitumen production and imports data were revised from 1995 onwards to reflect official data more accurately. Similarly, crude oil consumption in non-specified industry was revised from 2017 onwards.

In the 2021 edition, data on fuel oil input to electricity production have been revised for 2012-2019 in light of new information on power generation.

In the 2020 edition, data on electricity as well as multiple products related to electricity generation (natural gas, crude oil, gas/diesel, fuel oil) were revised from 2012 onwards due to newly available information. This might lead to breaks in time series between 2011 and 2012.

In the 2020 edition, crude oil and gasoline stock changes have been revised due to a change in methodology.

In the 2020 edition, new data became available, modifying the estimation of natural gas consumption as feedstock in ammonia and methanol manufacture from 2005 onwards. This may lead to breaks in the time series between 2004 and 2005.

In the 2015 edition, new data became available, allowing the estimation of natural gas consumption as a feedstock in ammonia and methanol manufacture from 1990 to 2013. The remaining natural gas consumption has been allocated

to the non-specified industry sector. Breaks in time series may occur between 1989 and 1990 for this reason.

Electricity production from autoproducers includes generation by desalination plants since 1979.

Electricity end use specific to the agriculture and forestry sector has not been reported since 2015.

New Yasref refinery in Yanbu came online in 2015 with 400 kbd refining capacity. Breaks in time series for oil industry consumption of oil products and diesel output from refineries may be observed between 2014 and 2015.

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IEA Secretariat estimates.

Serbia

General notes

Data for Serbia are available starting in 1990. Prior to that, they are included in Former Yugoslavia.

Serbia energy data include Montenegro until 2004 and Kosovo until 1999. Breaks in time series for oil products and natural gas may appear between 2006 and 2007 due to newly available data for 2007.

In the 2022 edition, the lignite input to heat autoproducers and the lignite own use in BKB/peat briquettes plants time series have been revised from 2014 to 2019, due to new information provided by the Ministry of Mining and Energy and the Statistical Office of the Republic of Serbia.

In the 2022 edition, the large increase observed in primary solid biofuels final consumption in the residential sector for year 2020 is due to a specific survey carried out under the authority of the Ministry of Mining and Energy, concerning only year 2020. This creates a break in-series with historic data.

In the 2021 edition, the time series for non-bio diesel consumption from 2016, lignite input into power plants from 2014, and inputs into blast furnaces from 2017 have been revised due to new information and improved methodologies.

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IEA Secretariat estimates.

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Joint IEA/Eurostat/UNECE annual energy questionnaire on renewables (1990-2020).

Direct communication with the Ministry of Mining and Energy, Belgrade.

IEA Secretariat estimates.

Singapore

General notes

Data for Singapore are available starting in 1971.

Singapore joined the IEA as an Association country in October 2016.

At the time of publication of the 2022 edition, refinery input and output figures for 2020 were not available and they have therefore been estimated by IEA Secretariat. These values may differ significantly from actual figures published later in Singapore's official sources. The 2019 refinery input and output became available, leading to revisions of the numbers published in the 2021 edition.

In the 2022 edition, the 2006-2019 electricity road consumption data were revised to take into account estimated Electric Vehicle (EV) consumption under transport sector.

In the 2021 edition, the 2008-2019 exports data for aviation gasoline were revised as new information became available.

The IEA Secretariat, the Energy Market Authority (EMA) and the National Climate Change Secretariat (NCCS) have worked closely together on improving data quality for Singapore. Therefore, breaks in time series between 2008 and 2009 and differences in trends when compared to previous publications may occur for some products.

From 2009, Singapore publishes splits of refinery output between light, middle and heavy distillates and residuum only. Further breakdown between products is estimated by the IEA Secretariat. Singapore aggregates petrochemical and refinery consumption. The split between refining and petrochemical consumption is estimated by the IEA Secretariat.

Refinery input is broken down between crude oil and feedstocks. Splits of feedstock by product are not provided by Singapore. By default, IEA estimates that feedstocks come from naphtha as a result of residual calculation plus gas/diesel and fuel oil in equal proportions.

Other data remain aggregated due to lack of data availability. Electricity consumption in the industry sector from 2005 includes electricity consumption by refineries. Electricity consumption in transport includes all electricity consumption at airport terminals. Municipal waste production and consumption may include biogas.

Refinery gas production and consumption may include syngas produced by the petrochemical sector.

Due to Singapore's large trade volume in comparison to its final consumption, slight misalignment of trade figures can have a significant impact on the energy balance of Singapore. The IEA Secretariat has adjusted total imports of gas/diesel from 2009 onwards to match demand.

A coal-fired power plant started operations in 2013. This might lead to breaks in time series between 2012 and 2013.

Sources

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IEA Secretariat estimates.

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The United Nations Energy Statistics Database, United Nations Statistical Division, New York.

IEA Secretariat estimates.

South Africa

General notes

Data for South Africa are available starting in 1971.

South Africa became an IEA Association country in November 2018.

Nuclear and Hydro electricity generation data are reported on a fiscal year basis, beginning on the 1 April Y and ending on the 31 March Y+1.

Data may be revised from Y-2 to Y to reflect the Y-2 and Y-1 energy balances published by the Department of Mineral Resources and Energy as they become available.

Coal

Outputs from gas-to-liquids and coal-to-liquids plants are presented in the “Transfers” flow.

Coking coal, coke oven coke, coke oven gas and blast furnace gas production and consumption are estimated using reported crude steel production figures.

For the 2019 edition, the estimation methodology was changed for gas work gas, which may lead to break in time series between 2009 and 2010. The IEA Secretariat uses the industrial activity data reported by the World Steel Association to estimate the consumption of the industry sector.

In the 2017 edition, new information became available which allowed the separation of non-energy use of coal in Coal to Liquids (CTL) plants from the coal used for energy purposes in these same plants. Non-energy conversion efficiencies for CTL plants in South Africa are assumed to be 60% in physical units. Due to specific calorific values used for this specific process, the efficiency is 73% in our energy balance format. This methodology may lead to breaks in time series between 2010 and 2011 for these products and flows.

In the 2013 edition, breaks in time series may occur for anthracite and coking coal between 2009 and 2010 as new information became available. Prior to 2010, coking coal data may include anthracite.

Oil

In the 2021 edition, the 2016-2019 inputs to refineries and outputs of refined oil products for were revised to avoid refinery gains in energy terms. This may result in high statistical difference for crude oil data.

In the 2019 edition, new information became available that led to changes in the split of kerosene type jet fuel consumption in domestic aviation and international bunker. Breaks in time series may occur between 2008 and 2009.

New information became available in 2015 on refinery output of lubricants. Data have been revised from 1998. This may lead to breaks in time series between 1997 and 1998. Reported quantities of synthetic fuels output may not include quantities from PetroSA.

Natural gas

In the 2014 edition, new information became available on consumption of natural gas in industrial sectors. Breaks in time series may occur between 2009 and 2010.

Biofuels and waste:

In the 2022 edition, the time series of charcoal and primary solid biofuels were revised starting in 2000 to include import and export data from FAO. Production, transformation, and consumption estimates were revised accordingly. Breaks in time series may occur between 1999 and 2000.

In the 2022 edition, the estimation methodology of bagasse and other vegetal materials and residues (primary solid biofuels) was changed to utilize data from the Department of Mineral Resources and Energy, FAO, and IRENA. Breaks in time series may occur between 1998 and 1999.

In the 2020 edition, the estimation methodology was changed for solid biofuels, which may lead to breaks in time series between 2002 and 2003. The IEA Secretariat methodology is now based on the results of a study lead by Statistics South Africa on the residential consumptions of fuels.

In the 2019 edition, bagasse consumption in CHP plants was reported for the first time by the Department of Energy. Data may include coal co-burnt with bagasse.

In the 2019 edition, new information on number of people without access to electricity became available. Breaks in time series may occur between 1999 and 2000 for fuelwood and charcoal.

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IEA Secretariat estimates.

Thailand

General notes

Data for Thailand are available starting in 1971.

Thailand joined the IEA as an Association country in November 2015.

Data for lubricants, refinery gas and non-specified oil products are not published by the Ministry of Energy and are estimated by the IEA Secretariat. Up to 2012 data, IEA Secretariat also estimated naphtha.

Data for production, own use and non-energy use of natural gas may include propane, butane and ethane produced in gas separation plants.

Stock changes may include statistical difference for certain products.

In the 2022 edition, the IEA Secretariat revised the methodology for reporting LPG output from the condensate splitter and the corresponding field condensates input. As a result, crude oil input to petrochemical plants between 2013 and 2019 has been deleted, while input to oil refineries has been revised. This also led to the removal of the time series on refinery feedstock production from other sources – oil products and transfers between 1996 and 2019, which also affected naphtha and LPG production figures between 1996 and 2019 and 2008 and 2019, respectively.

In the 2022 edition, NGL non-energy use in 2013 and 2014 was revised due to new available information.

In the 2021 edition, natural gas consumption in the industry sector was revised to reflect official data more accurately.

In the 2021 electricity generation data for hydropower, fuel oil and other bituminous coal plants were revised to take into account new information available on the split between main activity and autoproducer plants.

Naphtha production data from 2018 onwards, motor gasoline for 2019 and 2020 and gas/diesel oil for 2018 and 2020 were estimated by the IEA Secretariat to avoid refinery gains.

In the 2021 edition, in an effort to report the consumption of aviation fuels more accurately across the time series, the IEA Secretariat estimated the split between international and domestic aviation consumption prior to 2006.

In the 2020 edition, motor gasoline, other kerosene and fuel oil total final consumption as well as gas/diesel oil used in transformation processes were revised to reflect official data more accurately.

In the 2020 edition, natural gas flows between 2014 and 2017 were revised as new information on its consumption in the industry sector became available. Electricity consumption in the rail sector between 2014 and 2017 was revised as new information became available. Primary solid biofuel flows between 1989 and 1994 were revised as new information became available.

In the 2014 edition, information became available for the consumption of anthracite and lignite coal in industry. Breaks in time series may occur between 2011 and 2012.

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IEA Secretariat estimates.

Trinidad and Tobago

General notes

Data for Trinidad and Tobago are available starting in 1971.

Trinidad and Tobago's only refinery closed in 2018.

Data for refinery gas production include losses inside the refinery up until the year 1999.

In the 2022 edition, part of the final consumption data of oil products for year 2019 has been revised to use directly official data from the Ministry of Energy and Energy Affairs. In cases where this has not been possible, 2019 data is estimated based on the total final consumption data by product available and the split into sectors from 2018.

In the 2021 edition, electricity data for 2014 to 2017 was revised as new information from the Latin American Energy Organization (OLADE) became available. Similarly, trade of oil products has been revised for 2014, 2016 and 2018.

In the 2019 edition, new information became available from the Ministry of Energy and Energy Affairs in order to disaggregate the losses from the refinery gas production for 2000-2017.

In the 2014 edition, natural gas time series from 2000 were revised based on newly available information on the definition of production of natural gas used by Trinidad and Tobago (gross versus marketed production).

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Energy-Economic Information System (SIEE), Latin American Energy Organization (OLADE), Quito, accessed in March 2021: <http://sier.olade.org/>.

Tunisia

General notes

Data for Tunisia are available starting in 1971.

In the 2021 edition, net calorific values (NCVs) reported by Tunisia were used to convert physical data to energy units. In previous years, IEA standard NCVs were used. As a result, the time series of primary and secondary oil products in energy units were revised for varying periods between 1990 and 2018.

In the 2015 edition, new information for lubricants and bitumen became available. This may lead to breaks in the time series between 2009 and 2010.

A significant increase in crude oil production was reported for 2007 due to the start-up of several new development wells and the beginning of production of the Oudna field.

A shutdown of the Bizerte refinery occurred between March 2010 and June 2011, resulting in breaks in time series for crude oil and oil products for the years 2009 to 2011.

In the 2009 edition, new data on charcoal production became available. A break in time series for wood inputs and charcoal outputs can be observed between 2008 and 2009.

Revisions in heat data between 2013 and 2014 from the 2017 edition are based on a survey of autoproducers.

Sources

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IEA Secretariat estimates.

Ukraine

General notes

Data for Ukraine are available starting in 1990. Prior to that, they are included in Former Soviet Union.

Ukraine is one of the 11 EU4Energy focus countries.

Due to limited information being available to the State Statistics Service of Ukraine from part of the Donetsk and Luhansk regions of Ukraine and from the Autonomous Republic of Crimea, breaks in the time series occur after 2013 for coal products and in 2016, for diesel energy industry own use.

The IEA Secretariat and the State Statistics Service of Ukraine have worked closely on the revision of historical data. Therefore, breaks in time series may occur between 2006 and 2007.

From 2007 onwards the transparency of data may be reduced because of confidentiality issues. For instance: peat includes lignite and patent fuel; other kerosene includes aviation fuels (aviation gasoline, gasoline-type jet fuel and kerosene-type jet fuel) for the period 2007-2015; other products include petroleum coke; since 2016 aviation fuels and kerosene are included in other products; since 2017 bituminous coal includes anthracite.

Coal

IEA statistics refer to coal after washing and screening for the removal of inorganic matter. Official Ukrainian coal statistics refer to unwashed and unscreened coal prior to 1995.

The decline in coal production observed since 2013 is the reflection of lack of data availability in these regions, not of an actual decrease in coal production.

In the 2022 edition and for the year 2020, coking coal production has been reclassified as other bituminous coal production due to the lower quality of the extracted coal. This creates a break in the time series of indigenous production between 2019 and 2020 for both coal products.

Anthracite supply and demand data since 2017 are included in other bituminous coal due to confidentiality issues.

Bituminous coal from other sources refers to coal mined in informal sector.

Due to a plant closure in 2008, a stock of lignite/peat became available, without details about its consumption. This may lead to breaks in time series and high statistical difference for 2008.

Since 2013, quantities of other bituminous coal reported under patent fuel transformation are used to make briquettes from dust and due to confidentiality and calorific value of this output, it is reported in peat products and not in patent fuel production.

Oil

From the 2020 edition, the Statistics Service of Ukraine is encountering confidentiality issues that lead to lack of refinery output data availability. Since 2018 data, the resulting large refinery losses reflect the missing output data. Part of the production of Ukraine's refinery is included with "other non-specified oil products", more specifically all motor gasoline produced in 2018, and part of this production in 2019. Because of this, in the 2022 edition the IEA Secretariat decided to report motor gasoline and gas/diesel oil production from 2018 to 2020 as confidential.

Large statistical differences exist for some oil products such as transport fuels and LPG. These are due to identified reporting issues in Ukraine. The State Statistics Service of Ukraine continues to work with data providers to solve these issues.

Due to lack of disaggregated data, aviation fuels are included with "Other non-specified oil products".

In the 2017 edition, refinery inputs have been estimated for 2015 by the IEA Secretariat based on supply to correct the disbalance between inputs and outputs; discrepancies may appear in the 2015 refinery balance.

In the 2016 edition, refinery gas is reported in the transformation sector. A break in time series and statistical difference appear as more information on the supply side remains unavailable.

Quantities of other hydrocarbons reported correspond to petroleum coke produced from coal tar. This information is not available for 2016.

Natural gas

The data for the stock draw and statistical difference of natural gas in 2010 are a consequence of the accounting method chosen by the Ukrainian administration to reflect the ruling of the Stockholm Arbitration Tribunal of March 30, 2010.

Gas stocks include stocks supplied to the Autonomous republic of Crimea.

Due to the new annual survey form, there was reclassification between main activity producers and autoproducers in 2016.

Biofuels and waste

Charcoal production has included pyrolysis and calculated amounts of traditional production since 2008.

In the 2022 edition, the Statistics Service of Ukraine reported supply and demand of industrial waste from several sources for the first time.

Electricity and heat

Statistical difference for electricity includes electricity supplied to the Autonomous Republic of Crimea and the Donetsk and Luhansk regions of Ukraine.

In the 2016 edition, power plants have been reclassified due to the implementation of more detailed survey forms.

Information on electricity used for pumped hydro has been available since 2012, but it is confidential in 2020.

Sources

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IEA Secretariat estimates.

Sources 1990 to 1991:

IEA Secretariat estimates.

Sources for biofuels and waste:

Joint IEA/Eurostat/UNECE annual energy questionnaire on renewables since 2007.

Direct communication with the State Statistics Service of Ukraine, Kiev.

The World Bank, Washington DC.

IEA Secretariat estimates.

Methodological notes

This publication is based on the data in physical units of the IEA *World Energy Statistics* publication, which follow the definitions of the *United Nations International Recommendations for Energy Statistics (IRES)*⁶ and on the IEA energy balance methodology, briefly summarised below.

Energy balance: key concepts

Energy data are generally collected independently across different commodities. Energy statistics are the simplest format to present all the data together, assembling the individual balances of all products, each expressed in its own physical unit (e.g. TJ for natural gas, kt for coal, etc). These are called commodity balances.

However, energy products can be converted into one another through a number of transformation processes. Therefore, it is very useful to also develop one comprehensive national energy balance, to understand how products are transformed into one another, and to highlight the various relationships among them.

By presenting all the data in a common energy unit, the energy balance allows users to see the total amount of energy used and the relative contribution of each different source, for the whole economy and for each individual consumption sector; to compute the different fuel transformation efficiencies; to develop various aggregated indicators (for example consumption per capita or per unit of GDP) and to estimate CO₂ emissions from fuel combustion.

The energy balance is a natural starting point to study the evolution of the domestic energy market, forecast energy demand, monitor impacts of energy policies and assess potential areas for action. The statistician also uses the energy balance as a high-level check on the data accuracy, as large statistical differences in energy units, apparent energy gains or large losses in transformation processes, or large unexplained variations in shares or in high-level indicators may all indicate underlying data problems.

⁶ <https://unstats.un.org/UNSD/energy/ires/default.htm>.

The energy balance takes the form of a matrix, where columns present all the different energy sources (“products”) categories and rows represent all the different “flows”, grouped in three main blocks: energy supply, transformation/energy use and final consumption.

To develop an energy balance from the set of commodity balances, the two main steps are: i) all the data are converted to a common energy unit – also allowing to compute a “total” product; and ii) some re-formatting is performed to avoid double counting when summing all products together. For example, for secondary products (e.g. motor gasoline) the production appears in the production row in commodity balances, but is reported as an output of the relevant transformation (e.g. oil refineries) in an energy balance, where the production row only refers to production of primary products (e.g. crude oil).

The methodological assumptions underlying energy balances, discussed in the next section, are particularly important to understand differences across balances derived by different national and international organisations starting from the same energy commodity data.

IEA energy balances methodology

The unit adopted by the IEA is the tonne of oil equivalent (toe), defined as 10^7 kilocalories (41.868 gigajoules). This quantity of energy is, within a few per cent, equal to the net heat content of 1 tonne of crude oil. Conversion of the IEA energy balances to other energy units would be straightforward.

The main methodological choices underlying energy balances that can differentiate the final balances layout across organisations are: i) “net” versus “gross” energy content; ii) calorific values; and iii) primary energy conventions.

Net versus gross energy content

The IEA energy balances are based on a “**net**” energy content, which excludes the energy lost to produce water vapour during combustion. All the elements of the energy balance are expressed on the same net basis to ensure comparability. Even elements (e.g. natural gas) that in commodity balances may be already in energy units but on a different basis (e.g. “gross”) are converted (e.g. from “gross” to “net”).

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, the net calorific value is about 5% less than gross, for most

forms of natural and manufactured gas the difference is 9-10%, while for electricity and heat there is no difference as they are not combusted.

Calorific values

Generally, the IEA adopts country-specific, time-varying, and for some products flow-dependent, net calorific values supplied by national administrations for most products; and regional default values (in conjunction with Eurostat for the European countries) for the oil products. More detailed explanations on the IEA conversion to energy units for the different energy sources are given in Section 2, Units and conversions.

Primary energy conventions

A very important methodological choice is the definition of the “**primary energy equivalent**” for the electricity and heat produced from non-combustible sources, such as nuclear, geothermal, solar, hydro, wind. The information collected is generally the amount of electricity and heat produced, represented in the balance as an output of transformation. Conventions are needed to compute the most appropriate corresponding primary energy, input to the transformation, both in form and in amount.

The principle adopted by the IEA is that the **primary energy form** is *the first energy form downstream in the production process for which multiple energy uses are practical*. For example, the first energy form that can be used as energy in the case of nuclear is the nuclear heat of the reactor, most of which is then transformed into electricity. The application of this principle leads to the choice of the following primary energy forms:

- **Electricity** for primary electricity (hydro, wind, tide/wave/ocean and solar photovoltaic).
- **Heat** for heat and secondary electricity (nuclear, geothermal and solar thermal).

Once the primary energy form is identified for all electricity and heat generated from non-combustible sources, the IEA adopts the **physical energy content method** to compute the corresponding primary energy equivalent amounts: the primary energy equivalent is simply the physical energy content of the corresponding primary energy form.

For primary electricity, such as hydro and solar PV, as electricity is identified as the primary energy form, the primary energy equivalent is simply the gross electricity generated in the plant.

For nuclear electricity, the primary energy equivalent is the quantity of heat generated in the reactors. In the absence of country-specific information, the IEA estimates the primary energy equivalent from the electricity generated by assuming an efficiency of 33%, derived as the average efficiency of nuclear power plants across Europe. Note that the principle of using the heat from nuclear reactors as the primary energy form for the energy statistics has an important effect on any indicators of energy supply dependence. Under the present convention, the primary nuclear heat appears as an indigenous resource. However, the majority of countries using nuclear power import their nuclear fuel, and if this fact could be taken into account, it would lead to an increase in the supply dependence on other countries.

For geothermal electricity, the primary energy equivalent is the quantity of heat and a similar back-calculation is used where the quantities of steam supplied to the plant are not measured, assuming a thermal efficiency of 10%. This figure is only approximate and reflects the fact that the steam from geothermal sources is generally of low quality. If data for the steam input to geothermal power plants are available, they are used directly as primary energy equivalent.

Similarly, for solar thermal plants the heat supply is back-calculated assuming a 33% efficiency of conversion of heat into electricity, reflecting relatively low working temperatures, although central receiver systems can reach higher temperatures and therefore higher efficiencies.

In summary, for geothermal and solar thermal, if no country-specific information is reported, the primary energy equivalent is calculated using the following efficiencies:

- 10% for geothermal electricity;
- 50% for geothermal heat;
- 33% for solar thermal electricity;
- 100% for solar thermal heat.

An alternative to the physical energy content method is the **partial substitution method**, used in the past by the IEA. In this case, the primary energy equivalent of the electricity generated from non-combustible sources is computed as the hypothetical amount of energy necessary to generate the same amount of electricity in thermal power plants, assuming an average generation efficiency. The method was abandoned by the IEA and other organisations because it had little meaning for countries with significant hydro electricity generation, and because the actual substitution values were hard to establish, as they depended

on the efficiency of the marginal electricity production. It also had unreal effects on the energy balance, as transformation losses appeared without a physical basis.

Since the two methods differ significantly in the treatment of solar, hydro, etc., the share of renewables in total energy supply varies depending on the method. To interpret shares of various energy sources in total supply, it is important to understand the conventions used to calculate the primary energy supply.

Notes on data quality

Methodology

For OECD Member countries, the data shown in this publication are based on information provided in the five annual OECD questionnaires⁷: “Oil”, “Natural Gas”, “Coal (Solid Fossil Fuels and Manufactured Gases)”, “Renewables and Wastes” and “Electricity and Heat” completed by the national administrations. For the member countries of the Economic Commission for Europe of the United Nations (UNECE) and a few others, the data shown in this publication are mostly based on information provided by the national administrations through the same annual questionnaires. The commodity balances for all other countries are based as much as possible on national official energy data, but also potentially on other data of heterogeneous nature, converted and adapted to fit the IEA format and methodology.

Considerable effort has been made to ensure that the data presented in this publication adhere to the IEA definitions reported in the section on Methodological notes. These definitions, based on the *United Nations International Recommendations for Energy Statistics*⁸, are used by most of the international organisations that collect energy statistics.

Nevertheless, energy statistics at the national level are often collected using criteria and definitions which differ, sometimes considerably, from those of international organisations. This is especially true for non-OECD countries, which are submitting data to the IEA on a voluntary basis. The IEA Secretariat has identified and documented most of these differences and, where possible, adjusted the data to meet international definitions.

Recognised differences occurring in specific countries are presented in the section on Country notes and sources. Country notes present the most important deviations from the IEA methodology, and are by no means a comprehensive list of those. To ensure transparency, country notes also describe how data are estimated or revised, where relevant for the data user.

⁷ See link to the annual questionnaires: <https://www.iea.org/areas-of-work/data-and-statistics/questionnaires>

⁸ <https://unstats.un.org/UNSD/energy/ires/default.htm>.

Estimation

In addition to adjustments addressing differences in definitions, estimations⁹ are sometimes required to complete major aggregates, when key statistics are missing.

The IEA secretariat has attempted to provide all the elements of energy balances down to the level of final consumption, for all countries and years. Providing all the elements of supply, as well as all inputs and outputs of the main transformation activities (such as oil refining and electricity generation), has often required estimations. Estimations have been generally made after consultation with national statistical offices, oil companies, electricity utilities and national or international energy experts.

Time series and political changes

The IEA secretariat reviews its databases each year. In the light of new assessments, important revisions may be made to time series of individual countries during the course of this review. Therefore, some data in this publication have been substantially revised with respect to previous editions. Please always consult the section on Country notes and sources.

Generally speaking, energy statistics for some countries undergo continuous changes in their coverage or methodology. Consequently, breaks in time series are considered to be unavoidable.

For example, energy balances for the individual countries of the Former Soviet Union and the Former Yugoslavia have been constructed since 1990 and are not available for previous years. These balances are generally based on official submissions, but estimations also have been made by the IEA secretariat. The section on Country notes and sources describes in detail these elements country by country.

Classification of fuel uses

National statistical sources often lack adequate information on the consumption of fuels in different categories of end use. Many countries do not conduct annual surveys of consumption in the main sectors of economic activity, and published

⁹ Data may not include all informal and/or illegal trade, production or consumption of energy products, although the IEA Secretariat makes efforts to estimate these where reliable information is available.

data may be based on out-of-date surveys. Therefore, sectoral disaggregation of consumption should generally be interpreted with caution.

In countries of non-OECD Europe and Eurasia and in China, the sectoral classification of fuel consumption before the reforms of the 1990's significantly differed from that of IRES. Sectoral consumption was defined according to the economic branch of the user, rather than according to the purpose or use of the fuel. For example, consumption of gasoline in the vehicle fleet of an enterprise attached to the economic branch 'Iron and steel' was classified as consumption in the 'Iron and steel' industry itself.

Where possible, data have been adjusted to fit international classifications, for example by assuming that most gasoline is consumed in transport. However, it has not been possible to reclassify products other than gasoline and jet fuel as easily, and few other adjustments have been made to other products.

Imports and exports

For a given product, imports and exports may not sum up to zero at the world level for a number of reasons. Fuels may be classified differently (i.e. fuel oil exports may be reported as refinery feedstocks by the importing country; NGL exports may be reported as LPG by the importing country, etc.). Other possible reasons include discrepancies in conversion factors, inclusion of international bunkers in exports, timing differences, data reported on a fiscal year basis instead of calendar year for certain countries, and underreporting of imports and exports for fiscal reasons.

Specific issues by fuel

Coal

Data on sectoral coal consumption are usually reported in metric tonnes. Net calorific values of different coal types used in different end use sectors are not always available. In the absence of specific information, the IEA secretariat estimates end use net calorific values based on the available net calorific values for production, imports and exports.

Oil

The IEA secretariat collects comprehensive statistics for oil supply and use, including oil for own use of refineries, oil delivered to international bunkers, and

oil used as petrochemical feedstock. National statistics often do not report all these amounts.

Reported production of refined products may refer to net rather than gross refinery output; consumption of oil products may be limited to sales to domestic markets and may not include deliveries to international shipping or aircraft. Oil consumed as petrochemical feedstock in integrated refinery/petrochemical complexes is often not included in available official statistics.

Where possible, the IEA secretariat has estimated those unreported data, in consultation with the oil industry. In the absence of any other indication, refinery fuel use is estimated to be a percentage (e.g. 5%) of refinery throughput, and where possible, split between refinery gas and fuel oil. For a description of some adjustments made to the sectoral consumption of oil products, see the above section 'Classification of fuel uses'.

Natural gas

Natural gas should be comprised mainly of methane; other gases, such as ethane and heavier hydrocarbons, should be reported under the heading of 'oil'. The IEA defines natural gas production as the marketable production, i.e. net of field losses, flaring, venting and re-injection.

However, the lack of adequate definitions makes it difficult or impossible to identify all quantities of gas at all different stages of its separation into dry gas (methane) and heavier fractions. National data for natural gas do not always explicitly show separate quantities for field losses, flaring, venting and re-injection.

Natural gas supply and demand statistics are normally reported in volumetric units and it is difficult to obtain accurate data on the calorific value. In the absence of specific information, the IEA generally applies an average gross calorific value of 38 TJ/million m³.

For the countries that report natural gas data at temperature and pressure conditions of 20°C and 101.325 kPa, the calorific values are about 1.7% lower than the equivalent at temperature and pressure conditions of 15°C and 101.325 kPa. However, in energy terms no difference is observed between the two reporting conditions as natural gas volumes measured at 20°C and 101.325 kPa are 1.7% higher than natural gas volumes at 15°C and 101.325 kPa.

Reliable consumption data for natural gas at a disaggregated level are often difficult to find. This is especially true for some of the largest natural gas

consuming countries in the Middle East. Therefore, industrial use of natural gas for these countries is frequently missing from the data published here.

Electricity

The IEA classification shows ‘main activity producers’ separately from ‘autoproducers’ of electricity and heat. An autoproducer of electricity is an establishment which, in addition to its main activities, generates electricity wholly or partly for its own use. For non-OECD countries, data on autoproducers are not always reported. In such cases, the quantities of fuels used as input to electricity are included under the appropriate end-use sector.

When statistics of production of electricity from biofuels and waste are available, they are included in total electricity production. However, these data are not comprehensive; for example, much of the electricity generated from waste biomass in sugar refining facilities remains unreported.

When unreported, inputs of fuels for electricity generation are estimated using information on electricity output, fuel efficiency and type of generation capacity.

Heat

For heat, transition economies (countries of non-OECD Europe and Eurasia) and China used to adopt a different methodology from that adopted in market economies. They allocated the transformation of primary fuels (coal, oil and gas) by industry into heat *for consumption on site* to the transformation activity ‘*heat production*’, **not** to industrial consumption, as in the IEA methodology¹⁰. The transformation output of *Heat* was then allocated to the various end use sectors. The losses occurring in the transformation of fuels into heat in industry were not included in final consumption of industry.

Although a number of countries have recently switched to the practice of international organisations, this important issue reduces the possibility of cross-country comparisons for sectoral end use consumption between transition economies and market economies.

Biofuels and waste

The IEA publishes data on production, domestic supply and consumption of biofuels and waste for all countries and all regions.

¹⁰ For autoproducer plants, the international methodology restricts the inclusion of heat in transformation processes to that sold to third parties.

Data for non-OECD countries are often based on secondary sources and may be of variable quality, which makes comparisons between countries difficult. For many countries, historical data are derived from surveys which were often irregular, irreconcilable and conducted at a local rather than national level.

Where official data are incomplete or unavailable, the IEA Secretariat estimates the time series based on economic indicators and secondary sources. Those estimated time series should be treated very cautiously. The chart below provides a broad indication of the estimation methodology and of the data quality by region.

Region	Main source of data	Data quality	Exogenous variables
Africa	FAO database and AfDB	Low	Population growth rate
Non-OECD Americas	national and OLADE	High	None
Non-OECD Asia	surveys	high to low	Population growth rate
Non-OECD Europe and Eurasia	questionnaires and FAO	high to medium	None
Middle East	FAO	medium to low	None

Given the importance of vegetal fuels in the energy picture of many developing countries, balances down to final consumption by end-use for individual products or product categories have been compiled for all countries.

The IEA hopes that the inclusion of these data will encourage national administrations and other agencies active in the field to enhance the level and quality of data collection and coverage for biofuels and waste. More details on the methodology used by each country may be provided on request and comments are welcome.

Units and conversions

General conversion factors for energy

To	TJ	Gcal	Mtoe	MBtu	GWh
From:	multiply by:				
terajoule (TJ)	1	2.3885x10 ²	2.3885x10 ⁻⁵	9.478x10 ²	2.778x10 ⁻¹
gigacalorie (Gcal)	4.1868x10 ⁻³	1	1.000x10 ⁻⁷	3.968	1.163x10 ⁻³
million tonnes of oil equivalent (Mtoe)	4.1868x10 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 U.S.	gal U.K.	bbl	ft ³	l	m ³
From:	multiply by:					
U.S. gallon (gal U.S.)	1	8.327x10 ⁻¹	2.381x10 ⁻²	1.337x10 ⁻¹	3.785	3.785x10 ⁻³
U.K. gallon (gal U.K.)	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

10 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)

Energy content

Coal

Coal has separate net calorific values for production, imports, exports, inputs to electricity/heat generation and coal used in coke ovens, blast furnaces and industry.

For electricity/heat generation, coal inputs to each type of plant (i.e. main activity electricity plant, autoproducer electricity plant, main activity CHP plant, autoproducer CHP plant, main activity heat plant, autoproducer heat plant) are converted to energy units using average factors calculated from the Annual Electricity Questionnaire. All other flows are converted using an average net calorific value.

Crude oil

Country-specific net calorific values (NCV) for production, imports and exports by country are used to calculate the balances. The average value is used to convert all the other flows to heat values.

Gases

World Energy Statistics expresses the following gases in terajoules, using their gross calorific value.

Gas data provided in joules should be converted as follows: Data in TJ / 41 868 = Data in Mtoe.

To calculate the net heat content of a gas from its gross heat content, multiply the gross heat content by the appropriate following factor.

Gas	Ratio NCV to GCV
Natural gas	0.9
Gas works gas	0.9
Coke oven gas	0.9
Blast furnace gas	1.0
Other recovered gases	1.0

Biofuels and waste

The heat content of primary solid biofuels, biogases, municipal waste and industrial waste, expressed in terajoules on a net calorific value basis, is presented in *World Energy Statistics*. The Secretariat does not receive information on volumes and other characteristics of these fuels.

Data in TJ / 41 868 = Data in Mtoe. Data for charcoal are converted from tonnes using the average net calorific values given in the electronic tables.

Unless country-specific information has been provided, data for biogasoline are converted from tonnes using 26 800 kJ/kg. Biodiesels and other liquid biofuels are assumed to have a net calorific value of 36 700 kJ/kg unless otherwise specified.

Oil products

For oil products, the IEA applies regional net calorific values (in conjunction with Eurostat for the European countries), except for the individual countries listed in the table at the end of this section.

Electricity

Figures for electricity production, trade, and final consumption are calculated using the energy content of the electricity. Electricity is converted as follows: Data in TWh x 0.086 = data in Mtoe.

Hydro-electricity production (excluding pumped storage) and electricity produced by other non-thermal means (wind, tide/wave/ocean, solar PV, etc.) are accounted for similarly. Gross electricity generation in TWh x 0.086 = primary energy equivalent in Mtoe.

The primary energy equivalent of nuclear electricity is calculated from the gross generation by assuming a 33% conversion efficiency. The calculation to be carried out is the following: gross electricity generation in TWh x 0.086 / 0.33 = primary energy equivalent in Mtoe.

In the case of electricity produced from geothermal heat, if the actual geothermal efficiency is not known, then the primary equivalent is calculated assuming an efficiency of 10%. The calculation to be carried out is the following: gross electricity generation in TWh x 0.086 / 0.10 = primary energy equivalent in Mtoe.

For electricity produced from solar thermal heat, the primary equivalent is calculated assuming an efficiency of 33% unless the actual efficiency is known. The calculation to be carried out is the following: gross electricity generation in TWh x 0.086 / 0.33 = primary energy equivalent in Mtoe.

Heat

Information on heat is supplied in terajoules and is converted as follows: Data in TJ / 41 868 = Data in Mtoe.

In the case of heat produced in a geothermal plant, if the actual geothermal efficiency is not known, then the primary equivalent is calculated assuming an efficiency of 50%. The calculation to be carried out is the following: Heat production in TJ x 0.0000238 / 0.50 = primary energy equivalent in Mtoe.

For heat produced in a solar thermal plant, the primary equivalent is equal to the heat consumed. Data in TJ / 41 868 = data in Mtoe.

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

Examples

The following examples indicate how to calculate the net calorific content (in ktoe) of the quantities expressed in original units in *World Energy Statistics*.

From original units	To Mtoe (on a NCV basis)
Coking coal production (Poland) for 2016 in thousand tonnes	divide by 41 868 and then multiply by 29.606
Natural gas in terajoules (gross)	multiply by 2.38846×10^{-5} and then multiply by 0.9
Motor gasoline (Poland) in thousand tonnes	divide by 41 868 and then multiply by 44.000
Heat in terajoules (net)	multiply by 2.38846×10^{-5}

Abbreviations

Btu:	British thermal unit
GWh:	gigawatt hour
kcal:	kilocalorie
kg:	kilogramme
kJ:	kilojoule
Mt:	million tonnes
m ³ :	cubic metre
t:	metric ton = tonne = 1,000 kg
TJ:	terajoule
toe:	tonne of oil equivalent = 10 ⁷ kcal (International Steam Table calorie (1956) definition)

CHP:	combined heat and power
GCV:	gross calorific value
GDP:	gross domestic product
HHV:	higher heating value = GCV
LHV:	lower heating value = NCV
NCV:	net calorific value
PPP:	purchasing power parity
TES:	total energy supply

AfDB:	African Development Bank
EU-27:	European Union - 27
FAO:	Food and Agriculture Organisation of the United Nations
IEA:	International Energy Agency
IPCC:	Intergovernmental Panel on Climate Change
ISIC:	International Standard Industrial Classification
OECD:	Organisation for Economic Co-Operation and Development
OLADE:	Organización Latinoamericana de Energía
UN:	United Nations
UNIPED:	International Union of Producers and Distributors of Electrical Energy

c	confidential
e	estimated
..	not available
x	not applicable

Publisher's page

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