WORLD ENERGY STATISTICS
2022 EDITION

# Database documentation

This documentation provides support information for the IEA *World energy statistics* database. This document can be found online at: https://www.iea.org/subscribe-to-data-services/world-energy-balances-and-statistics.

Please address your inquiries to stats@iea.org.

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# Changes from last edition

## Geographical coverage

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.

The IEA continues to expand the coverage of its statistics reports and encourages more countries to collaborate on data exchange. As detailed data have become consistently available for the Kingdom of Eswatini, Madagascar, Rwanda and Uganda, the associated time series are now shown explicitly in the main list of countries and have been removed from the Other Africa region.

For further details, please refer to the section on *Geographical coverage*.

| Old longname | New longname | Shortname | Old shortname (if changed) |
|---|---|---|---|
| | Kingdom of Eswatini | ESWATINI | |
| Memo: Madagascar | Madagascar | MADAGASCAR | MMADAGASCA |
| Memo: Rwanda | Rwanda | RWANDA | MRWANDA |
| Memo: Uganda | Uganda | UGANDA | MUGANDA |
| Turkey | Republic of Türkiye | TURKEY | |

## Time

In a continuous effort to provide users with more timely data, the 2022 edition of IEA's World energy statistics has been expanded to increase data coverage for the most recent (2021) year:

- Full 2021 energy statistics tables and balances are available for 2 non-OECD countries: Argentina and Brazil.
- Coverage of total electricity generation by product has been extended, now including 32 non-OECD countries and additional regional aggregates such as the European Union



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- Coverage of imports and exports of crude oil is complete for People's Republic of China; India; Indonesia; Thailand; Trinidad and Tobago; and Uruguay; with data for imports and exports of all primary and secondary oil products available for another 19 non-OECD countries and some regional aggregates, such as European Union and G8.
- In addition to supply, selected demand flows are now available for OECD countries in year 2021. As the full breakdown of final consumption flows was not available for all countries, the flow "final consumption not elsewhere specified" has been adjusted by the IEA Secretariat to ensure flows consistency.



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# Database structure

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

- countries: 150 countries and 35 regional aggregates
  (see section *Geographical coverage*);
- years: 1960-2020 (OECD countries);
  1971-2020 (non-OECD countries;regional aggregates; world);
  2021 (provisional energy data).

The database includes the following three files:

WBES.IVT **Energy statistics**
Energy statistics in matrix form (69 products; 103 flows) (various natural units, depending on the product);
Electricity and heat output by type of producer (12 flows) (GWh; TJ).

WCONV.IVT **World conversion factors**
net calorific values by flow for 15 coal, peat, oil shale 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/$m^3$).

WORLD_BBL.IVT **Oil demand by product**
Oil consumption (4 flows for 9 oil product categories) (kbbl/d).

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



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# Flow definitions

## Supply

| Flow | Short name | Definition |
|---|---|---|
| Production | INDPROD | Refers to the quantities of fuels extracted or produced, calculated after any operation for removal of inert matter or impurities (e.g. sulphur from natural gas). For “other hydrocarbons” (shown with crude oil), production includes synthetic crude oil (including mineral oil extracted from bituminous minerals such as oil shale and tar sands, etc.). Production of secondary oil products represents the gross refinery output. Secondary coal products (including coal gases) represent the output from coke ovens, gas works, blast furnaces and other transformation processes. |
| From other sources – coal | OSCOAL | Refers to both primary energy that has not been accounted for under production and secondary energy that has been accounted for in the production of another fuel. For example, under primary coal: recovered slurries, middlings, recuperated coal dust and other low-grade coal products that cannot be classified according to type of coal from which they are obtained; under gas works gas: natural gas, refinery gas, and LPG, that are treated or mixed in gas works (i.e. gas works gas produced from sources other than coal). |
| From other sources – natural gas | OSNATGAS | Refers to both primary energy that has not been accounted for under production and secondary energy that has been accounted for in the production of another fuel. |
| From other sources – oil products | OSOIL | Refers to both primary energy that has not been accounted for under production and secondary energy that has been accounted for in the production of another fuel. For example, under additives: benzol, alcohol and methanol produced from natural gas; under refinery feedstocks: backflows from the petrochemical industry used as refinery feedstocks; under “other hydrocarbons” (included with crude oil): liquids obtained from coal liquefaction and GTL plants. |
| From other sources – renewables | OSRENEW | Refers to both primary energy that has not been accounted for under production and secondary energy that has been accounted for in the production of another fuel. |
| From other sources – non-specified | OSNONSPEC | Refers to both primary energy that has not been accounted for under production and secondary energy that has been accounted for in the production of another fuel. This flow is used if the source is not known. |
| Imports | IMPORTS | Comprise amounts having crossed the national territorial boundaries of the country whether or not customs clearance has taken place.<br>*For coal*: 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.<br>*For oil and natural gas:* 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 |



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| Flow | Short name | Definition |
|---|---|---|
| | | 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.<br>*For electricity*: Amounts are considered as imported when they have crossed the national territorial boundaries of the country. If electricity is "wheeled" or transited through a country, the amount is shown as both an import and an export. |
| Exports | EXPORTS | Comprise amounts having crossed the national territorial boundaries of the country whether or not customs clearance has taken place.<br>*For coal*: 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.<br>*For oil and natural gas:* 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.<br>*For electricity*: 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. |
| International marine bunkers | MARBUNK | 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 *domestic navigation*, *fishing* and *non-specified (other)*.<br>*International marine bunkers* are excluded from the *supply* at the country and regional level, but not for world, where they are included in *transport* under *World marine bunkers*. |
| 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.<br>*International aviation bunkers* are excluded from the *supply* at the country and regional level, but not for world, where they are included in *transport* under *World aviation bunkers*. |
| 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. Oil and gas stock changes in pipelines are not taken into account. With the exception of large users mentioned above, changes in final users' stocks are not taken into account. A stock build is shown as a negative number, and a stock draw as a positive number. |



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| Flow | Short name | Definition |
|---|---|---|
| Domestic supply | DOMSUP | Defined as *production + from other sources + imports - exports - international marine bunkers - international aviation bunkers ± stock changes*. Note, exports, bunkers and stock changes incorporate the algebraic sign directly in the number. |
| Transfers | TRANSFER | Comprises *interproduct transfers*, *products transferred* and *recycled products*.<br>*Interproduct transfers* 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 *interproduct transfers* is zero.<br>*Products transferred* 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.<br>*Recycled products* 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 | Defined as deliveries to *final consumption + use for transformation processes + consumption by energy industry own use + losses - domestic supply - transfers*. Statistical differences arise because the data for the individual components of supply and demand are often derived from different data sources by the national administration. Furthermore, the inclusion of changes in some large consumers' stocks in the supply part of the balance introduces distortions which also contribute to the statistical differences. |

## 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). |
| 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. |



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| Flow | Short name | Definition |
|---|---|---|
| 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. |
| 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. Note that the sale need not take place through the public grid. |
| 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 |



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| Flow | Short name | Definition |
|---|---|---|
| | | 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 *transformation processes* 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 *blast furnaces* in the column appropriate for the fuel, and the consumption component is shown in the row *iron and steel*, 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 quantities of fuels used for the production of town gas. |
| Coke ovens | TCOKEOVS | Includes the use of fuels for the manufacture of coke and coke oven gas. |
| Patent fuel plants | TPATFUEL | Includes the use of fuels for the manufacture of patent fuels. |
| BKB/peat briquette plants | TBKB | Includes the use of fuels for 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 | Includes backflows returned from the petrochemical industry. Note that backflows from oil products that are used for non-energy 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 primary solid biofuels into charcoal. |
| Non-specified (transformation) | TNONSPEC | Includes the transformation of natural gas for hydrogen manufacture and other non-specified transformation. |



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## 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).<br>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 *residential*). |
| 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. |
| 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. |



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| Flow | Short name | Definition |
|---|---|---|
| Non-specified (energy) | ENONSPEC | Represents use in non-specified energy industries. |
| Losses | DISTLOSS | Represents losses in energy distribution, transmission and transport. |

## Final consumption

| Flow | Short name | Definition |
|---|---|---|
| Final consumption | FINCONS | 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 *stock changes*).<br>Backflows from the petrochemical industry are not included in final consumption (see *from other sources* under supply and *petrochemical plants* in transformation processes).<br>Note that *international aviation bunkers* and *international marine bunkers* are not included in final consumption except for the world total, where they are reported as *World aviation bunkers* and *World marine bunkers* 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 Divisions 07 and 08 and Group 099 (NACE Divisions 07 and 08 + Group 09.9)] Mining (excluding fuels) and quarrying. |
| Construction | CONSTRUC | [ISIC and NACE Rev. 4 Divisions 41 to 43] |
| Manufacturing | MANUFACT | Manufacturing refers to the sum of the following industrial sub-sectors:<br>• Iron and steel<br>• Chemical and petrochemical<br>• Non-ferrous metals<br>• Non-metallic minerals<br>• Transport equipment<br>• Machinery<br>• Food and tobacco<br>• Paper, pulp and print<br>• Wood and wood products<br>• Textile and leather<br>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. |



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| Flow | Short name | Definition |
|---|---|---|
| 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] |
| 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 *non-specified (industry)* 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 (*international aviation bunkers*) for the world total.<br>*World aviation bunkers* is not applicable for individual countries and regions and is included in *transport* for the world total.<br>Note that for World, *total energy supply* includes *international aviation bunkers*. |
| 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 |



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| Flow | Short name | Definition |
|---|---|---|
| | | 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 *energy industry own use*, while the energy used for the final distribution of water (ISIC Rev. 4 Division 36) to household, industrial, commercial and other users should be included in *commercial/public services*. Losses occurring during the transport between distributor and final users should be reported as *losses*. |
| World marine bunkers | WORLDMAR | Includes fuels delivered to ships of all flags not engaged in international navigation (international marine bunkers) for the world total. *World marine bunkers* 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 *international marine bunkers*). 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: *International marine bunkers* and *international aviation bunkers* are shown in *supply* and are not included in *transport* as part of final consumption, except for the world total (see note on *supply*). |
| 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]. *Prior to 2007 edition, fishing was included with agriculture/forestry and this may continue to be the case for some countries.* |
| 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 |



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| Flow | Short name | Definition |
|---|---|---|
| | | 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. |
| 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 *non-energy use*.<br>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. |
| *Memo: Non-energy use in industry* | *NEIND* | Non-energy in industry (please see above for more details on industry sub-sector definitions). |
| *Memo: Non-energy use in iron and steel* | *NEIRONSTL* | Non-energy use in iron and steel (please see above for more details on industry sub-sector definitions). |
| *Memo: Non-energy use chemical/petrochemical* | *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, butadene and other hydrocarbon-based raw materials in processes such as steam cracking, aromatics plants and steam reforming [part of ISIC Rev. 4 Group 201].<br>*Note: this flow was called "of which petrochemical feedstocks" in previous editions.* |
| Memo: Non-energy use in non-ferrous metals | NENONFERR | Non-energy use in non-ferrous metals (please see above for more details on industry sub-sector definitions). |
| Memo: Non-energy use in non-metallic minerals | NENONMET | Non-energy use in non-metallic minerals (please see above for more details on industry sub-sector definitions). |
| Memo: Non-energy use in transport equipment | NETRANSEQ | Non-energy use in transport equipment (please see above for more details on industry sub-sector definitions). |
| Memo: Non-energy use in machinery | NEMACHINE | Non-energy use in machinery (please see above for more details on industry sub-sector definitions). |
| Memo: Non-energy use in mining and quarrying | NEMINING | Non-energy use in mining and quarrying (please see above for more details on industry sub-sector definitions). |
| Memo: Non-energy use in food/beverages/tobacco | NEFOODPRO | Non-energy use in food/beverages/tobacco (please see above for more details on industry sub-sector definitions). |



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| Flow | Short name | Definition |
|---|---|---|
| Memo: Non-energy use in paper/pulp and printing | NEPAPERPRO | Non-energy use in paper/pulp and printing (please see above for more details on industry sub-sector definitions). |
| Memo: Non-energy use in wood and wood products | NEWOODPRO | Non-energy use in wood and wood products (please see above for more details on industry sub-sector definitions). |
| Memo: Non-energy use in construction | NECONSTRUC | Non-energy use in construction (please see above for more 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. |



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## 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. Electricity production for hydro pumped storage is also given separately for main activity producers and autoproducers. |
| 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 | |
| Main activity producers - pumped hydro production (GWh) | MHYDPUMP | |
| Autoproducer - pumped hydro production (GWh) | AHYDPUMP | |

## Heat output (TJ)

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



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## 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. |
| Volume to mass ratio | BBLTONRATIO | This ratio (barrels/tonne), inverse of density, is used to calculate the oil demand by product (in barrels). |
| 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. |



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## Oil demand

Expressed in **thousand barrels/day** (converted from kt using volume to mass ratios in barrels/tonne).

| Flow | Short name | Definition |
|---|---|---|
| Net inland consumption | NETDELIC | Obtained from above flows, as: DOMSUP+TRANSFER+STATDIFF-TPETCHEM-TREFINER-TCOALLIQ-TGTL-EREFINER. Note that only in this table, net inland consumption includes international aviation bunkers for all countries. |
| Refinery fuel | REFFUEL | Equal to EREFINER. It shows oil refineries' own use of oil products for operation of equipment, heating and lighting. It mainly includes refinery gas, gas/diesel oil and fuel oil. |
| International marine bunkers | MARBUNK | Equal to MARBUNK. It shows international marine bunkers consumption of liquid fuels, mainly gas/diesel oil and fuel oil. |
| Demand | DEMAND | Sum of the previous three flows. Note that only in this table, demand includes international marine and aviation bunkers for all countries. |



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# Product definitions

## Coal

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

| 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. 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 characterized by higher volatile matter than anthracite (more than 10%) and lower carbon content (less than 90% fixed carbon). Its gross calorific value is equal to or greater than 24 000 kJ/kg 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 *energy industry own use*. |



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| Product | Short name | Definition |
|---|---|---|
| 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 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 *energy industry own use* includes the consumption at the coking plants themselves. Consumption in the *iron and steel industry* 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 *blast furnaces*). |
| 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. *Energy industry own use* includes the consumption of gas coke at gas works. |
| Coal tar | COALTAR | Coal tar is a result of the destructive distillation of bituminous 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. |
| 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. |



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## Peat and peat products

The fuels in this section are expressed in thousand tonnes.

| 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

The fuels in this section are expressed in thousand tonnes.

| 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 *from other sources* under crude oil (*other hydrocarbons*). |

## Natural gas

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

| 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).<br>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.<br>Note: starting with the 2011 edition, gas works gas is included with coal. In previous years, gas works gas was included with natural gas. |



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## Crude, NGL, refinery feedstocks

The fuels in this section are expressed in thousand tonnes.

| 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. 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 biofuel fractions of biogasoline, biodiesel and ethanol are not included here, but under liquid biofuels. This differs from the presentation of additives in the *Oil Information* 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). |



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## Oil products

The fuels in this section are expressed in thousand tonnes.

Oil products are any oil-based products which can be obtained by distillation and are normally used outside the refining industry. The exceptions to this are those finished products which are classified as refinery feedstocks.

*Production* of oil products shows gross refinery output for each product.

Refinery fuel (row *oil refineries*, under *energy industry own use*) represents consumption of oil products, both intermediate and finished, within refineries, e.g. for heating, lighting, traction, etc.

| 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 *oil refineries* in *energy industry own use*. |
| Ethane | ETHANE | Ethane is a naturally gaseous straight-chain hydrocarbon ($C_2H_6$). 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 ($C_3H_8$) and butane ($C_4H_{10}$) 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 13.7kPa and 20.6kPa. Additives can be included to improve fuel stability and combustibility. |



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| Product | Short name | Definition |
|---|---|---|
| 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 150ºC and 300ºC but not generally above 250ºC). 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 150ºC and 300ºC. |
| 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 distils between 180ºC and 380ºC. 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 380ºC and 540ºC 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 80ºC. The flash point is always above 50ºC 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 distils between 30ºC and 210ºC. Naphtha imported for blending is shown as an import of naphtha, and then shown in the *transfers* 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 30ºC and a distillation range of 135ºC to 200ºC. Industrial spirit (SBP) comprises light oils distilling between 30ºC and 200ºC, with a temperature difference between 5% volume and 90% volume distillation points, including losses, of not more than 60ºC. 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. |



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| Product | Short name | Definition |
|---|---|---|
| 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 45ºC. |
| 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. |



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## Biofuels and wastes

The fuels in this section are expressed in terajoules on a **net calorific value** basis, with the exception of liquid biofuels and charcoal, which are in thousand tonnes.

| 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, biogas 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 are 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).<br>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 modify their composition and can be further processed to produce substitute natural gas.<br>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. |



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| Product | Short name | Definition |
|---|---|---|
| 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

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

| Product | Short name | Definition |
|---|---|---|
| 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. |
| 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 | GEOTHERM | 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:<br>• for electricity generation using dry stream or high enthalpy brine after flashing<br>• directly as heat for district heating, agriculture, etc. |



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| Product | Short name | Definition |
|---|---|---|
| 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:<br>• flat plate collectors, mainly of the thermosyphon type, for domestic hot water or for the seasonal heating of swimming pools<br>• solar thermal-electric plants<br>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.<br>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.<br>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.<br>Fuels used to produce quantities of heat for sale are included in the transformation processes under the rows *CHP plants* and *Heat plants*. 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. |



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## Products for oil demand (within WORLD_BBL.IVT)

Expressed in **thousand barrels/day** (converted from kt using volume to mass ratios in barrels/tonne)

| Flow | Short name | Definition |
|---|---|---|
| NGL/LPG | NGL/LPG | NGL+LPG+ETHANE |
| Naphtha | NAPHTHA | NAPHTHA |
| Motor gasoline | MOTORGAS | NONBIOGASO+ADDITIVE+BIOGASOL+OBIOLIQ |
| Aviation fuels | JETKERO | NONBIOJETK+BIOJETKERO+AVGAS+JETGAS |
| Other kerosene | OTHKERO | OTHKERO |
| Gas/diesel oil | GASDIES | NONBIODIES+BIODIESEL |
| Fuel oil | RESFUEL | RESFUEL |
| Other products | OPRODS | WHITESP+LUBRIC+BITUMEN+PARWAX+ PETCOKE+ONONSPEC+CRUDEOIL+NONCRUDE +REFINGAS |
| Total products | TOTPRODS | Sum of all products. |



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# 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 |
|---|---|---|
| World | WORLD | Includes OECD Total; Africa; non-OECD Asia (excluding China); China (P.R. of China and Hong Kong, China); Non-OECD Americas; Middle East; Non-OECD Europe and Eurasia; World aviation bunkers and World marine bunkers. It is also the sum of Africa (UN), Americas (UN), Asia (UN), Europe (UN), Oceania (UN), World aviation bunkers and World marine bunkers. |
| 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; the Republic of Türkiye and the United Kingdom. Estonia, Latvia, Lithuania and Slovenia are included starting in 1990. Prior to 1990, data for Estonia, Latvia and Lithuania are included in Former Soviet Union and data for Slovenia in Former Yugoslavia. |
| Africa | AFRICA | Includes Algeria; Angola; Benin; Botswana; Cameroon; Republic of Congo (Congo); Côte d'Ivoire; Democratic Republic of Congo; Egypt; Equatorial Guinea; Eritrea; the Kingdom of Eswatini; Ethiopia; Gabon; Ghana; Kenya; Libya; Madagascar; Mauritius; Morocco; Mozambique; Namibia (from 1991); Niger; Nigeria; Rwanda; Senegal; South Africa; South Sudan; Sudan, United Republic of Tanzania (Tanzania); Togo; Tunisia; Uganda; Zambia; Zimbabwe and **Other Africa.**<br>Note that Africa is identical to Memo: Africa (UN). |
| Non-OECD Americas | LATAMER | Includes Argentina; Plurinational State of Bolivia (Bolivia); Brazil; Cuba; Curaçao [2]; Dominican Republic; Ecuador; El |

[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.



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| Country/Region | Short name | Definition |
|---|---|---|
| | | Salvador; Guatemala; Guyana; Haiti; Honduras; Jamaica; Nicaragua; Panama; Paraguay; Peru; Suriname (from 2000); Trinidad and Tobago; Uruguay; Bolivarian Republic of Venezuela (Venezuela) and **Other non-OECD Americas**. |
| Middle East | MIDEAST | Includes Bahrain; Islamic Republic of Iran; Iraq; Jordan; Kuwait; Lebanon; Oman; Qatar; Saudi Arabia; Syrian Arab Republic; United Arab Emirates and Yemen. |
| Non-OECD Europe and Eurasia | EURASIA | Includes Albania; Armenia; Azerbaijan; Belarus; Bosnia and Herzegovina; Bulgaria; Croatia; Cyprus[3]; the Republic of North Macedonia (North Macedonia); Georgia; Gibraltar; Kazakhstan; Kosovo[4]; Kyrgyzstan; Malta; Republic of Moldova (Moldova); Montenegro; Romania; Russian Federation; Serbia[5]; Tajikistan; Turkmenistan; Ukraine; Uzbekistan; Former Soviet Union (prior to 1990) and Former Yugoslavia (prior to 1990).<br>Prior to 1990, data for Estonia, Latvia and Lithuania are included in Former Soviet Union and data for Slovenia in Former Yugoslavia. |
| Non-OECD Asia (excluding China) | ASIA | Includes Bangladesh; Brunei Darussalam; Cambodia (from 1995); Democratic People's Republic of Korea; India; Indonesia; Lao People's Democratic Republic (from 2000); Malaysia; Mongolia (from 1985); Myanmar; Nepal; Pakistan; Philippines; Singapore; Sri Lanka; Chinese Taipei; Thailand; Viet Nam and **Other non–OECD Asia**. |
| China (P.R. of China and Hong Kong, China) | CHINAREG | Includes the People's Republic of China and Hong Kong, China. |
| World marine bunkers | WORLDMAR | Due to the structure of the database, World marine bunkers are reported both as a flow and as an entity similar to a country or a region. World marine bunkers represent the sum of International marine bunkers from all countries. Therefore, 'World marine bunkers' is not applicable for individual countries and regions, and it is included in transport for the world total. |
| World aviation bunkers | WORLDAV | Due to the structure of the database, World aviation bunkers are reported both as a flow and as an entity similar |

[2] Netherlands Antilles was dissolved on 10 October 2010, resulting in two new constituent countries, Curaçao and Sint Maarten, with the remaining islands joining the Netherlands as special municipalities. From 2012 onwards, data now account for the energy statistics of Curaçao Island only. Prior to 2012, data remain unchanged and still cover the entire territory of the former Netherlands Antilles.

[3] **Note by the Republic of Türkiye (Türkiye):**
*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. Türkiye recognises the Turkish Republic of Northern Cyprus (TRNC). Until a lasting and equitable solution is found within the context of the United Nations, Türkiye 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 Türkiye. The information in this document relates to the area under the effective control of the Government of the Republic of Cyprus.*

[4] This designation is without prejudice to positions on status, and is in line with United Nations Security Council Resolution 1244/99 and the Advisory Opinion of the International Court of Justice on Kosovo's declaration of independence.

[5] Serbia includes Montenegro until 2004 and Kosovo until 1999.



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| Country/Region | Short name | Definition |
|---|---|---|
| | | to a country or a region. World aviation bunkers represent the sum of International aviation bunkers from all countries. Therefore, 'World aviation bunkers' is not applicable for individual countries and regions, and it is included in transport for the world total. |
| Albania | ALBANIA | |
| Algeria | ALGERIA | |
| Angola | ANGOLA | |
| 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. Prior to that, they are included in Former Soviet Union. |
| Australia | AUSTRALI | Excludes the overseas territories.<br>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. Prior to that, they are included in Former Soviet Union. |
| Bahrain | BAHRAIN | |
| Bangladesh | BANGLADESH | Data are reported on a fiscal year basis. By convention data for the fiscal year that starts on 1 July Y-1 and ends on 30 June Y are labelled as year Y. |
| Belarus | BELARUS | Data for Belarus are available starting in 1990. Prior to that, they are included in Former Soviet Union. |
| Belgium | BELGIUM | |
| Benin | BENIN | |
| Plurinational State of Bolivia | BOLIVIA | |
| Bosnia and Herzegovina | BOSNIAHERZ | Data for Bosnia and Herzegovina are available starting in 1990. Prior to that, they are included in Former Yugoslavia. |
| Botswana | BOTSWANA | |
| 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. |
| Brunei Darussalam | BRUNEI | |
| Bulgaria | BULGARIA | |



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| Country/Region | Short name | Definition |
|---|---|---|
| Cambodia | CAMBODIA | Data for Cambodia are available starting in 1995. Prior to that, they are included in Other Asia. |
| Cameroon | CAMEROON | |
| Canada | CANADA | |
| Chile | CHILE | Data start in 1971.<br>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 *Oil Information* may be different from those in *World Energy Statistics* due to a change in reporting methodology.<br>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. |
| Republic of Congo | CONGO | |
| Costa Rica | COSTARICA | Costa Rica joined the OECD in May 2021; data are now included in the applicable OECD aggregates. |
| Côte d'Ivoire | COTEIVOIRE | |
| Croatia | CROATIA | Data for Croatia are available starting in 1990. Prior to that, they are included in Former Yugoslavia. |
| Cuba | CUBA | |
| Curaçao/Netherlands Antilles | CURACAO | The Netherlands Antilles was dissolved on 10 October 2010, resulting in two new constituent countries, Curaçao and Sint Maarten, with the remaining islands joining the Netherlands as special municipalities. From 2012 onwards, data now account for the energy statistics of Curaçao Island only. Prior to 2012, data remain unchanged and still cover the entire territory of the former Netherlands Antilles. |
| Cyprus | CYPRUS | **Note by the Republic of Türkiye (Türkiye):**<br>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. Türkiye recognizes the Turkish Republic of Northern Cyprus (TRNC). Until a lasting and equitable solution is found within the context of the United Nations, Türkiye shall preserve its position concerning the "Cyprus" issue.<br>**Note by all the European Union Member States of the OECD and the European Union:**<br>The Republic of Cyprus is recognised by all members of the |



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| Country/Region | Short name | Definition |
|---|---|---|
| | | United Nations with the exception of Türkiye. 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. |
| Democratic People's Republic of Korea | KOREADPR | |
| Democratic Republic of Congo | CONGOREP | |
| Denmark | DENMARK | Excludes Greenland and the Faroe Islands, except prior to 1990, where data on oil for Greenland were included with the Danish statistics. |
| Dominican Republic | DOMINICANR | |
| Ecuador | ECUADOR | |
| 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.<br>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. |
| El Salvador | ELSALVADOR | |
| Equatorial Guinea | EQGUINEA | |
| Eritrea | ERITREA | Data for Eritrea are available from 1992. Prior to that, they are included in Ethiopia. |
| Estonia | ESTONIA | Data start in 1990. Prior to that, they are included within Former Soviet Union. |
| Kingdom of Eswatini | ESWATINI | |
| Ethiopia | ETHIOPIA | Ethiopia energy data include Eritrea from 1971 to 1991. From 1992, the two countries are reported separately.<br>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. |
| 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.<br>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. |
| Gabon | GABON | |



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| Country/Region | Short name | Definition |
|---|---|---|
| Georgia | GEORGIA | Data for Georgia are available starting in 1990. Prior to that, they are included in Former Soviet Union. |
| Germany | GERMANY | Includes the new federal states of Germany from 1970 onwards. |
| Ghana | GHANA | |
| Gibraltar | GIBRALTAR | |
| Greece | GREECE | |
| Guatemala | GUATEMALA | |
| Guyana | GUYANA | |
| Haiti | HAITI | |
| Honduras | HONDURAS | |
| 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.<br>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. |
| Islamic Republic of Iran | IRAN | Data are reported according to the Iranian calendar year. By convention data for the year that starts on 20 March Y and ends on 19 March Y+1 are labelled as year Y. |
| Iraq | IRAQ | |
| 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.<br>Data start in 1971.<br>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), |



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| Country/Region | Short name | Definition |
|---|---|---|
| | | for data starting in 1971 and for the entire time series. |
| Italy | ITALY | Includes San Marino and the Holy See. |
| Jamaica | JAMAICA | |
| Japan | JAPAN | Includes Okinawa.<br>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. |
| Jordan | JORDAN | |
| Kazakhstan | KAZAKHSTAN | Data for Kazakhstan are available starting in 1990. Prior to that, they are included in Former Soviet Union. |
| Kenya | KENYA | |
| 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. Prior to 1990, they are included in Former Yugoslavia. |
| Kuwait | KUWAIT | |
| Kyrgyzstan | KYRGYZSTAN | Data for Kyrgyzstan are available starting in 1990. Prior to that, they are included in Former Soviet Union. |
| Latvia | LATVIA | Data for Latvia are available starting in 1990. Prior to that, they are included in Former Soviet Union. |
| Lao People's Democratic Republic | LAO | Data start in 2000. Prior to that, they are included in the Other non-OECD Asia region. |
| Lebanon | LEBANON | |
| Libya | LIBYA | |
| 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.<br>Data for Lithuania are available starting in 1990. Prior to that, they are included in Former Soviet Union. |
| Luxembourg | LUXEMBOU | |
| Madagascar | MADAGASCAR | |
| Malaysia | MALAYSIA | |
| Malta | MALTA | |
| Mauritius | MAURITIUS | |



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| Country/Region | Short name | Definition |
|---|---|---|
| Mexico | MEXICO | Data start in 1971. |
| Republic of Moldova | MOLDOVA | Data for Moldova are available starting in 1990. Prior to that, they are included in Former Soviet Union. |
| Mongolia | MONGOLIA | Data for Mongolia are available starting in 1985. Prior to that, they are included in Other Asia. |
| Montenegro | MONTENEGRO | Data for Montenegro are available starting in 2005. Between 1990 and 2004, data for Montenegro are included in Serbia. Prior to 1990, they are included in Former Yugoslavia. |
| 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. |
| Mozambique | MOZAMBIQUE | |
| Myanmar | MYANMAR | Data are reported on a fiscal year basis. By convention data for the fiscal year that starts on 1 April Y and ends on 31 March Y+1 are labelled as year Y. |
| Namibia | NAMIBIA | Electricity data are reported on a fiscal year basis. By convention data for the fiscal year that starts on 1 July Y and ends on 31 June Y+1 are labelled as year Y.<br>Data for Namibia are available starting in 1991. Prior to that, data are included in Other Africa. |
| Nepal | NEPAL | Data are reported on a fiscal year basis. By convention data for the fiscal year that starts on 1 July Y and ends on 30 June Y+1 are labelled as year Y. |
| Netherlands | NETHLAND | Excludes Suriname, Aruba and the other former Netherland Antilles (Bonaire, Curaçao, Saba, Saint Eustatius and Sint Maarten). |
| New Zealand | NZ | |
| Nicaragua | NICARAGUA | |
| Niger | NIGER | |
| Nigeria | NIGERIA | |
| Republic of North Macedonia | NORTHMACED | Data for the Republic of North Macedonia (North Macedonia) are available starting in 1990. Prior to that, they are included in Former Yugoslavia. |
| Norway | NORWAY | |
| Oman | OMAN | |
| Pakistan | PAKISTAN | 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. |
| Panama | PANAMA | |



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| Country/Region | Short name | Definition |
|---|---|---|
| Paraguay | PARAGUAY | |
| Peru | PERU | |
| Philippines | PHILIPPINE | |
| Poland | POLAND | |
| Portugal | PORTUGAL | Includes the Azores and Madeira. |
| Qatar | QATAR | |
| Romania | ROMANIA | |
| Russian Federation | RUSSIA | Data for Russia are available starting in 1990. Prior to that, they are included in Former Soviet Union. |
| Rwanda | RWANDA | |
| Saudi Arabia | SAUDIARABI | |
| Senegal | SENEGAL | |
| Serbia | SERBIA | Data for Serbia are available starting in 1990. Prior to that, they are included in Former Yugoslavia. Serbia includes Montenegro until 2004 and Kosovo until 1999. |
| 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. Prior to that, they are included within Former Yugoslavia. |
| 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.<br>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. |
| South Sudan | SSUDAN | Data for South Sudan are available from 2012. Prior to 2012, they are included in Sudan. |
| Spain | SPAIN | Includes the Canary Islands. |
| Sri Lanka | SRILANKA | |
| Sudan | SUDAN | South Sudan became an independent country on 9 July 2011. From 2012, data for South Sudan are reported separately. |
| Suriname | SURINAME | Data for Suriname are available starting in 2000. Prior to that, they are included in Other Non-OECD Americas. |



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| Country/Region | Short name | Definition |
|---|---|---|
| Sweden | SWEDEN | |
| Switzerland | SWITLAND | Includes Liechtenstein for the oil data. Data for other fuels do not include Liechtenstein. |
| Syrian Arab Republic | SYRIA | |
| Chinese Taipei | TAIPEI | |
| Tajikistan | TAJIKISTAN | Data for Tajikistan are available starting in 1990. Prior to that, they are included in Former Soviet Union. |
| United Republic of Tanzania | TANZANIA | Oil data are reported on a fiscal year basis, beginning on the 1 July Y and ending on the 30 June Y+1. |
| 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. |
| Togo | TOGO | |
| Trinidad and Tobago | TRINIDAD | |
| Tunisia | TUNISIA | |
| Republic of Türkiye | TURKEY | |
| Turkmenistan | TURKMENIST | Data for Turkmenistan are available starting in 1990. Prior to that, they are included in Former Soviet Union. |
| Uganda | UGANDA | |
| Ukraine | UKRAINE | Data for Ukraine are available starting in 1990. Prior to that, they are included in Former Soviet Union.<br>Ukraine is currently an IEA Association country, therefore it is included in the IEA and Accession/Association countries aggregate (IEA Family), for data starting in 1990 and for the entire time series. |
| United Arab Emirates | UAE | |
| 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.<br>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.<br>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 |



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| Country/Region | Short name | Definition |
|---|---|---|
| | | generally excludes all territories, and all trade between the U.S. and its territories. Oil statistics include Guam, Puerto Rico[6] and the United States Virgin Islands; trade statistics for coal include international trade to and from Puerto Rico and the United States Virgin Islands. Starting with 2017 data, inputs to and outputs from electricity and heat generation include Puerto Rico. |
| Uruguay | URUGUAY | |
| Uzbekistan | UZBEKISTAN | Data for Uzbekistan are available starting in 1990. Prior to that, they are included in Former Soviet Union. |
| Bolivarian Republic of Venezuela | VENEZUELA | |
| Viet Nam | VIETNAM | |
| Yemen | YEMEN | |
| Zambia | ZAMBIA | |
| Zimbabwe | ZIMBABWE | |
| Former Soviet Union (if no detail) | FSUND | Before 1990, includes Armenia; Azerbaijan; Belarus; Estonia; Georgia; Kazakhstan; Kyrgyzstan; Latvia; Lithuania; Republic of Moldova; Russian Federation; Tajikistan; Turkmenistan; Ukraine and Uzbekistan. |
| Former Yugoslavia (if no detail) | YUGOND | Before 1990, includes Bosnia and Herzegovina; Croatia; Republic of North Macedonia (North Macedonia); Kosovo; Montenegro; Slovenia; and Serbia. |
| Other Africa | OTHERAFRIC | Includes Burkina Faso; Burundi; Cape Verde; Central African Republic; Chad; Comoros; Djibouti; Gambia; Guinea; Guinea-Bissau; Lesotho; Liberia; Malawi; Mali; Mauritania; Namibia (until 1990); Réunion (until 2010); Sao Tome and Principe; Seychelles; Sierra Leone; and Somalia. |
| Other non-OECD Americas | OTHERLATIN | Includes Anguilla, Antigua and Barbuda; Aruba; Bahamas; Barbados; Belize; Bermuda; Bonaire; British Virgin Islands; Cayman Islands; Dominica; Falkland Islands (Malvinas); French Guiana (until 2010); Grenada; Guadeloupe (until 2010); Martinique (until 2010); Montserrat; Puerto Rico[7] (for natural gas); Saba (from 2012); Saint Eustatius (from 2012); Saint Kitts and Nevis; Saint Lucia; Saint Pierre and Miquelon; Saint Vincent and the Grenadines; Sint Maarten (from 2012); Suriname (until 1999); and the Turks and Caicos Islands. |

[6] 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.

[7] Oil statistics as well as coal trade statistics for Puerto Rico are included under the United States. Inputs to and outputs from electricity and heat generation up to 2016, and natural gas data for the entire time series are included under Other non-OECD Americas.



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| Country/Region | Short name | Definition |
|---|---|---|
| Other non-OECD Asia | OTHERASIA | Includes Afghanistan; Bhutan; Cambodia (until 1994); Cook Islands; East Timor; Fiji; French Polynesia; Kiribati; Lao People's Democratic Republic (until 1999); Macau, China; Maldives; Mongolia (until 1984); New Caledonia; Palau (from 1994); Papua New Guinea; Samoa; Solomon Islands; Tonga and Vanuatu. |
| Memo: Africa (UN) | UNAFRICA | Includes Algeria; Angola; Benin; Botswana; Burkina Faso; Burundi; Cabo Verde; Cameroon; Central African Republic; Chad; Comoros; the Republic of the Congo (Congo); Côte d'Ivoire; the Democratic Republic of the Congo; Djibouti; Egypt; Equatorial Guinea; Eritrea; the Kingdom of Eswatini; Ethiopia; Gabon; Gambia; Ghana; Guinea; Guinea-Bissau; Kenya; Lesotho; Liberia; Libya; Madagascar; Malawi; Mali; Mauritania; Mauritius; Morocco; Mozambique; Namibia; Niger; Nigeria; Réunion (until 2010); Rwanda; Sao Tome and Principe; Senegal; the Seychelles; Sierra Leone; Somalia; South Africa; South Sudan (from 2012), Sudan; the United Republic of Tanzania (Tanzania); Togo; Tunisia; Uganda; Zambia; Zimbabwe.<br>Note that Memo: Africa (UN) is identical to Africa. |
| Memo: Americas (UN) | UNAMERICAS | Includes Antigua and Barbuda; Argentina; Aruba; the Bahamas; Barbados; Belize; Bermuda; the Plurinational State of Bolivia (Bolivia); Bonaire (from 2012); the British Virgin Islands; Brazil; Canada; the Cayman Islands; Chile; Colombia; Costa Rica; Cuba; Curaçao[8]; Dominica; the Dominican Republic; Ecuador; El Salvador; the Falkland Islands (Malvinas); Guatemala; French Guiana (until 2010); Grenada; Guadeloupe (until 2010); Guyana; Haiti; Honduras; Jamaica; Martinique (until 2010); Mexico; Montserrat; Nicaragua; Panama; Paraguay; Peru; Puerto Rico (for natural gas)[9]; Saba (from 2012); Saint Kitts and Nevis; Saint Lucia; Saint Pierre and Miquelon; Saint Vincent and the Grenadines; Sint Eustatius (from 2012); Sint Maarten (from 2012); Suriname; Trinidad and Tobago; the Turks and Caicos Islands; the United States; Uruguay; the Bolivarian Republic of Venezuela (Venezuela). |

[8] The Netherlands Antilles was dissolved on 10 October 2010 resulting in two new "constituent countries" (Curaçao and Sint Maarten) with the other islands joining The Netherlands as "special municipalities'. However, due to lack of detailed data the IEA Secretariat's data and estimates under the "Netherlands Antilles" still refer to the whole territory of the Netherlands Antilles as it was known prior to 10 October 2010 up to the end of 2011. Data refer only to the island of Curaçao from 2012. The other islands of the former Netherlands Antilles are added to Other non-OECD Americas from 2012.

[9] Oil statistics as well as coal trade statistics for Puerto Rico are included under the United States. Inputs to and outputs from electricity and heat generation up to 2016, and natural gas data for the entire time series are included under Other non-OECD Americas.



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| Country/Region | Short name | Definition |
|---|---|---|
| Memo: Asia (UN) | UNASIA | Data for Asia (UN) are available from 1990. Includes Afghanistan; Armenia; Azerbaijan; Bahrain; Bangladesh; Bhutan; Brunei Darussalam; Cambodia; the People's Republic of China; Cyprus[10]; Georgia; Hong Kong, China; India; Indonesia; the Islamic Republic of Iran; Iraq; Israel[11]; Japan; Jordan; the Democratic People's Republic of Korea; Korea; Kazakhstan; Kuwait; Kyrgyzstan; Lao People's Democratic Republic; Lebanon; Macau, China; Malaysia; the Maldives; Mongolia; Myanmar; Nepal; Oman; Pakistan; the Philippines; Qatar; Saudi Arabia; Singapore; Sri Lanka; the Syrian Arab Republic; Tajikistan; Chinese Taipei; Thailand; Timor-Leste; the Republic of Türkiye; Turkmenistan; the United Arab Emirates; Uzbekistan; Viet Nam; and Yemen. |
| Memo: Europe (UN) | UNEUROPE | Data for Europe (UN) are available from 1990. Includes Albania; Austria; Belarus; Belgium; Bosnia and Herzegovina; Bulgaria; Croatia; the Czech Republic; Denmark; Estonia; Finland; the Republic of North Macedonia (North Macedonia); France; Germany; Gibraltar; Greece; Hungary; Iceland; Ireland; Italy; Kosovo[12]; Latvia; Lithuania; Luxembourg; Malta; the Republic of Moldova (Moldova); Montenegro; the Netherlands; Norway; Poland; Portugal; Romania; the Russian Federation; Serbia[13]; the Slovak Republic; Slovenia; Spain; Sweden; Switzerland; Ukraine; the United Kingdom. |
| Memo: Oceania (UN) | UNOCEANIA | Includes Australia; New Zealand; Cook Islands; Fiji; French Polynesia; Kiribati; New Caledonia; Palau; Papua New Guinea; Samoa; the Solomon Islands; Tonga; Vanuatu. |
| 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; the Republic of Türkiye; the United Kingdom and the United States. Estonia, Latvia, Lithuania and Slovenia are included starting in 1990. Prior to 1990, data for Estonia, Latvia and Lithuania are included in Former Soviet Union and data for Slovenia in Former Yugoslavia. |
| Memo: Non-OECD Total | NOECDTOT | Includes Africa; Asia (excluding China); China (P.R. of China and Hong Kong, China); Non-OECD Americas; Middle East and Non-OECD Europe and Eurasia. |
| 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; |

[10] Refer to the country note for Cyprus earlier in this section.
[11] Refer to the country note for Israel earlier in this section.
[12] This designation is without prejudice to positions on status, and is in line with United Nations Security Council Resolution 1244/99 and the Advisory Opinion of the International Court of Justice on Kosovo's declaration of independence.
[13] Serbia includes Montenegro until 2004 and Kosovo until 1999.



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| Country/Region | Short name | Definition |
|---|---|---|
| | | Portugal; the Slovak Republic; Spain; Sweden; Switzerland; the Republic of Türkiye; the United Kingdom and the United States.<br>Estonia is included starting in 1990. Prior to 1990, data for Estonia are included in Former Soviet Union.<br>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, Luxembourg, Mexico, the Netherlands, New Zealand, Norway, Poland, Portugal, the Slovak Republic, Spain, Sweden, Switzerland, the Republic of Türkiye, the United Kingdom and the United States; Accession countries: Chile, Colombia, Israel and Lithuania; Association countries: Argentina, Brazil, the People's Republic of China, Egypt, India, Indonesia, Morocco, Singapore, South Africa, Thailand, and Ukraine. |
| Memo: European Union – 27 | EU27_2020 | Includes Austria; Belgium; Bulgaria; Croatia; Cyprus[14]; 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.<br>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: European Union – 28 | EU28 | Refers to the EU27 with the addition of the United Kingdom. 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[15].<br>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: FSU 15 | MFSU15 | Includes the Former Soviet Union with all 15 countries for all years |
| Memo: Former Yugoslavia | MYUGO | Includes Former Yugoslavia (if no detail); Bosnia and Herzegovina; Croatia; the Republic of North Macedonia (North Macedonia); Kosovo; Montenegro; Slovenia and Serbia |
| Memo: OPEC | OPEC | Includes Algeria; Angola; Republic of the Congo; Equatorial Guinea; Gabon; the Islamic Republic of Iran; Iraq; Kuwait; |

[14] Refer to the country note for Cyprus earlier in this section.
[15] 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.



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| Country/Region | Short name | Definition |
|---|---|---|
| | | Libya; Nigeria; Saudi Arabia; the United Arab Emirates; the Bolivarian Republic of Venezuela (Venezuela). [16] |
| Memo: ASEAN | MASEAN | Data start in 2000. Includes: Brunei; Cambodia; Indonesia; Lao People's Democratic Republic; Malaysia; Myanmar; Philippines; Singapore; Thailand; and Viet Nam. |
| Memo: G7 | MG7 | Includes Canada, France, Germany, Italy, Japan, United Kingdom and United States. |
| Memo: G8 | MG8 | Includes Canada, France, Germany, Italy, Japan, Russian Federation, United Kingdom and United States. |
| Memo: G20 | MG20 | Includes Argentina, Australia, Brazil, Canada, China (P.R. of China and Hong Kong, China), India, Indonesia, Japan, Korea, Mexico, Russian Federation, Saudi Arabia, South Africa, the Republic of Türkiye, United States and European Union – 28. |

Please note that the following countries and territories have not been considered:

- **Non-OECD Europe and Eurasia**: Andorra; Faroe Islands (after 1990); Liechtenstein (except for oil data)[17]; the Palestinian Authority; Svalbard; Jan Mayen Islands;
- **Africa:** British Indian Ocean Territory; French Southern and Antarctic Lands; Mayotte; Saint Helena; Western Sahara;
- **Non-OECD Americas**: Bouvet Island; Saint Barthélemy; Greenland (after 1990); Saint Martin (French Part); South Georgia and the South Sandwich Islands;
- Antarctica;
- **Non-OECD Asia excluding China:** American Samoa; Cocos (Keeling) Islands; Christmas Island; Heard Island and McDonald Islands; Marshall Islands; Micronesia (Federated States of); Nauru; Niue; Norfolk Island; Northern Mariana Islands; Pitcairn; Tokelau; Tuvalu; United States Minor Outlying Islands; Wallis and Futuna Islands.

[16] The OPEC aggregate is calculated based on the constant composition of countries listed here where 2020 is the reference year, regardless of their year of accession to the organisation.
[17] Oil data for Liechtenstein are included under Switzerland.



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## 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. |
| Bangladesh | BANGLADESH | Data are reported on a fiscal year basis. By convention data for the fiscal year that starts on 1 July Y-1 and ends on 30 June Y are labelled as year Y. |
| Egypt | EGYPT | Data are reported on a fiscal year basis. By convention, data for the fiscal year that starts on 1 July Y and ends on 30 June Y+1 are labelled as year Y. |
| Ethiopia | ETHIOPIA | Data are reported on a fiscal year basis. By convention, data for the fiscal year that starts on 1 July Y and ends on 30 June Y+1 are labelled as year Y. |
| India | INDIA | Data are reported on a fiscal year basis. By convention, data for the fiscal year that starts on 1 April Y and ends on 31 March Y+1 are labelled as year Y. This convention is different from the one used by Government of India, whereby fiscal year starts on 1 April Y and ends on 31 March Y+1 are labelled as year Y+1. |
| Islamic Republic of Iran | IRAN | Data are reported according to the Iranian calendar year. By convention data for the year that starts on 20 March Y and ends on 19 March Y+1 are labelled as year Y. |
| Japan | JAPAN | Starting 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. |
| Myanmar | MYANMAR | Data are reported on a fiscal year basis. By convention data for the fiscal year that starts on 1 April Y and ends on 31 March Y+1 are labelled as year Y. |
| Namibia | NAMIBIA | Electricity data are reported on a fiscal year basis. By convention data for the fiscal year that starts on 1 July Y and ends on 31 June Y+1 are labelled as year Y. |
| Nepal | NEPAL | Data are reported on a fiscal year basis. By convention data for the fiscal year that starts on 1 July Y and ends on 30 June Y+1 are labelled as year Y. |
| Pakistan | PAKISTAN | Data are reported on a fiscal year basis. By convention data for the fiscal year that starts on 1 July Y and ends on 30 June 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. |



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| Country/Region | Short name | Definition |
|---|---|---|
| United Republic of Tanzania | TANZANIA | Oil data are reported on a fiscal year basis, beginning on 1 July Y and ending on 30 June Y+1. |



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# Country notes and sources

# OECD countries

## General notes

The notes given in this document refer to data for the years 1960 to 2021 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). Energy data reported for 2021 (shown as 2021E) in the final release are provisional supply and demand data based on submissions received in early 2022 and on monthly submissions to the IEA from member countries.

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

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

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

In 1996, the IEA Secretariat extensively revised data on coal and coke use in blast furnaces, and in the iron and steel industry (for those countries with blast



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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.



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# 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.



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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



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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.



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# 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



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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.



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### 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



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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 2021 preliminary data, there are no more exports reported due to a change in methodology to eliminate the reporting of transit trade.

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 hydrodesulphurization in refineries.



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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.



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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.



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# 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*



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*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.



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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*.



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# 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.



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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.



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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 2021 preliminary data, there is no longer *Exports* reported due to a change in methodology to eliminate the reporting of transit trade.

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



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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 *Energieversongung 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%.



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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

For 2021p, electricity consumption in the *Energy sector* may include some transformation inputs to **pumped hydro**. The Austrian Administration hope to revise this in the upcoming cycle.

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.



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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.



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# 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



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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.



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# 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



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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.



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### 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.



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### 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

For 2021p, *transmission and distribution losses* of **heat** show a break in-series compared to 2020 values due to the implementation of a new methodology. Historical revisions are pending.

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.



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## 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 from2010.

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.



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## Consumption

For 2021p, the trend in heat consumption over 2020 is distorted somewhat due to the use of a new methodology used for *transmission and distribution losses* of **heat** in 2021 only. Historical revisions are pending.

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.



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# Canada

## Source

Natural Resources Canada, Ottawa.

## General notes

In the 2018 edition, data for Canada were revised back to 2005 following a ten year revision of the Report on Energy Supply and Demand (RESD), the main set of Canadian annual data. The revision 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 (RESD), 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 (RESD), significant statistical differences can be observed



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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.



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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.



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## 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.



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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.



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# 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



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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.



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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 (RESD). In particular, revisions were made on the inputs and outputs of power plants fuelled by combustible fuels and on the breakdown of final electricity consumption, resulting in possible breaks in time series.

### Supply

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

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

For 2017 onwards, fluctuations in electricity output from **nuclear** occur in part due to reactor refurbishment works. Staggered mainteance across various reactors is scheduled for Darlington (2017-2027) and Bruce (2020-2034) power generation stations.

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.



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**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.



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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.



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# 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.



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# 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 trans-formation* 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**.



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### 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.



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**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



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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.



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# Colombia

## Sources

### Sources for 2019 onwards:

Ministry of Mines and Energy, Bogota.

### Sources 1992 to 2018:

*Energy-Economic Information System (SIEE),* Latin American Energy Organization (OLADE), Quito, accessed April 2020: http://sier.olade.org/.

Online statistics, Unidad de Planeación Minero Energética (UPME) Ministerio de Minas y Energía, Bogotá, various editions up to 2018.

Direct communication with the Ministry of Mines and Energy, Energy Information Department, Bogotá.

*Statistics 1996-2018*, Sistema de Información Eléctrico Colombiano, Ministry of Mines and Energy, Bogotá, online statistics, various editions up to 2018.

*Sistema de Información de Petróleo y Gas Colombiano*, Ministry of Mines and Energy, Bogotá, online statistics, various editions up to 2016.

*Informe de Sostenibilidad* 2018, Refinería de Cartagena S.A.S.

*Información de mercado,* IncoAsfalto, Cundinamarca, acessed in May 2020: http://www.incoasfaltos.com/

*Resultados Trimestrales*, Ecopetrol, Bogotá, accessed in April 2020: https://www.ecopetrol.com.co.

*Informe Estadístico Petrolero*, Asociación Colombiana del Petróleo (ACP), Bogotá, accessed in April 2020: https://acp.com.co/.

IEA Secretariat estimates.

### Sources up to 1991:

*Boletin Minero-Energético,* Ministerio de Minas y Energía, Bogotá, December 1991.

*Estadísticas Minero-Energéticas 1940-1990,* Ministerio de Minas y Energía, Bogotá, 1990.



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*Estadísticas Básicas del Sector Carbón,* Carbocol, Oficina de Planeación, Bogotá, various editions from 1980 to 1988.

*Colombia Estadística 1985,* DANE, Bogotá, 1970 to 1983 and 1987.

*Informe Anual,* Empresa Colombiana de Petróleos, Bogotá, 1979, 1980, 1981 and 1985.

Estadísticas de la Industria Petrolera Colombiana Bogotá 1979-1984, Empresa Colombiana de Petróleos, Bogotá, 1985.

*Informe Estadístico Sector Eléctrico Colombiano*, Government of Colombia, Bogotá, 1987 and 1988.

*La Electrificación en Colombia 1984-1985,* Instituto Colombiano de Energía Eléctrica, Bogotá, 1986.

*Balances Energéticos 1975-1986,* Ministerio de Minas y Energía, Bogotá, 1987.

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

### 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



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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 2022 edition, 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.



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### Supply

In the 2022 edition, the Colombian administration reported stock changes in 2021p for several oil products.

The stock change of crude oil in 2020 and 2021p 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.



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# 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.



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# 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 net-to-gross ratio for each year. Revisions are pending.

## Transformation

Prior to 2016, inputs of **residual fuel oil** and **non-bio 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.



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# 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.

The use of **gas works gas** ceased in 2020.

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.



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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.



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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.



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### 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.



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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.



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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.



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**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.



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# Denmark

## Source

Danish Energy Agency, Copenhagen.

## General notes

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

## 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.



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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.



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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.



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# 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



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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.



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# 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.



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# 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.



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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.



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## 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.



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# Finland

## Source

Statistics Finland, Helsinki.

## General notes

In 2014, a new survey system and a reclassification of the data lead to breaks in the time series between 1999 and 2000 for most products and sectors. The new survey system is more detailed and has better product coverage, especially in electricity, CHP and heat production, as well as in industry.

## 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**.



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## 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).



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# 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.

## Supply

In 2021p, refinery output declined due to a 12-week maintenance outage.

## 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.



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# 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.



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### 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.

In the 2022 final edition, the administration changed the methodology to estimate **primary solid biofuels** trade data for 2021p. For this reason, a break in the time series appears between 2020 and 2021p. In future editions, the administration will revise historical data.

### 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.



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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.



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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.



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# 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, chamical 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



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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** furn**a**ce **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.**

## Supply

For the year 2021E the production of **coke oven coke** has been merged with stock change due to confidentiallity reasons.

## 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.



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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.



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## 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*.



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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.



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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.



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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.



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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.



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

There was 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



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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.



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# Germany

## Source

Federal Ministry for Economic Affairs and Energy, Berlin.

## General notes

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

## 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



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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.



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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.



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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 *Mineröl*wirtschaftsverband.

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.



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### 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.



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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 Bundesrepublic für das Jahr* 1990 provided by the German Institute for Economic Research.



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## 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**.



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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.



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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.



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# 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.



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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 $C_2/C_4$ 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*.



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# 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.



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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.



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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.



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# Hungary

## Source

Hungarian Energy and Public Utility Regulatory Authority, Budapest.

## General notes

Data are available starting in 1965.

The Hungarian administration submitted questionnaires to the IEA Secretariat for the first time with 1993 data.

## 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.



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### 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.



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# 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

In 2021 preliminary data, there are no more *Exports* reported due to a change in methodology to eliminate the reporting of transit trade.

*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)*.



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# 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.



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*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.



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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.



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# 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.



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# 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 Admistration revised data back to 2007 due to improved methodologies.



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## 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 2017onwards 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.



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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.



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# 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 methology 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.



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## 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 anthracire 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.



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# 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.



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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



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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.



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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.



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## 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.



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# 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.



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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,



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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.



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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.



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# 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.



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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.



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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

Due to the unavailability of data at the time of reporting, some sectoral 2021p data are reported combined with other sectors, which may result in breaks in time series.

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

### Supply

In 2021, Exports increased substantially due to the TAP pipeline beginning operations.

### 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.



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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.



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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



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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.



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# 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.



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## 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.



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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.



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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.



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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



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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



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**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.



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# 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.



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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.



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# Natural gas

## Supply

Since 2013, *receipts from other sources – oil is estimated using the histrorical 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**.



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# 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 Wolseong nuclear power plants in June 2017 and June 2018 respectively.

For 2018, the increase in heat production from **natural gas** was in part due to the commencement and expansion of operations at two CHP plants (Hwaseong Dongtan and Anyang).

For 2017, the decrease in electricity production from **residual fuel oil** is due to the closure of two main activity producer plants.

Some discrepancies exist between data reported for **residual fuel oil** in the oil databases and the electricity and heat databases. The Korean administration hopes to remedy this situation in a coming cycle.

Prior to 2009, autoproducer **heat** production includes amounts of unsold heat.



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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.



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# 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.



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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.



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### 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.



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# 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.



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# 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.



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# 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.



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### 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.



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# 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**.



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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.



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# 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.



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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.



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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 Minatitlan 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 majeur 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



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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.



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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.



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### 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 2021p, all data have been estimated by the IEA Secretariat based on monthly/quarterly submissions and publically available data sources.

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.



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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.



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# 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 $CO_2$ 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.



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## 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.



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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.



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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 Trad-ing 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.



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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.



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# 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 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.



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## 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.



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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 andforestry* is due to expansion of greenhouse farming.



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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.



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# 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.



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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.



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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**.



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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

The increase in the consumption of **motor gasoline** and **gas/diesel oil** in the residential sector in 2021p is due to a methodological change by the New Zealander administration. These quantities now include these oil products purchased at service stations but used for recreational marine purposes.

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.



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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.



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### 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.



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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.



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# 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



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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.



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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.



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# 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.



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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

In the 2022 edition, **charcoal** consumption data appears in residential for 2021p for the first time. Historical data will be revised in the next edition.

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.



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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

In September 2020, a fire occured at a **natural gas**-fired power plant. As a result, lower electricity output from natural gas was observed in 2021 and early 2022.

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



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**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 c*hemical (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.



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# 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.



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### 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.



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### 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

Sharp decline in *Exports* with 2021 preliminary data is due to a change in methodology.

*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.



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### 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.



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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.



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## 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.



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# 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.



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### 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**.



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### 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.



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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.



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# 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.



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# 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.



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### 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.



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# 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 autoproducter 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**.



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## 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.



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# 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.



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### 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 petrochemcal* 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.



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# 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 g**eothermal 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.



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# 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.



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### 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 Activy 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.



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# 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.

In 2021 preliminary data, *Exports* increased due to gas market evolution and more countries looking to other markets to diversify.

## 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.



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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**.



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### 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.



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**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



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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).



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# 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.



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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.



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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.



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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.



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### 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 2021p, **electricity** and **heat** production data, are based on surveys which do not have the same coverage as the annual survey. Therefore data are provisional and subject to revision. In particular, due to this difference in coverage, the distribution of output across combustible fuels shows breaks in-series compared with data for previous years.

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**.



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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.



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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 lead 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.



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# 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*.



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### 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.



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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 $CO_2$ 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.



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Due to a new program launched in September 2014 in which $CO_2$ 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

For 2021, the decrease in electricity output from **nuclear** was mainly due to maintenance works at the Leibstadt power plant.

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



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**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*.



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**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.



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# 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**.



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### 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 throughout 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.



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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.



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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*.



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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.



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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*.



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Comprehensive data on electricity consumption are available from 1973. This causes a break in the time series between 1972 and 1973.



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# 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.



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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.



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**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.



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## 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.



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*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.



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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.



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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 2021, the decrease in electricity output from **nuclear** was due to a high number of outages, and the commencement of defuelling at Dungeness B.

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.



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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 bu 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.



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# 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**.



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**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



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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.



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### 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 EIAIn 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.



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## 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.



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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.

In the 2022 edition, **bio jet kerosene** appears for the first time for the year 2021p. The values will be subject to revisions in future editions.

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,



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**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.



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## 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



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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.



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## 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*.



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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.



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# 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.

Energy data reported for 2021 (shown as 2021p) in the final release are provisional supply data based on submissions received in early 2022 from selected countries and on a set of secondary sources, as well as IEA Secretariat estimates.



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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 the only source of information for time series of the countries not listed individually and included in the regions Other Africa, Other non-OECD Americas and Other non-OECD Asia. It was also used in a number of other countries as a complementary data source.

Energy Sub-Saharan Africa is a 4-year (2019-2023) EU-INTPA funded programme aimed to create sustainable and inclusive economic growth in selected sub-Saharan African countries through energy sector transitions towards low-carbon and climate-resilient energy systems based in renewable energy, while delivering universal and affordable energy access. This will be achieved by helping the selected sub-Saharan African countries to develop enhanced energy statistics and energy modelling capabilities, to improve tracking against energy-related NDCs, SDGs, and other policy goals, as well as long-term energy planning. The ten countries that have adhered to the programme are Benin, Democratic Republic of the Congo, Ethiopia, Ghana, Kenya, Nigeria, Rwanda, Senegal, Uganda and Zambia.



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# 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.

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# Algeria

## General notes

Data for Algeria 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.

In the 2021 edition, newly available information lead to the report of the split between international marine bunkers and domestic navigation for the first time.

In the 2021 edition, new use of official data on final consumption of natural gas led to revisions in the breakdown by detailed industries between 2014 and 2018. This may cause breaks in time series between 2013 and 2014.

In 2018 Sonatrach, the national oil and gas company, acquired a refinery in Italy. Crude oil input and refined oil products output, such as gas oil and gasoline, from this facility may be included in Algeria's national production for 2018 and the first half of 2019. This activity stopped for the second semester of 2019.

In the 2015 edition, revisions were made to the energy balances in 2009 and 2010 which add more detail for certain products and flows. This may result in breaks in time series between 2008 and 2009.

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# Angola

## General notes

Data for Angola 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.

The natural gas export terminal Soyo, which began operations in 2013 and halted them in 2014, re-opened in 2016. Breaks in time series in natural gas export, supply, and consumption can be observed between 2013 and 2017.

In the 2022 edition, 2018 natural gas data were revised based on revisions to data provided by Cedigaz.

In the 2021 edition, natural gas input to main activity producer electricity plants was added from 2017-2019 to account for the operations of the Soyo Combined Cycle thermal power plant. Consequently, all electricity flows have also been revised over this period.

In the 2021 edition, several data points were revised to better reflect data published by Sonangol. They include: crude oil refinery input (2018), imports of LPG, jet kerosene, other kerosene, motor gasoline, and gas/diesel oil (2016-2018), exports of jet kerosene and motor gasoline (2018), and jet kerosene consumption (2018). Gas/diesel oil input to main activity electricity plants (2016-2018) and fuel oil production and international marine bunkers (2018) were also affected by these revisions.

In the 2021 edition, 2018 hydroelectricity production was revised based on revisions to data provided by the International Renewable Energy Agency (IRENA).

In the 2019 edition, revisions to biofuels and waste data are due to revisions in population data for Angola.

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# 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.



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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.

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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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Prior to 2014: *Forestry Statistics,* Food and Agriculture Organisation (FAO), Rome, IEA Secretariat estimates.



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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 $CO_2$ 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.

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Joint IEA/Eurostat/UNECE annual energy questionnaires on renewables, 2000-2020.

Before 2000: IEA Secretariat estimates.



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# Bahrain

## General notes

Data for Bahrain are available starting in 1971.

Crude oil production includes half the production from the Abu Sa'fah field, which is shared with Saudi Arabia.

Consumption of natural gas for autoproducer power generation may include quantities used for non-power generation purposes.

In the 2021 edition, crude oil imports and exports data from 2001 onwards were revised as new information became available from National Oil and Gas Authority of Bahrain (NOGA). This may create a break in time series between 2000 and 2001.

In the 2021 edition, the following products and flows were revised as new information became available from National Oil and Gas Authority of Bahrain (NOGA): natural gas industrial consumption data from 2012 onwards; gas/diesel oil international marine bunker consumption from 2010 onwards; fuel oil international marine bunker consumption from 1971 onwards; residential and commercial and public services consumption of other kerosene from 2017 onwards; production of jet kerosene from 2017 onwards; and imports and non-energy use consumption of bitumen from 2014 onwards.

In the 2021 edition, stock changes for fuel oil were revised based on JODI data from 2005 onwards.

In the 2021 edition, conversion factors (barrels/tonne) for all oil products were revised as new information was provided by NOGA. This led to the revision of oil products data for the entire time series.

In the 2020 edition, stock changes for LPG, motor gasoline and kerosene type jet fuel were revised based on JODI data from 2009 onwards. New information from Bahrain Open Data Portal led to the revision of exports of fuel oil from 2006 to 2015. Natural gas stock changes from 2005 onwards were revised due to the clarification on the definition of published data by Central Informatics Organization.

In the 2019 edition, historical revisions in bitumen transfer data from 1988 onwards have been made.



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In the 2017 edition, historical revisions in LPG, naphtha and refinery gas data from 2011 are consistent with official report from Bahrain National Gas Company. Breaks in time series are observed in 2011 for LPG exports.

In the 2014 edition, estimations of the use of petroleum coke in the manufacture of aluminium have been made to track this consumption from 2000 onwards. This may lead to breaks in time series between 1999 and 2000.

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# Bangladesh

## General notes

Data for Bangladesh are available starting in 1971.

Data are reported on a fiscal year basis. Data for 2020 correspond to 1 July 2019 – 30 June 2020.

Official data on electricity production provide net generation. The own use is estimated by the IEA Secretariat at 6% of the net electricity generation from 2008 onwards.

From 2000 onwards, due to the lack of official information, by convention, the fuelwood domestic usage is equally split between transformation and final consumption.

In the 2021 edition, electricity final consumption data were revised as new information from Bangladesh Bureau of Statistics became available.

In the 2021 edition, production and residential consumption of primary solid biofuels including fuelwood, bagasse, vegetal materials and residues, animal waste and charcoal were revised from 2000 onwards using data from the World Health Organisation on reliance on biomass for cooking.

In the 2020 edition, times series for electricity imports were revised from 2014 to 2017 based on new data retrieved from the Bangladesh Power Development Board. Breaks in time series may occur between 2013 and 2014.

In the 2014 edition, petroleum products time series were revised from 2004 to 2012 based on new data retrieved from the Bangladesh Petroleum Corporation and the Eastern Refinery Limited. This may result in breaks in time series between 2004 and 2005 for primary and secondary oil products.

In the 2013 edition, electricity time series were revised from 2008 to 2011 based on data retrieved from the Bangladesh Power Development Board. This may result in breaks in time series between 2007 and 2008.



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# 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.



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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.

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IEA Secretariat estimates.



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# Benin

## General notes

Data for Benin are available starting in 1971.

Benin is one of the ten countries that benefit from EU Support to IEA Data for Affordable and Sustainable Energy System for Sub-Saharan Africa.

In the 2020 edition, times series were revised from 2011 to 2014 based on new data received from the Ministry of Energy, Water, and Mines. Breaks in time series may occur between 2010 and 2011.

In the 2019 edition, times series were revised from 2015 to 2017 based on new data received from the Ministry of Energy, Water, and Mines. Breaks in time series may occur between 2014 and 2015.

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IEA Secretariat estimates.



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# Bolivia

## General notes

Data for Bolivia are available starting in 1971.

Blending of ethanol in gasoline started in 2018. Additives are also imported, with imported quantities included in gasoline data.

Data on distribution losses of crude oil and oil products includes unexpected positive or negative quantity variations in refineries, pipelines and tanks that are not captured by the oil industry storage system measured in stock changes.

National authorities currently publish charcoal, fuel wood and bagasse data combined in a single aggregate, using projections given the lack of detailed information. This data can be revised in the future as the national authorities develop their statistical system further.

The efficiency of natural gas based electricity generation has been continuously increasing since 2011, in turn decreasing the gas grid emission factor. According to information provided by Ministerio de Hidrocarburos, this is due to major actions that are being deployed in Bolivia in order to upgrade existing natural gas power plants to combined cycle.

In the 2022 edition, new information provided by Ministerio de Hidrocarburos led to important revisions in NGL, White Spirit, Fuel Oil and Other Non-Specified Oil products between 2006 and 2020. The IEA Secretariat now considers Gasolina Blanca Estabilizada and Gasolina Rica en Isopentanos as NGL, and these products are reported as refinery intake. Crudo Reconstituido, a residual refinery output, is now reported in Other Non-Specified Oil Products. Gasolina Blanca (Refinery White Spirit) volumes do not appear in IEA Secretariat data as they are already reported in Motor Gasoline. Finally, the only transfer currently reported is from NGL to LPG.

In the 2022 edition, new information from Ministerio de Hidrocarburos led to revisions between 2000 and 2019. This may lead to breaks in time series of oil, natural gas and electricity between 1999 and 2000.

In the 2022 edition, new information on the split of natural gas input to main activity and to autoproducer electricity plants became available since year 2000, leading to revisions between 2000 and 2019.



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In the 2022 edition, new information became available for Refinery gas production, own use in oil refineries and losses, leading to revisions between 2000 and 2019. More detailed data in energy balances provided by Ministerio de Hidrocarburos led to revisions in jet kerosene consumption split between international and domestic aviation.

In the 2022 edition, revisions to bagasse consumption in the Industry sector from Ministerio de Hidrocarburos led to revised IEA estimations for bagasse production in 2000-2019 time series.

In the 2021 edition, revisions to conversion factors of motor gasoline led to revised total final consumption data between 2006 and 2018. Solid biofuels data was also revised between 2014 and 2018. Communication with Ministerio de Hidrocarburos also led to revisions to liquid biofuels data, with ethanol data available from 2018 onwards. Refinery gas data is estimated by the IEA secretariat from 2011 onwards, due to lack of national statistics available on refinery production and use of such gases.

In the 2020 edition, new information from Ministerio de Hidrocarburos, Instituto Nacional de Estadistica and Autoridad de Fiscalizacion y Control Social de Electricidad led to revisions between 2006 and 2017. This may lead to breaks in time series of oil, natural gas and electricity between 2005 and 2006.

In the 2020 edition, anthracite imports data also became available since 2000.

In the 2020 edition, time series for solid biofuels were revised from 2000 to 2017 due to new information from Ministerio de Hidrocarburos, Autoridad de Fiscalizacion y Control Social de Electricidad and Food and Agriculture Organisation (FAO). Data is partially estimated by the IEA Secretariat. This may lead to breaks in the series between 1999 and 2000.

In the 2020 edition, new information on the split between independent power producers and autoproducers became available since 2015, leading to revisions to autoproducer electricity generation and inputs to power generation.

Data for international aviation bunkers are estimated by the IEA Secretariat. New information available in 2019 led to revisions of the data for 2005-2017 that may lead to breaks in time series between 2004 and 2005.



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IEA Secretariat estimates.



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# 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.



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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.

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# Botswana

## General note

Data for Botswana are available starting in 1971.

In the 2022 edition, 2018 and 2019 aviation gasoline and non-bio jet kerosene flows were revised based on data provided by the Botswana Department of Energy, Ministry of Minerals, Energy and Water Resources. Furthermore, other bituminous coal exports (2017-2019) and production (2018) were revised to align with data published by Statistics Botswana.

In the 2021 edition, motor gasoline imports and road consumption were revised from 1971-1980 to reflect trends in vehicle registrations published by Statistics Botswana.

In the 2021 edition, data were added for gas/diesel oil and fuel oil electricity output from main activity electricity plants for the years 1971-1980. This data were previously classified as electricity output from main activity electricity plants for other non-specified oil products. Based on this re-classification, revisions were also made to gas/diesel oil and fuel oil input to main activity electricity plants and imports over the same time period.

In the 2021 edition, 2018 imports and road consumption of motor gasoline, 2018 imports and residential consumption of kerosene, 2018 imports and 2009-2018 consumption of gas/diesel oil, and 2018 production of other bituminous coal were revised to align with data provided by the Botswana Department of Energy, Ministry of Minerals, Energy and Water Resources.

In the 2021 edition, revisions were also made to other bituminous coal exports (2017-2018) and 2012 transformation in main activity electricity plants using data provided by the United Nations Statistical Division. Furthermore, the 2018 electricity output from other bituminous coal was revised to reflect data available from the Botswana Power Corporation.

In the 2021 edition, solar thermal production and non-specified consumption data were added for the years 2015-2018 to reflect newly accessed data from AEE – Institute for Sustainable Technologies.

Also in the 2021 edition, data provided by the United Nations Statistical Division were added for charcoal production and consumption for the years 1990-2018. New flows include charcoal production, residential consumption, and fuelwood



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transformation in charcoal production plants. Consequently, fuelwood production was also revised from 2004-2018 to incorporate this new data. Fuelwood residential consumption from 2006-2018 was also revised to reflect trends in rural population growth published by the World Bank.

In the 2020 edition, data for Botswana became available for the years 1971-1980, allowing the IEA Secretariat to remove Botswana entirely from the Other Africa region. Breaks in time series might occur between 1980 and 1981.

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# 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,



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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.

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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”. Add-itionally, only the part of these gases consumed for power generation (i.e. energy purposes) has been ac-counted 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.

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# Brunei Darussalam

## General notes

Data for Brunei Darussalam are available starting in 1971.

In 2019, a new refinery and petrochemical complex located at Pulau Muara Besar started operations. A new plant began producing electricity to supply it. This is reflected in the 2021 edition oil data as well as imports and use of lignite.

In the 2018 edition, Brunei Darussalam 2015 and 2016 energy balances were established by the IEA Secretariat based on official energy balances submitted by Ministry of Energy, Manpower and Industry.

In the 2009 edition, new information became available on the split in consumption of refinery gas. This may lead to breaks in time series between 2008 and 2009.

In the 2008 edition, Brunei Darussalam confirmed that they stopped using fuel wood in 1992.

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# 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.



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# Cambodia

## General notes

Data for Cambodia are available starting in 1995. Prior to that, they are included in Other Asia.

In the 2022 edtion, 2018-2020 official energy balances from the Energy Statistics Office of the Ministry of Mines and Energy became available. This led to a series of revisions and breaks in time series between 2017 and 2018.

In the 2021 edition, 2019 official energy balances from the Energy Statistics Office of the Ministry of Mines and Energy were not available in time for publication. Most flows were therefore estimated by the IEA Secretariat. For oil products, imports and final use data are based, where relevant, on International Trade Centre data, or on GDP and population developments.

In the 2021 edition, total electricity, hydroelectricity, motor gasoline, jet kerosene, gas/diesel oil, LPG, fuel oil and sub-bituminous coal data for production, trade, as well as use in the different economy sectors were revised from 2010 onwards as new information became available from Economic Research Institute for ASEAN and East Asia (ERIA). This leads to breaks in time series between 2009 and 2010.

In the 2021 edition, residential consumption of fuelwood and charcoal were re-estimated from 1995 onwards using data from the World Health Organisation on reliance on biomass for cooking.

In the 2020 edition, due to lack of official country data, the trade and final consumption of oil products and coal have been estimated by the IEA Secretariat.

In the 2019 edition, information on stock changes for coal and some petroleum products became available. This may lead to breaks in time series between 2016 and 2017.

In the 2018 edition, information on the split of consumption for some petroleum products became available starting from 2016. This may lead in breaks in time series between 2015 and 2016.

In the 2015 edition, new information regarding the imports of petroleum products in Cambodia from 2007 onwards became available. Data for these products were



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revised accordingly and as a result, breaks in time series may occur for different products between 2007 and 2013.

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World Health Organization (WHO), Geneva, accessed in June 2022: https://www.who.int/.

IEA Secretariat estimates.



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# Cameroon

## General notes

Data for Cameroon are available starting in 1971.

In May 2019, a fire occurred at Cameroon's only oil refinery, shutting down processing operations. As 2019 data for oil products were not available at the time of publication, the impact of this event was estimated in the 2021 edition. It was assumed that refinery inputs and outputs would decrease proportionally, and that deficits in supply would be filled by imports.

At the time of publication of the 2022 edition, no official energy data were available for Cameroon for 2020 with the exception of primary oil and gas. Data for 2020 were therefore estimated by the IEA secretariat for all other products.

In the 2021 edition, NGL production and transfer to LPG were added for 2018 and 2019. This new data corresponds to new extraction of LPG from the Sanaga South gas fields.

In the 2021 edition, newly available data from the Cameroon National Institute of Statistics resulted in the revision of crude oil imports (2012-2014, 2016-2018), exports (2016-2018), and refinery input (2012-2014), LPG production (2011-2014), imports (2016-2018), and consumption flows (2014, 2016-2018), motor gasoline production (2011-2014), imports (2017-2018), and road transport (2011-2014, 2016-2018), and electricity losses (2016-2018). Production of non-bio jet kerosene, refinery gas, gas/diesel oil, and non-specified oil products was also revised for 2012-2014 based on these changes. Breaks in the time series may occur.

Also in the 2021 edition, natural gas production for 2016-2018 was revised to better reflect data provided by Cedigaz. Consequently, natural gas input to autoproducer electricity plants, electricity output, and electricity consumption flows were revised slightly over the same period. Furthermore, bitumen imports and consumption for 2012-2018 were revised based on trends observed in UN Comtrade data. Finally, electricity output from hydro in 2016 was revised to match data published by Eneo. Breaks in the time series may occur.

Fuelwood production, transformation in charcoal plants, and consumption data from 2011 to 2014 were re-estimated in the 2021 edition in order to improve the quality of the time series for this product. Furthermore, data for bagasse



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production and industrial consumption were added for 1997-2018 based on newly accessed data from the Food and Agriculture Organisation (FAO).

For the 2020 edition, 2016, 2017 and 2018 data were not available by the time this publication was prepared. Data for those years were therefore estimated by the IEA secretariat.

In 2018, Cameroon started to export LNG. The IEA Secretariat sources LNG data from Cedigaz publication. Breaks in time series might occur between 2017 and 2018.

In the 2019 edition, OAG data was used to estimate the share of domestic and international bunkering for aviation fuel between 2005 and 2017. Breaks in time series might occur between 2004 and 2005. Additionally, solar photovoltaic electricity generation was estimated based on IRENA data.

In the 2015 edition, new information regarding Cameroon became available. Data points were revised accordingly, which may lead to breaks in times series between 2011 and 2012 for electricity own use and losses and between 2011 and 2011 for crude oil trade and production.

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IEA Secretariat estimates.

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IEA Secretariat estimates.

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IEA Secretariat estimates based on 1991 data from *Forests and Biomass Sub-sector in Africa,* African Energy Programme of the African Development Bank, Abidjan, 1996.



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# 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



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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.



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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



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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.

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Direct communication with the Institute of Built Environment of Tsinghua University, Beijing.

IEA Secretariat estimates.



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# Congo

## General notes

Data for Congo are available starting in 1971.

In the 2020, 2021 and 2022 editions, no official 2018, 2019 or 2020 annual oil and gas data was available. The IEA Secretariat therefore estimated supply of oil and gas based on data from the OPEC and Cedigaz, and consumption based on population and economy growth where relevant. Electricity generation figures for all years were obtained from the Ministère de l'Energie et de l'Hydraulique. Historical data for hydroelectricity generation might be slightly revised.

In the 2019 edition, new data were received from the Ministry of Energy and Hydraulics for all products in 2015, 2016 and 2017. Breaks in time series might appear between 2014 and 2015.

In the 2016 edition, time series for the period 2000-2012 were revised based on energy balances received from the Ministry of Energy. Breaks in time series may occur between 1999 and 2000.

The Imboulou Hydro Plant (120 MW) began operating in May 2011.

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# Côte d'Ivoire

## General notes

Data for Côte d'Ivoire are available starting in 1971.

In the 2021 edition, 2019 data were largely sourced from the Compagnie Ivoirienne d'Electricité and the Direction Générale des Hydrocarbures.

In the 2021 edition, solar PV electricity generation was added starting in 2000 based on data provided by the International Renewable Energy Agency (IRENA). Furthermore, 2018 bitumen data was revised to reflect export data provided by the UN Comtrade database. Breaks in the time series may occur between 2017 and 2018.

In the 2021 edition, lubricants production and consumption (2010-2018) and gas/diesel oil consumption (2009-2018) were revised to represent the energy system more accurately.

At the time of preparation of the 2021 edition, no official 2018 data were received from the Direction de l'Energie. Thus, 2018 data have been sourced or estimated based on the Système d'Information Energétique – Union Economique et Monétaire Ouest-Africaine (SIE-UEMOA) web portal data. For several products, breaks in the time series might occur between 2017 and 2018, and between 2014 and 2015.

In the 2020 edition, the energy industry own use of electricity from 2004 to 2017 was revised based on newly available information from SIE-UEMOA.

In the 2020 edition, hydropower electricity generation in 2016 and 2017 was revised based on newly available information from SIE-UEMOA.

In the 2020 edition, 2016 and 2017 final consumption of diesel was partially reallocated from non-specified industry to mining and quarrying based on newly available information from SIE-UEMOA.

In the 2019 edition, revisions were received for 2016 data from the Direction de l'Energie.



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IEA Secretariat estimates.



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# 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.

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Joint IEA/Eurostat/UNECE annual energy questionnaires.

IEA Secretariat estimates.



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# 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.

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IEA Secretariat estimates.



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# Curaçao

## General notes

Data for Curaçao are available starting in 1971.

Refinery inputs and outputs are estimated based on the IEA Secretariat expertise, while the oil demand is estimated based on economic indicators of the region.

In the 2022 edition, some supply and demand flows of gasoline, gas/diesel, fuel oil, lubricants and other non-specified oil products have been revised from 1997 onwards due to new available information on economic indicators of Curaçao.

Since 2021 edition, the IEA Secretariat estimated oil data for Curaçao from 2017 onwards since no official data on the operations of the Isla refinery were available by the time this publication was prepared. It was assumed based on IEA Secretariat expert's sources, that the refinery has been idle since the beginning of 2019.

In the 2020 edition, oil data between 2011 and 2016 as well as crude oil refinery input for 2017 were revised to better reflect available Petróleos de Venezuela, S.A (PDVSA) data and to include trade information for petroleum coke and bitumen. The Isla refinery did not operate for most of 2018, leading to a significant reduction in refinery activity.

In the 2020 edition, new information from Aqualectra led to revisions from 2012 onwards to electricity generation from fossil sources and wind, as well as electricity demand and diesel/fuel oil inputs to power generation.

In the 2018 edition, new sources became available that led to revisions of the solar PV and wind data. This might lead to a break in time series between 2011 and 2012.

The Netherlands Antilles was dissolved on 10 October 2010, resulting in two new constituent countries, Curaçao and Sint Maarten, with the remaining islands joining the Netherlands as special municipalities. The methodology for accounting for the energy statistics of the Netherland Antilles has been revised in order to follow the above-mentioned geographical changes. From 2012 onwards, data now account for the energy statistics of Curaçao Island only. Prior to 2012, data remain unchanged and still cover the entire territory of the former Netherland Antilles. This leads to breaks in time series between 2011 and 2012.



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As the Isla refinery did not operate to its maximum capacity in 2010, a break in time series might occur in that year for crude oil and oil products.

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IEA Secretariat estimates.



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# Cyprus

## General notes

**Note by the Republic of Türkiye (Türkiye):**

*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. Türkiye recognizes the Turkish Republic of Northern Cyprus (TRNC). Until a lasting and equitable solution is found within the context of the United Nations, Türkiye 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 Türkiye. 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.



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Joint IEA/Eurostat/UNECE annual energy questionnaires on renewables.

IEA Secretariat estimates.



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# Democratic People's Republic of Korea

## General notes

Data for the Democratic People's Republic of Korea are available starting in 1971.

The sources cited below provide domestic supply data for DPR Korea. All other flows are estimated by the IEA Secretariat.

In the 2021 edition, final consumption data of electricity, secondary oil products and primary coal products are estimated from 2017 onwards based on economic structure from neighbouring China provinces of Liaoning and Jilin.

In the 2021 edition, power efficiencies for other bituminous coal from 2009 onwards were adjusted to reflect the status of technology in DPR Korea.

In the 2020 edition, solar PV electricity generation was estimated from 2001 onwards, using IRENA data.

In the 2020 edition, 2016 anthracite production was revised, using data reported by Statistics Korea.

In the 2019 edition, data for 2017 anthracite production by Statistics Korea became available; as trade data are estimated based on reported importers' data, this might result in statistical differences.

In the 2014 edition, 2011 data for primary coals were revised based on new information. This may lead to breaks in the time series between 2010 and 2011 and differences in trends compared to previous editions for some products.

## Sources

### Sources 1971 to 2020:

*Major Statistics Indicators of North Korea*, Statistics Korea, Seoul, various editions up to 2021.

*North Korea Statistics,* Korean Statistical Information Service website, Seoul, accessed in June 2022: www.kosis.kr.

*Dow Jones Coal Price and Industry Statistics*, Dow Jones Energy Limited, London, 2022.



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*Renewable capacity statistics 2022*, International Renewable Energy Agency (IRENA), Abu Dhabi, 2021.

*The United Nations Energy Statistics Database*, United Nations Statistical Division, New York.

IEA Secretariat estimates.

## Sources for biofuels and waste:

*The United Nations Energy Statistics Database*, United Nations Statistical Division, New York.

*Forestry Statistics*, Food and Agriculture Organisation (FAO), Rome, accessed in June 2022: http://www.fao.org/faostat.

IEA Secretariat estimates.



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# Democratic Republic of the Congo

## General notes

Data for the Democratic Republic of the Congo are available starting in 1971.

Democratic Republic of the Congo is one of the ten countries that benefit from EU Support to IEA Data for Affordable and Sustainable Energy System for Sub-Saharan Africa.

In the 2021 edition, no official 2019 annual energy data was available. The IEA Secretariat therefore estimated the 2019 dataset based on secondary sources and data partially available on electricity generation and oil products.

In the 2020 edition, the IEA secretariat added available off-grid solar photovoltaic from the International Renewable Energy Agency (IRENA) for 2011 – 2018.

In the 2019 edition data became available for the split of consumption in industry. Breaks in time series may occur between 2016 and 2017 for electricity data.

In the 2015 edition, new information and methodologies regarding solid biofuels including charcoal became available. Breaks in time-series may occur between 2013 and 2014.

## Sources

### Sources up to 2020:

Direct communication with the Ministère de l'Energie, Kinshasa Gombe.

*AFREC Energy questionnaire*, African Energy Commission (AFREC), Algiers, 2014 to 2018.

*Renewable energy statistics 2021*, International Renewable Energy Agency (IRENA), Abu Dhabi, 2021.

*Natural Gas in the World,* Cedigaz, Paris, various editions up to 2021.

IEA Secretariat estimates.

### Sources up to 2013:

Direct communication with the Ministère de l'Energie, Kinshasa Gombe.



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Commission Nationale de l'Energie, Ministère de l'Energie, Kinshasa Gombe, 2005.

World Energy Council-IEA Joint Energy Reporting Format for Africa, 1999 to 2000.

*The United Nations Energy Statistics Database*, United Nations Statistical Division, New York.

*L'Energie en Afrique,* IEPE/ENDA, Paris, 1995, in turn sourced from the *Annuaire Statistique Energétique 1990*, Communauté Economique des Pays des Grands Lacs, Bujumbura, 1990.

IEA Secretariat estimates.

## Sources for biofuels and waste:

*Forestry Statistics*, Food and Agriculture Organisation (FAO), Rome, accessed in June 2022: http://www.fao.org/faostat.

*AFREC Energy questionnaire*, African Energy Commission (AFREC), Algiers, 2014 to 2018.

IEA Secretariat estimates based on 1991 data from *Forests and Biomass Sub-sector in Africa,* African Energy Programme of the African Development Bank, Abidjan, 1996.



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# Dominican Republic

## General notes

Data for the Dominican Republic are available starting in 1971.

In the 2022 edition, the 2019 and 2020 national energy balance were not available at the time of publication. Therefore, 2019 and 2020 flows have been estimated by the IEA Secretariat, based on OLADE data or economic trends, where relevant.

In the 2021 edition, coking coal has been reclassified as petroleum coke following information from the Comisión nacional de energía (CNE).

In the 2020 edition, data for the years 1998 to 2017 were revised following revision of the official data from Comisión nacional de energía (CNE).

In the 2019 edition, a breakdown of transport consumption was added thanks to new information from Comisión nacional de energía (CNE) starting in 1998.

In the 2017 edition, a breakdown of consumption data in industry, residential, commerce and services was added starting from 1998.

In the 2014 edition, the national energy balance was adopted as the primary data source. This could lead to breaks in time series between 1997 and 1998 for some flows.

## Sources

### Sources 1971 to 2020:

*Balance energia neta,* Comisión nacional de energía, Santo Domingo, various editions up to 2018.

*Energy-Economic Information System (SIEE),* Latin American Energy Organization (OLADE), Quito, accessed in June 2022: http://sier.olade.org/.

*Importación de petróleo y derivados,* Ministre de Industria y Comercio (MIC), Santo Domingo, various editions up to 2012.

Capacidad instalada y generación del SENI por año, según tecnología, 2000-2010, Oficina Nacional de Estadística, Santo Domingo.

IEA Secretariat estimates.



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# Ecuador

## General notes

Data for Ecuador 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.

In the 2022 edition, 2018 and 2019 data for Ecuador were revised to reflect revisions of official data from the Instituto de Investigación Geológico y Energético. This may lead to breaks in the time series between 2017 and 2018. In particular, the biggest changes regard refinery gas production and use and diesel and fuel oil final consumption in industry and commercial and public services.

In the 2020 edition, data for Ecuador were revised for the years 2000 to 2006, following revision of official data from the Instituto de Investigación Geológico y Energético. This may lead to breaks in the time series between 1999 and 2000. Revisions also include non-energy use of oil products between 1992 and 1999 as new information became available.

In the 2019 edition, data for Ecuador were revised for the years 2007 to 2016, following revision of the official data from Instituto de Investigación Geológico y Energético for national and international bunkers for oil products.

In the 2019 edition, solid biofuels data for the years 2007-2016 were revised. This leads to different figures compared to previous editions.

## Sources

### Sources 2000 to 2020:

Direct communication with the Instituto de Investigación Geológico y Energético, Quito.

*Energy Information System of Latin America and the Caribbean (sieLAC),* Latin American Energy Organization (OLADE), Quito, accessed in April 2022: http://sielac.olade.org/.



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*Balance Energético Nacional* – Instituto de Investigación Geológico y Energético, Quito, various editions up to 2020, last accessed in May 2022: https://www.geoenergia.gob.ec/.

*Informe Estadístico*, & *Informe Cifras Petroleras*, Petroecuador, Empresa Estatal Petróleos del Ecuador, Quito, various editions up to 2020.

*Estadística del Sector Eléctrico Ecuatoriano*, Agencia de Regulación y Control de Electricidad Arconel, Quito, various editions up to 2020.

IEA Secretariat estimates.

## Sources up to 1999:

Ministerio de Energía y Minas.

*Energy-Economic Information System (SIEE),* Latin American Energy Organization (OLADE), Quito: http://sier.olade.org/.

*Cuentas Nacionales,* Banco Central del Ecuador, Quito, various editions from 1982 to 1987.

*Memoria 1980-1984,* Banco Central del Ecuador, Quito, 1985.

*Ecuadorian Energy Balances 19741986,* Instituto Nacional de Energía, Quito, 1987.

*Informacion Estadística Mensual*, *No. 1610,* Instituto Nacional de Energía, Quito, 1988.

*Plan Maestro de Electrificación de Ecuador,* Ministerio de Energía y Minas, Quito, 1989.



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# 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, new information from CAPMAS became available to the IEA Secretariat, leading to revisions in primary and secondary oil data for years 2018 and 2019 as well as coal data for the same period. Trade data for these product aggregates has also been revised for the period 2014-2019.

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 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.



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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

## Sources 1992 to 2020:

Direct communication with the Central Agency for Public Mobilization and Statistics, Cairo, CAPMAS.

Direct communication with the Organisation for Energy Planning, Cairo.

World Energy Council-IEA Joint Energy Reporting Format for Africa, 2000 to 2012.

Direct submission to the IEA Secretariat from the Ministry of Petroleum, Cairo.

*Annual Report*, Egyptian Natural Gas Holding Company (EGAS), Nasr City, various editions up to 2018/2019.

*JODI Oil World database*, Joint Organisations Data Initiative (JODI), Riyadh, accessed in April 2022: https://www.jodidata.org/oil/ .

*Statistical Bulletin,* Arab Union of Producers, Transporters and Distributors of Electricity (AUPTDE), Amman, various editions up to 2018.

*Natural Gas in the World,* Cedigaz, Paris, various editions up to 2021.

*Annual Report 1995, 1997, 1998, 1999,* Ministry of Petroleum, Egyptian General Petroleum Corporation, Cairo, 1996, 1998 to 2000.

*Annual Report of Electricity Statistics 1996/1997 to 2010/2011,* Ministry of Electricity and Energy, Egyptian Electricity Holding Company, Cairo, 1998 to 2012.

*Arab Oil and Gas,* The Arab Petroleum Research Center, Paris, October 1997.

*Middle East Economic Survey,* Middle East Petroleum and Economic Publications, Nicosia, February 1994, June 1996, March 1998.

*A Survey of the Egyptian Oil Industry 1993,* Embassy of the United States of America in Cairo, Cairo, 1994.

IEA Secretariat estimates.



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## Sources up to 1991:

*Annual Report of Electricity Statistics 1990/1991,* Ministry of Electricity and Energy, Egyptian Electricity Authority, Cairo, 1992.

*Statistical Yearbook of the Arab Republic of Egypt,* Central Agency for Public Mobilisation and Statistics, Cairo, 1977 to 1986.

*L'Electricité, l'Energie, et le Pétrole,* République Arabe d'Egypte, Organisme Général de l'Information, Cairo, 1990.

*Annual Report,* The Egyptian General Petroleum Corporation, Cairo, 1985.

## Sources for biofuels and waste:

*The United Nations Energy Statistics Database*, United Nations Statistical Division, New York.

*Forestry Statistics*, Food and Agriculture Organisation (FAO), Rome, accessed in February 2021: http://www.fao.org/faostat.

IEA Secretariat estimates.



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# El Salvador

## General notes

Data for El Salvador are available starting in 1971.

In the 2021 edition, imports and exports of oil products were revised from 2013 onwards, to exclude transit trade.

In the 2020 edition, bagasse data were revised for the years 1998-2012 based on new information from El Salvador's Consejo Nacional de Energía (CNE) and IEA Secretariat estimates. Data for coke oven coke and petroleum coke have been revised for the years 1994-2018 following new trade information from the Banco Central de Reserva de El Salvador. Petroleum coke demand is estimated by the IEA Secretariat.

In the 2019 edition, data for El Salvador for the years 2014 to 2016 have been revised across all products and flows following revision of the official data from El Salvador's CNE.

In the 2019 edition, solid biofuels data for the years 2000-2016 have been revised. This leads to a break in time series between 1999 and 2000. Data from 2007 onwards were updated based on CNE's balance. This leads to breaks in time series for wood and charcoal between 2006 and 2007, and between 2013 and 2014 in which years El Salvador updated their data thanks to a new survey.

The only refinery in El Salvador shut down in 2012.

## Sources

### Sources up to 2020:

*Balances Energéticos,* Consejo Nacional de Energía (CNE), San Salvador, various editions from 2007 to 2020.

Direct communication with the Consejo Nacional de Energia, San Salvador.

*Boletín de Estadísticas,* Superintendencia General de Electricidad y Telecomunicaciones (SIGET), San Salvador, various editions from 1998 to 2020.

*Energy-Economic Information System (SIEE)*, Latin American Energy Organization (OLADE), Quito, accessed in May 2022: https://sielac.olade.org/.



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*Comercio Internacional de Mercancías,* Banco Central de Reserva de El Salvador, San Salvador, accessed in September 2021: http://www.bcr.gob.sv/comex/

*Centroamérica: estadísticas de hidrocarburos,* Comisión Económica para América Latina y el Caribe (CEPAL), Mexico City, various editions from 2009-2017.

IEA Secretariat estimates.

## Sources for biofuels and waste:

*Balances Energéticos,* Consejo Nacional de Energía (CNE), San Salvador, various editions from 2007 to 2020.

*Energy-Economic Information System (SIEE)*, Latin American Energy Organization (OLADE), Quito, accessed in May 2022: https://sielac.olade.org/.

IEA Secretariat estimates.



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# Equatorial Guinea

## General notes

Data for Equatorial Guinea are available starting in 1971.

In the 2022 edition, the time series of several products were heavily revised based on changes to the IEA Secretariat methodology and updated data received from the United Nations Statistical Division. These products and their respective start of revisions include: primary solid biofuels (1981), charcoal (1981), natural gas (1998), crude oil (2000), natural gas liquids (1995), liquified petroleum gas (1990), motor gasoline (1990), jet kerosene (2000), other kerosene (2000), gas/diesel oil (1990), lubricants (2000), bitumen (2000) and electricity (1998).

In the 2021 edition, numerous revisions were made to reflect national data published by the Instituto Nacional de Estadística de Guinea Ecuatorial (INEGE). These revisions affect: crude oil production, exports, and energy industry own use (2006-2018), LPG exports and transfers (2006-2018), NGL transfers (2006-2018), production, and exports (2017-2018), natural gas exports (2013-2018) and own use in gas-to-liquids plants (2017-2018), motor gasoline imports and consumption (2017-2018), jet kerosene imports, international aviation bunkers, and consumption (2017-2018), other kerosene imports and residential consumption (2017-2018), gas/diesel oil input to electricity plants, output from electricity plants (2015-2018), and consumption (2017-2018), and finally, electricity use for oil and gas extraction (2016-2018).

In the 2021 edition, several other gas/diesel oil flows were revised to better accommodate the information published by INEGE. Consumption data is now sourced from OPEC for 2014-2015 and imports are now sourced from UNSD for 2017-2018.

Furthermore, revisions to OPEC data resulted in changes to natural gas production (2012-2017) and exports (2012) in the 2021 edition. Other revisions to natural gas flows include industry consumption (2016-2018) and LNG production and exports (2007-2018). Finally, residential electricity consumption was also revised from 2017-2018.



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# Sources

## Sources 1971 to 2020:

*Anuario Estadístico de Guinea Ecuatorial*, Instituto Nacional de Estadística de Guinea Ecuatorial (INEGE), Malabo, various editions up to 2021.

The United Nations Energy Statistics Database, United Nations Statistical Division, New York, various editions up to 2021.

The African Statistical Yearbook, African Development Bank Group, Abidjan, various editions up to 2020.

AFREC Energy questionnaire, African Energy Commission (AFREC), Algiers, 2000 to 2019.

Annual Statistical Bulletin, Organization of Petroleum Exporting Countries (OPEC), Vienna, various editions up to 2021.

Annual Statistical Bulletin, Gas Exporting Countries Forum (GECF), Doha, various editions up to 2021.

JODI Oil World Database, Joint Organisations Data Initiative (JODI), Riyadh, accessed in April 2022: https://www.jodidata.org/oil/.

IEA Secretariat estimates.



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# Eritrea

## General notes

Data for Eritrea are available starting in 1992. Prior to 1992, data are included in Ethiopia.

At the time of preparation of the 2022 edition, no official data were available from Eritrea from 2019 to 2020. Official data were also not available for most products and flows for 2018. As a consequence, the statistics and balances for 2018 to 2019 have been mostly estimated based on data from the UNSD. Data for 2020 have been estimated based on population growth for biomass and household consumption, and GDP growth for other products.

In the 2022 edition, most products and flows were revised from 2011 to 2017 based on new data provided by the Ministry of Energy and Mines.

In the 2021 edition, 2018 data for jet kerosene and gas/diesel oil were revised based on information provided by OAG and the Ministry of Energy and Mines, respectively. This leads to breaks in time series. Uses of naphtha for electricity generation for 2007-2009 were also revised due to new data available.

In the 2021 edition, main activity producer electricity output from solar PV (2011-2016) and non-specified oil products (2011-2018) was revised to reflect data published by the African Development Bank Group (AFDB) and African Energy Commission (AFREC). Solar PV electricity output for 2018 was also modified based on revisions made by the International Renewable Energy Agency (IRENA). Consequently, total electricity production and consumption flows were revised from 2011-2018. Breaks in time series may occur.

In the 2020 edition, the IEA Secretariat received from the Ministry of Energy and Mines partial solar photovoltaic generation and other electricity and data as well as oil products consumption figures for 2017, and fuel oil total consumption for 2018. Based on this newly available information, the IEA Secretariat revised imports of fuel oil, diesel, motor gasoline, lubricants and LPG for 2017 and imports of LPG and lubricants between 2011 and 2016. Furthermore, electricity generation from solar photovoltaics was revised in 2017, leading to a break in time series between 2016 and 2017.

In the 2019 edition, OAG data were used to estimate the breakdown of aviation fuels between domestic aviation and international aviation bunkers between 2005 and 2017. Breaks in time series might occur between 2004 and 2005.



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Solid biofuels consumption data have been periodically re-estimated by Eritrea. This may result in breaks in time series for this product in 1998 and 2003.

# Sources

## Sources 2011 to 2020:

Direct communication with the Ministry of Energy and Mines, Asmara.

*The United Nations Energy Statistics Database*, United Nations Statistical Division (UNSD), New York.

OAG (2021), *Origin-Destination of Commercial Flights* (database), OAG Aviation, Luton, www.oag.com/analytics/traffic-analyser.

*The African Statistical Yearbook,* African Development Bank Group, Abidjan, 2021.

*AFREC Energy questionnaire*, African Energy Commission (AFREC), Algiers, 2011 to 2019.

*Renewable energy statistics 2021*, International Renewable Energy Agency (IRENA), Abu Dhabi, 2021.

IEA Secretariat estimates.

## Sources 1992 to 2010:

Direct communication with the Ministry of Energy and Mines, Asmara.

IEA Secretariat estimates.



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# Kingdom of Eswatini

## General notes

Data for the Kingdom of Eswatini (Eswatini) are available starting in 1971.

Data from the Eswatini Electricity Company are reported on a fiscal year basis. Data for 2020 correspond to 1 April 2020 – 31 March 2021. This source is used for several electricity flows starting in 2005, including imports, losses, consumption (until 2015), and output from hydro.

At the time of preparation of the 2022 edition, official data from the Eswatini Ministry of Natural Resources and Energy were not yet available for 2020. 2020 data are therefore entirely estimated by the IEA Secretariat based on secondary sources or economic growth, except for electricity flows for which data from the Eswatini Electricity Company are used.

## Sources

### Sources 2000 to 2020:

Direct communication with the Ministry of Natural Resources and Energy, Mbabane.

*Annual Report*, Eswatini Electricity Company, Mbabane, various editions up to 2020/2021.

*Renewable energy statistics 2021*, International Renewable Energy Agency (IRENA), Abu Dhabi, 2021.

*AFREC Energy questionnaire*, African Energy Commission (AFREC), Algiers, 2000 to 2009.

*The United Nations Energy Statistics Database*, United Nations Statistical Division, New York.

IEA Secretariat estimates.

### Sources up to 1999:

*The United Nations Energy Statistics Database*, United Nations Statistical Division, New York.

IEA Secretariat estimates.



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## Sources for biofuels and waste:

Direct communication with the Ministry of Natural Resources and Energy, Mbabane.

*The United Nations Energy Statistics Database*, United Nations Statistical Division, New York.

*Forestry Statistics*, Food and Agriculture Organisation (FAO), Rome, accessed in February 2022: http://www.fao.org/faostat.

IEA Secretariat estimates.



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# Ethiopia

## General notes

Data for Ethiopia are available starting in 1971.

Ethiopia is one of the ten countries that benefit from EU Support to IEA Data for Affordable and Sustainable Energy System for Sub-Saharan Africa.

Ethiopia energy data include Eritrea from 1971 to 1991. From 1992 onwards, the two countries are reported separately.

Data are reported according to the Ethiopian financial year. For instance, 2020 data refers to the fiscal year starting on 1st of July 2020 and ending on 30th of June 2021, or 2013 in Ethiopian fiscal years.

At the time of preparation of the 2022 edition, limited 2020 data were available from official sources. 2020 data for several products are therefore entirely estimated by the IEA Secretariat based on economic indicators. 2019 data estimated for the 2021 edition were replaced based on new data provided by the Ministry of Water, Irrigation, and Energy, hence the revisions in the database.

At the time of preparation of the 2021 edition, 2019 official data for Ethiopia were not available yet. 2019 data are therefore entirely estimated by the IEA Secretariat based on available secondary sources and population or economic growth. 2018 data estimated for the 2020 edition were replaced by official Ethiopia data for this edition, hence the revisions in the database.

In the 2020 edition, solar photovoltaic off-grid generation was revised down following revision by International Renewable Energy Agency (IRENA) of its estimation.

In the 2020 edition, International Civil Aviation Organization (ICAO) data were used to estimate the split of aviation fuels between domestic aviation and international aviation bunkers from 2005 onwards. Breaks in time series might occur between 2004 and 2005.

In the 2017 edition, electricity data were revised based on ministry reporting split between wind and geothermal production since 2011.

The Aluto Langano pilot geothermal power plant began an expansion project in 2010. Breaks in geothermal time series can be seen in 2010 due to the plant being out of commission.



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# Sources

## Sources 2012 to 2020:

Direct communication with the Ministry of Water, Irrigation, and Energy, Addis Ababa.

*Annual Report,* National Bank of Ethiopia, Addis Ababa, various editions up to 2020-2021.

*Supply and Sales Data,* Ethiopian Petroleum Supply Enterprise, Addis Ababa, accessed May 2022: http://epse.gov.et/web/guest/supply-facts-and-figures.

*Renewable energy statistics 2021*, International Renewable Energy Agency (IRENA), Abu Dhabi, 2021.

OAG (2018), *Origin-Destination of Commercial Flights* (database), OAG Aviation, Luton, www.oag.com/analytics/traffic-analyser.

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*Biomass Energy Strategy Formulation for Ethiopia*, European Union Energy initiative, in cooperation with the Ethiopian Ministry for Water and Energy, Germany, 2013.

IEA Secretariat estimates.

## Sources 1992 to 2012:

Direct communication with the Ministry of Mines and Energy, Addis Ababa.

Direct communication with the Energy Development Follow-up and Expansion Department of the Ministry of Infrastructure, Addis Ababa, 2004 and 2005.

Direct communication with the Ministry of Finance and Economic Development, Addis Ababa, 1998 to 2003.

*The United Nations Energy Statistics Database*, United Nations Statistical Division, New York.

IEA Secretariat estimates.



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## Sources up to 1991:

Ten Years of Petroleum Imports, Refinery Products, and Exports, Ministry of Mines & Energy, Addis Ababa, 1989.

*Energy Balance for the Year 1984*, Ministry of Mines & Energy, Addis Ababa, 1985.

*1983 Annual Report*, National Bank of Ethiopia, Addis Ababa, 1984.

*Quarterly Bulletin*, National Bank of Ethiopia, Addis Ababa, various editions from 1980 to 1985.

## Sources for biofuels and waste:

Direct communication with the Ministry of Water, Irrigation, and Energy, Addis Ababa.

*Biomass Data 2007-2012*, Ministry of Water and Energy, Addis Ababa, 2012.

IEA Secretariat estimates up to 2006 based on 1992 data from Eshetu and Bogale, *Power Restructuring in Ethiopia*, AFREPREN, Nairobi, 1996.

IEA Secretariat estimates.



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# Gabon

## General notes

Data for Gabon are available starting in 1971.

In the 2022 edition, the IEA Secretariat obtained data on the oil sector in Gabon in year 2020 through information published by the Ministère de l'Economie et de la Relance. This led to revisions in oil and oil products supply data between 2017 and 2019.

In the 2021 edition, 2018 and 2019 data were not available by the time this publication was prepared. Data were therefore estimated by the IEA secretariat. New data from the SEEG led to revision of electricity data from 2016 to 2018.

The use of the AFREC questionnaire data for 2017 lead to break in time series for LPG, non-bio gasoline, non-bio jet-kerosene, other kerosene and non-bio diesel.

In the 2018 edition, revisions to natural gas production were made from 2013 to 2015. Breaks in time series can be seen from 2013 to 2014.

In the 2017 edition, revisions were made to the residential oil products consumption from the time period of 2010 to 2014 to take into account newly available data. This may result in a break in time series between 2009 and 2010 for LPG and kerosene. Revisions were made for crude oil production for the whole time series.

## Sources

### Sources 1992 to 2020:

*Note sur le Secteur Pétrolier fin décembre 2021,* Ministère de l'Economie et de la Relance de la République Gabonaise, Libreville.

*AFREC Energy questionnaire*, African Energy Commission (AFREC), Algiers, 2020.

*Rapport annuel de la SEEG*, Société d'Énergie et d'Eau du Gabon, Libreville, various editions from 2000 to 2018.

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*Annuaire Statistique du Gabon*, Ministère de l'économie, du commerce, de l'industrie et du tourisme, Libreville, 2001 to 2007 and 2004 to 2008, 2011.

Direct communication with Direction Générale de l'Energie, Libreville, 2003 to 2008.

Direct communication with Société Gabonaise de Raffinage, Port Gentil, 1997, 2000 to 2006, 2008 to 2009.

*Tableau de Bord de l'Economie, Situation 1997, Perspectives 1998-1999*, Direction Générale de l'Economie, Ministère des Finances, de l'Economie, du Budget et des participations, Libreville, 1998.

*Rapport d'Activité,* Banque Gabonaise de Développement, Libreville, 1985, 1990, 1992 and 1993.

*The United Nations Energy Statistics Database*, United Nations Statistical Division, New York.

IEA Secretariat estimates.

## Sources up to 1991:

*Tableau de Bord de l'Economie, Situation 1983 Perspective 198485,* Ministère de l'Economie et des Finances, Direction Générale de l'Economie, Libreville, 1984.

## Sources for biofuels and waste:

IEA Secretariat estimates based on 1991 data from *Forests and Biomass Sub-sector in Africa,* African Energy Programme of the African Development Bank, Abidjan, 1996.



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# 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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IEA Secretariat estimates.



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# Ghana

## General notes

Data for Ghana are available starting in 1971.

Ghana is one of the ten countries that benefit from EU Support to IEA Data for Affordable and Sustainable Energy System for Sub-Saharan Africa.

Production from the TEN field started in 2016 and from the Sankofa Gye Nyame (SGN) field in 2017. Two new producing wells were added to the SGN field in 2019. Breaks in time series might occur between 2016 and 2017 in crude oil production, and between 2018 and 2019 for natural gas production.

In the 2022 edition, international marine bunkers and exports of gas/diesel oil (2017-2019) were revised to match data published by the Energy Commission. Imports (2015-2019) and industry consumption (2017-2019) of fuel oil were also revised based on new data in Energy Commission publications.

In the 2021 edition, data were added for main activity electricity plants and electricity generation for LPG (2018-2019), gas/diesel oil (2011-2019), and fuel oil (2015-2019) based on new official sources. LPG consumption flows (2017-2018) and fuel oil imports (2015-2018) were also affected. Furthermore, revisions were made to reflect data provided by the United Nations Statistical Division for aviation gasoline imports (2009-2018) and international aviation bunkers (1996-2018), gas/diesel oil exports and international marine bunkers (2009-2018), and imports and non-energy use of bitumen (1996-2018), lubricants (1999-2018), and non-specified petroleum products (1996-2018).

In the 2019 edition, fuelwood time series from 2008 to 2016 were revised as Ghana published new data. Breaks in time series might occur between 2007 and 2008.

In 2014, Ghana started to exploit gas that was previously flared.

In the 2015 edition, primary solid biofuels figures for 2000-2012 were revised, as new information became available. Breaks in time series might occur between 1999 and 2000.

In the 2014 edition, data were revised for electricity, oil products and biofuels until 2000 and from 2009 to 2012 based on new information received from the Energy Commission. Breaks in time series may occur for these products.



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In 2011, Ghana began oil production from the Jubilee fields, resulting in a change in crude production and exports between 2010 and 2011.

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IEA Secretariat estimates.



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# Gibraltar

## General notes

Data for Gibraltar are available starting in 1971.

Since the 2019 edition, data from 2016 onwards were estimated since no edition of the Abstract of Statistics has been published beyond 2016. Electricity generation from fuel oil has been revised for 2016.

In the 2015 edition, the time series for residual fuel oil and gas/diesel oil consumed as international marine bunkers were revised based on newly available information.

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IEA Secretariat estimates.



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# Guatemala

## General notes

Data for Guatemala are available starting in 1971.

In the 2022 edition, electricity generation in a new natural gas power plant is reported for the year 2020, for the first time in the time series, to take into account new information provided by Administrador del Mercado Mayorista. Natural gas production in Guatemala and consumption in main activity electricity producers are therefore estimated for that year.

In the 2021 edition, there are revisions to the domestic consumption of jet kerosene between 2005 and 2010. There may now be a break in time series between 2004 and 2005. Additionally, international aviation bunkers values between 2010 and 2012 were revised.

The 2021 edition also includes revisions to estimated solid biofuel electricity plant outputs between 1986 and 1997. There are also revisions across the time series for biogasoline production and exports, in order to change sources for this information.

In the 2020 edition, data for 2001 to 2009 were revised to take into account new information from the Ministry of Energy and Mines. Breaks in time series may occur between 2000 and 2001.

In the 2019 edition, data on the production and export of liquid biofuels were added for the years 2005-2017.

New information on the domestic consumption of jet kerosene became available in the 2019 edition for the years 2010-2017. The consequent revisions may lead to break in time series between 2009 and 2010.

In the 2018 edition, data for 2010 to 2015 were revised to take into account new information from the ministry of energy and mines.

Orimulsion was imported between 2004 and 2006 for electricity generation and is reported under “other hydrocarbons”.

Electricity generation from primary solid biofuels from 1998 to 2000 is in mobile harvest year, which does not fully coincide with calendar year. Harvest year Y-1/Y corresponds to year Y in IEA data.

The Texaco refinery in Escuintla ceased operations in 2002.



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IEA Secretariat estimates.



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# Guyana

## General notes

Data for Guyana are available starting in 1971.

Guyana started extracting commercial grade crude oil from Liza oilfield in December 2019. The 2022 edition shows the resulting increase of crude oil production and exports in 2020 as well of non-specified oil products (mostly lubricants) used in the extraction operations.

The IEA Secretariat added Guyana energy data to the World Energy Statistics and Balances in the 2021 edition. In previous editions the data were included in "Other non-OECD Americas" region.

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# Haiti

## General notes

Data for Haiti are available starting in 1971.

In the 2022 edition, inputs to power generation for 2020 were estimated by the IEA Secretariat due to national data not being available at the time of publication.

In the 2022 edition, electricity generation data was revised for the year 2019 as new data became available in Ministère de l'Economie et des Finances de la République d'Haïti.

In the 2021 edition, inputs to power generation and electricity generation by source for 2019 were estimated by the IEA Secretariat due to national data not being available at the time of publication.

In the 2020 edition, inputs to power generation and generation by source were updated from 2010 onwards to reflect information from the Ministry of Economy and Finances. This may lead to breaks in time series between 2009 and 2010. Imports of oil products were updated from 1998 to reflect new information from the Central Bank of Haiti and available mirror trade information.

In the 2020 edition, solid biofuels data were also revised up to 2008 to reflect revised information from Latin American Energy Organization (OLADE).

In the 2020 edition, liquid biofuels data were also added to reflect revised information from OLADE. Ethanol production data starts in 2012, while import data from 2010 is sourced from the US Energy Information Administration.

Solar photovoltaic generation has been estimated by the IEA Secretariat using OLADE capacity estimates.

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# Honduras

## General notes

Data for Honduras are available starting in 1971.

In the 2022 edition, new official data for all energy products and flows from Secretaría de Estado en el Despacho de Energía became available through the sieHONDURAS online platform, for the period 2010-2020. As a result of this, energy statistics and balances of these years have been completely revised.

In the 2021 edition, autoproducer electricity generation from bagasse and fuel oil have been revised for years 2017 and 2018 to reflect new information on cogeneration. As a result of this, 2017 and 2018 inputs to autoproducer plants of fuel oil have been revised, as well as 2017 total electricity generation.

In the 2020 edition, direct communication with the Secretaría de Estado en el Despacho de Energía led to revisions of data since 2005. The revisions made to integrate this information can lead to breaks in time series between 2004 and 2005. Data for coke oven coke were revised to zero and corresponding amounts subsequently re-allocated to petroleum coke.

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# 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.



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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.

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IEA Secretariat estimates.



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# 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



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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



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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.



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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.



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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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## Electricity and heat

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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.



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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.

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# Islamic Republic of Iran

## General notes

Data for the Islamic Republic of Iran are available starting in 1971.

Data are reported according to the Iranian calendar year. Data for 2020 correspond to 21 March 2020 – 19 March 2021, which is Iranian year 1399.

Primary oil products (crude oil, NGL and condensates) data are estimated based on data from OPEC, JODI.

Crude oil production and export data do not include field condensate. Field condensate quantities are included with natural gas liquids.

Statistical differences in the Islamic Republic of Iran statistics and balances can include stock change for some coal and oil products.

At the time of preparation of the 2022 edition, the official 2020 energy balance of the Islamic Republic of Iran was not available. As a consequence, the statistics and balances for 2020 have been estimated by the IEA Secretariat.

At the time of preparation of the 2021 edition, the official 2019 energy balance of the Islamic Republic of Iran was not available. As a consequence, the statistics and balances for 2019 have been estimated by the IEA Secretariat, with the exception of electricity supply and part of electricity demand, which are based on official sources. Additionally, 2018 data, which was estimated in the 2020 cycle, and some 2017 flows have been revised to incorporate official energy balance data from the Islamic Republic of Iran. 2017 and 2018 NGL exports and stock change estimates have also been revised, as has 2017-2018 primary solid biofuels production and consumption values.

In the 2014 cycle, more detailed information for the consumption of coke oven coke became available for 2009-2012. Breaks in time series may occur between 2008 and 2009.

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# Iraq

## General notes

Data for Iraq are available starting in 1971.

Production of paraffin waxes might include other non-specified oil products.

Crude oil production and export data do not include field condensate. Field condensate quantities are included in natural gas liquids.

Crude oil export data include back-blending of fuel oil.

In the 2022 edition, multiple natural gas flows were revised from 2017 to 2019 based on data published by the Gas Exporting Countries Forum (GECF).

In the 2022 edition, 2019 electricity production data were revised based on new data made available by the Iraq Ministry of Electricity.

In the 2021 edition, LPG supply and demand flows were reassessed and revised from 1993 to 2006. Crude oil refinery input, input/output to/from electricity plants, and transfers, fuel oil own use in refineries, input to electricity plants, and transfers, and non-specified oil product electricity output may be affected over this period.

In the 2021 edition, gas/diesel oil and fuel oil input to electricity plants (2009-2018) were revised to better reflect information provided by the Iraq Ministry of Electricity for 2014-2017 and Arab Union of Producers, Transporters and Distributors of Electricity (AUPTDE) for 2009-2013, 2018. Gas/diesel oil imports (2011-2018) were also revised based on data published by the Joint Organisations Data Initiative (JODI). Reported consumption of gas/diesel oil (2011-2018) and fuel oil/crude oil transfers (2016-2018) were impacted.

In the 2021 edition, production and non-energy use of paraffin wax and non-specified oil products (2017-2018) and crude oil input to electricity plants (2018) were revised based on newly available data from the Iraqi Extractive Industries Transparency Initiative (IEITI). Crude oil and non-specified oil product electricity output (2018) were impacted.

In the 2021 edition, naphtha production and exports (2016-2018) were revised to reflect data published by Organization of Arab Petroleum Exporting Countries (OAPEC) and JODI, respectively. Naphtha and motor gasoline transfers were affected over the same period.



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In the 2021 edition, jet kerosene international aviation bunkers and consumption for domestic aviation (2010-2018) were revised based on information available from OAG Aviation and the International Civil Aviation Organization (ICAO).

In the 2020 edition, off-grid solar photovoltaics generation was added to the dataset for the years 2013-2018 based on International Renewable Energy Agency (IRENA) estimations.

In the 2020 edition, the estimation of Iraq's charcoal production data was revised for 1996-2018 to adjust the efficiency of the charcoal production process. This revision may lead to breaks in time series between 1995 and 1996.

In the 2016 edition, data for electricity generation became available for 2010-2013. Breaks in time series may occur between 2009 and 2010.

Destruction of Iraq's largest refinery occurred in 2015, resulting in large decreases in oil products output in 2015.

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# Jamaica

## General notes

Data for Jamaica are available starting in 1971.

In the 2022 edition, electricity generation in natural gas main activity producer plants has been revised from year 2016, according to new information provided by the Ministry of Science, Energy and Technology.

In the 2022 edition, electricity generation in wind and solar PV electricity plants has been revised for years 2016 and 2019, according to new information provided by the Ministry of Science, Energy and Technology.

In the 2021 edition, a number of oil products' 2018 production data has been revised due to the newly published data, and details for domestic aviation have been included from 2017. Natural gas imports and inputs to electricity plants have also been revised across the time series. The allocation of diesel to non-specified industries has also been revised between 2004 and 2018, following new information from the Ministry of Science, Technology, Energy and Mining of Jamaica.

In the 2021 edition, there is a break in the time series for solid biofuels as Jamaica has revised their published 2019 consumption estimates for these products based on a 2014 study. There are also series breaks for consumption allocations between 2018 and 2019 for all fuels due to revision of industry classifications by Jamaica.

In the 2020 edition, the IEA Secretariat revised its estimations of the time series of bagasse, using information from the Latin American Energy Organization (OLADE), the Jamaica Sugar Industry Authority, and the International Renewable Energy Agency (IRENA) data on capacity and electricity generation. As a result, electricity generation and inputs to power of bagasse are significantly lower than in previous editions.

In the 2020 edition, fuel oil and diesel data between 1971 and 1989, as well as electricity generation between 1971 and 1999 were also revised based on revisions from OLADE. Naphtha data was revised to resolve past inconsistencies.

In the 2019 edition, the IEA incorporated revisions of 2016 data from the Ministry of Science, Technology, Energy and Mining of Jamaica. Major impact is the



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addition of natural gas to the energy mix of the country that has retrofitted its power plants and started to import liquefied natural gas.

In the 2019 edition, a revision of the electricity balance for the years 2011-2017 was implemented by the IEA to take into account more official data; it can lead to breaks in time series in the electricity consumption data between 2010 and 2011, as well as 2013 and 2014.

In the 2018 edition, information became available on charcoal and wood production. This may lead to breaks in time series between 1989 and 1990 data.

In the 2016 edition, information became available on industrial consumption of oil products and electricity. This may lead to breaks in time series between 2007 and 2008 data.

Jamaica changed their reporting methodology for final energy consumption starting with 2014 data. This leads to breaks in time series between 2013 and 2014.

Electricity consumption of the residential sector might include small commercial customers.

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# Jordan

## General notes

Data for Jordan are available starting in 1971.

In the 2022 edition, electricity demand data for 2020 have been estimated from Ministry of Energy information.

In the 2022 edition, some 2019 data for natural gas and primary and secondary oil have been revised due to new available information from the Ministry of Energy.

At the time of preparation of the 2021 edition, 2019 official data for natural gas, primary and secondary oil products, coal and biofuels have been not available yet. Therefore, 2019 figures are entirely estimated by the IEA Secretariat based on available secondary sources or, when other sources were not available, based on economic developments.

In the 2020 edition, solid biofuels in 2016 and 2017 were revised based on newly available information. This leads to a break in time series between 2015 and 2016.

In the 2020 edition, data across multiple products were revised based on newly available information: namely, non-bio jet kerosene (from 2012), other kerosene, motor gasoline and gas/diesel (from 2016), fuel oil (from 2014), and natural gas (from 2007).

In the 2018 edition, revisions in commercial and public services electricity consumption lead to break in time series between 1992 and 1993.

Due to an attack on a major natural gas pipeline between Egypt and Jordan during the 2011 revolution in Egypt, Jordan relied much more on fuel oil and diesel for power generation between 2011 and 2014.

Jordan started importing coal products in 2012.

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# 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



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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.

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IEA Secretariat estimates.



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# Kenya

## General notes

Data for Kenya are available starting in 1971.

Kenya is one of the ten countries that benefit from EU Support to IEA Data for Affordable and Sustainable Energy System for Sub-Saharan Africa.

Stock changes for lubricants may include informal trade.

Solar photovoltaic data comes from the International Renewable Energy Agency (IRENA) estimations of the off-grid generation up to 2018.

In the 2022 edition, electricity data were revised from 2003 to 2019 to be reported on a calendar year basis. In previous editions, electricity data were reported on a fiscal year basis, beginning on 1 July and ending on 30 June of the subsequent year.

In the 2022 edition, oil product data were revised to more accurately reflect the final consumption by sector reported by the Kenya National Bureau of Statistics.

In the 2021 edition, new information became available on the detailed generation of electricity from oil products. Generation per product is now available from 2016 onwards.

In the 2021 edition, new information became available on the food and tobacco industry activity, leading to revisions of the estimations for energy consumption in the sector from 1996 onward.

In the 2020 edition, refinery data have been revised from 2014 onwards, as the national refinery have stopped its activity in 2013.

In the 2020 edition, new data regarding primary and secondary biofuels production and consumption became available, leading to breaks in time series between 2017 and 2018.

In the 2014 edition, fuelwood and other vegetal matters and residues are estimated based on 2000 data. Charcoal data are derived from the wood input to charcoal production with assumed efficiency of 33%; bagasse production and input to power plants is back-estimated from data on Mumias cogeneration.



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*Kenya Statistical Digest,* Ministry of Planning and National Development, Central Bureau of Statistics, Nairobi, 1988.

## Sources for biofuels and waste:

*Economic Survey*, Central Bureau of Statistics, Nairobi, various editions up to 2021.

*Forestry Statistics*, Food and Agriculture Organisation (FAO), Rome, accessed November 2020: http://www.fao.org/faostat.

Data for 2000 are based on research carried out by the Ministry of Energy on consumption of solid biofuels. The results of this research were published as part of a National Energy Policy initiative.

IEA Secretariat estimates.



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# 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.



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# Kuwait

## General notes

Data for Kuwait 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 Saudi Arabia.

Information for the use of ethane in the petrochemical sector is available from 2008 onwards. This may lead to breaks in time series for ethane and naphtha production in the petrochemical industry and consumption between 2007 and 2008.

Electricity outputs from crude oil are not separated from other oil products electricity output. Electricity own use by power plant prior to 2015 may include electricity consumption by water desalination plant.

In the 2021 edition, natural gas production data were revised based on Cedigaz data from 2009 onwards. Naphtha exports data were revised based on JODI data from 2009 onwards.

In the 2021 edition, following products and flows were revised as new information became available from the Kuwait Institute for Scientific Research: electricity losses and final consumption data from 2014 onwards; electricity own use by power plant from 2015 onwards to exclude electricity consumption by water desalination plant; solar PV generation from 2016 onwards; and wind generation from 2013 onwards.

In the 2020 edition, complete official data from Kuwait about primary and secondary oil for 2018 were not obtained in time for publication. The IEA Secretariat estimated the data based on secondary sources.

In the 2020 edition, new data on fossil fuels' input to electricity generation led to revisions of main activity electricity generation by fuel from 2007 onwards.

In the 2020 edition, due to newly available information, the use of ethane in the petrochemical sector was revised from 2014 onwards.



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In the 2020 edition, diesel exports, motor gasoline exports and stock changes were revised based on JODI data from 2002 onwards. These may include small quantities of aviation gasoline.

In the 2020 edition, electricity generation from solar photovoltaics and wind has been estimated, based on the International Renewable Energy Agency (IRENA) data.

In the 2018 edition, data became available for oil products consumption. Revisions in oil products may be seen between 2012 and 2015.

# Sources

## Sources 1992 to 2020:

Direct communication with the Kuwait Institute for Scientific Research (KISR), Kuwait City.

*Electrical Energy Statistical Year Book*, Ministry of Electricity and Water, Kuwait City, various editions up to 2021.

*Annual Report,* Kuwait National Petroleum Company, Ahmadi, various editions up to 2018-2020.

*Natural Gas in the World,* Cedigaz, Paris, various editions up to 2021.

*Annual Statistical Bulletin,* Organization of Petroleum Exporting Countries (OPEC), Vienna, various editions up to 2021.

*Annual Statistical Report*, Organization of Arab Petroleum Exporting Countries (OAPEC), Kuwait, various editions up to 2021.

*JODI Oil World database*, Joint Organisations Data Initiative (JODI), Riyadh, accessed in June 2022: https://www.jodidata.org/oil/

*Annual Statistical Abstract*, Central Statistical Bureau, State of Kuwait, various editions up to 2017-2018.

*Renewable energy statistics 2020*, International Renewable Energy Agency (IRENA), Abu Dhabi, 2022.

*Statistical Bulletin,* Arab Union of Producers, Transporters and Distributors of Electricity (AUPTDE), Amman, 2011 to 2018.



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*Annual Electrical Statistics*, Ministry of Electricity and Water, Safat, various editions up to 2009.

Direct communication with the Ministry of Planning, Ministry of Oil and the Ministry of Electricity & Water, Kuwait City.

*Monthly Digest of Statistics,* Ministry of Planning, Central Statistical Office, Kuwait, 1999.

*A Survey of the Kuwait Oil Industry,* Embassy of the United States of America in Kuwait City, Kuwait, 1993.

*Twelfth Annual Report 1991-1992,* Kuwait Petroleum Corporation, Kuwait, 1993.

*The United Nations Energy Statistics Database*, United Nations Statistical Division, New York.

IEA Secretariat estimates.

## Sources up to 1991:

*Quarterly Statistical Bulletin,* Central Bank of Kuwait, Kuwait, various editions from 1986 and 1987.

*The Kuwaiti Economy,* Central Bank of Kuwait, Kuwait City, various editions from 1980 to 1985.

*Annual Statistical Abstract,* Ministry of Planning, Central Statistical Office, Kuwait City, 1986 and 1989.

*Monthly Digest of Statistics,* Ministry of Planning, Central Statistical Office, Kuwait City, various editions from 1986 to 1990.

*Economic and Financial Bulletin Monthly,* Central Bank of Kuwait, Kuwait City, various editions from 1983 to 1986.

*Kuwait in Figures,* National Bank of Kuwait, Kuwait City, 1986, 1987.

## Sources for Biofuels and waste:

*Forestry Statistics,* Food and Agriculture Organisation (FAO), Rome, 2001.

IEA Secretariat estimates.



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# 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.



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## 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.

*CIS and East European Energy Databook*, Eastern Bloc Research Ltd, Tolsta Chaolais, 2008 to 2012.

*Natural Gas Vehicles Statistics,* International Association for Natural Gas Vehicles, online database: www.iangv.org.

*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.

Asian Development Bank, Mandaluyong.

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.



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# Lao People's Democratic Republic

## General notes

The IEA Secretariat added the Lao People's Democratic Republic energy data from 2000 onwards in the 2020 edition. Before 2000, data are included in the "Other non-OECD Asia" region.

Breaks in coal time series in 2014-2015 reflect the start in operations of the lignite mine-mouth Hongsa Power Plant. While operation started in 2015, the last unit started operation in the first quarter of 2016.

## Sources

### Sources 2016 to 2020:

Direct communication with the Ministry of Energy and Mines, Vientiane.

*Energy Demand and Supply of the Lao People's Democratic Republic 2010-2018,* prepared by Ministry of Energy and Mines, Lao PDR, Vientiane, and supported by the Economic Research Institute for ASEAN and East Asia (ERIA), Jakarta, February 2020.

IEA Secretariat estimates.

### Sources 2000 to 2015:

*Lao PDR Energy Statistics 2018*, prepared by Ministry of Energy and Mines, Lao PDR, Vientiane, and supported by the Economic Research Institute for ASEAN and East Asia (ERIA), Jakarta, July 2018.

### Sources for biofuels and waste:

*Forestry Statistics,* Food and Agriculture Organisation (FAO), Rome, accessed in June 2022: http://www.fao.org/faostat.

IEA Secretariat estimates.



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# Lebanon

## General notes

Data for Lebanon are available starting in 1971.

In the 2022 edition, many data on the electricity sector and oil products supply for 2020, usually provided by the Central Administration of Statistics, were not available. Thus, the IEA Secretariat estimated those 2020 statistics based on the available information.

In the 2021 edition, the use of landfill biogas for electricity generation in the landfill of Naameh is included for the first time. Data from the Central Administration of Statistics shows that operations started during 2018.

In addition, wood imports from 1999 to 2016 have been revised to take into account new information available from the Food and Agriculture Organisation (FAO).

In the 2020 edition, electricity production, losses and final consumption from 2012 onwards were revised due to new information from the Central Administration of Statistics.

In the 2020 edition, the IEA Secretariat revised the electricity generated from diesel and fuel oil by main activity producers, from 1998 and from 2010 onwards respectively.

In the 2020 edition, solar photovoltaics and wind electricity generation was estimated by the IEA Secretariat based on International Renewable Energy Agency (IRENA) data.

In the 2020 edition, charcoal time series were revised for the period 1992-2003, due to new information from FAO.

In the 2020 edition, the IEA Secretariat estimated 2017 and 2018 wood imports based on FAO imports data.

A significant share of electricity generated in Lebanon is produced using private generators. The corresponding electricity outputs and inputs were estimated by the IEA Secretariat based on Association Libanaise pour la Maîtrise de l'Energie et l'Environnement (ALMEE) figures until 2014 and expert analysis for 2015 to 2018.



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Customs data for trade of oil products may be misleading due to the existence of informal trade with neighbouring countries.

# Sources

## Sources up to 2020:

*Les bilans énergétiques au Liban,* Association Libanaise pour la Maîtrise de l'Energie et de l'Environnement, Beirut, 2007 to 2015.

*L'Energie au Liban,* Association Libanaise pour la Maîtrise de l'Energie et de l'Environnement, Beirut, 1994 to 2006.

*L'Energie au Liban, le Défi,* Association Libanaise pour la Maîtrise de l'Energie, Beirut, December 1996.

*Renewable energy statistics 2021*, International Renewable Energy Agency (IRENA), Abu Dhabi, 2021.

*Renewable capacity statistics 2022*, International Renewable Energy Agency (IRENA), Abu Dhabi, 2022

Thematic Time Series: Electricité du Liban (EDL) 1995-2021, Central Administration of Statistics, Beirut.

Thematic Time Series: Imported Petroleum products 1995-2019, Central Administration of Statistics, Beirut.

*Solar Heat Worldwide*, AEE - Institute for Sustainable Technologies, Gleisdorf, IEA Solar Heating & Cooling Programme, various editions up to 2021.

*Renewable Energy in Lebanon in 2015,* Association Libanaise pour la Maîtrise de l'Energie et de l'Environnement, Beirut.

IEA Secretariat estimates.

## Sources for biofuels and waste:

*Le marché du solaire thermique au Liban,* Association Libanaise pour la Maîtrise de l'Energie et de l'Environnement, Beirut, 2010.

*Forestry Statistics,* Food and Agriculture Organisation (FAO), Rome, accessed in May 2021: http://www.fao.org/faostat.

IEA Secretariat estimates.



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# Libya

## General notes

Data for Libya 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.

In the 2022 edition, data on natural gas production (2005-2014) and consumption (2005-2019) were updated based on revisions from Cedigaz (2005-2014) and the Gas Exporting Countries Forum (GECF) (2016-2019).

In the 2021 edition, energy industry own use and consumption flows for natural gas were revised from 2010-2018 to reflect newly accessed data published by the GECF.

Also in the 2021 edition, non-energy use of naphtha was revised from 2011-2018 to reflect information on petrochemical production published by the Central Bank of Libya (CBL) and the National Oil Corporation. These revisions resulted in changes to naphtha transfers, NGL transfers, and NGL production over the same period.

In the 2021 edition, non-energy use of lubricants was revised from 2010-2011 to match data reported by CBL. Following years (2012-2018) were estimated to grow with the national economy. Lubricants imports were revised to reflect these changes in consumption.

Also in the 2021 edition, updates to 2018 ICAO data led to revisions in jet kerosene exports, international aviation bunkers, and domestic aviation for 2018.

In the 2020 edition, the IEA Secretariat started estimating the charcoal production and consumption based on Food and Agriculture Organisation (FAO) data. This led to revisions and breaks in time series between 2001 and 2002.

In the 2020 edition, the OPEC revised other kerosene production and importation data up to 1995.

In the 2020 edition, the IEA Secretariat revised its estimation methodology for natural gas production; data were revised up to 2014.

In the 2019 edition, the IEA Secretariat started estimating domestic aviation. This led to revisions and breaks in time series between 2004 and 2005.



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Due to lack of official country data, oil products trade and solid biofuels data are estimated by the IEA Secretariat. Data for natural gas inputs to electricity are unavailable from 2015 to 2018.

Non-technical losses and data uncertainty result in break in time series for electricity losses and statistical differences between 2011 and 2012.

Due to information on oil and electricity becoming available from 2006, breaks in time series may occur between 2005 and 2006.

# Sources

## Sources 1971 to 2020:

*Statistical Bulletin*, Central Bank of Libya, Tripoli, various editions up to 2019.

*Annual Statistical Report*, Organization of Arab Petroleum Exporting Countries (OAPEC), Kuwait, various editions up to 2021.

*Annual Statistical Bulletin*, Organization of Petroleum Exporting Countries (OPEC), Vienna, various editions up to 2021.

*Statistical Bulletin*, Arab Union of Producers, Transporters and Distributors of Electricity (AUPTDE), Amman, various editions up to 2018.

*Natural Gas in the World*, Cedigaz, Paris, various editions up to 2021.

*GECF Annual Statistical Bulletin,* Gas Exporting Countries Forum, Doha, 2021.

OAG (2021), *Origin-Destination of Commercial Flights* (database), OAG Aviation, Luton, www.oag.com/analytics/traffic-analyser.

*Annual Report,* International Civil Aviation Organization (ICAO), 2019, United Nations, New York.

*Renewable energy statistics 2021*, International Renewable Energy Agency (IRENA), Abu Dhabi, 2021.

Bulletin Statistique Annuel, Comité Maghrébin d'électricité (COMELEC), Algiers, various editions up to 2015.

Direct communication with the Ministry of Electricity and Renewable Energy, Tripoli, until 2015.

*Annual Report*, 2008, General Electricity Company (GECOL), Tripoli.



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*Statistical Abstract of Libya*, 19th vol., Government of Libya, Tripoli, 1983.

IEA Secretariat estimates.

## Sources for biofuels and waste:

*The United Nations Energy Statistics Database*, United Nations Statistical Division, New York.

*Forestry Statistics,* Food and Agriculture Organisation (FAO), Rome, accessed in February 2022: http://www.fao.org/faostat.

IEA Secretariat estimates.



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# Madagascar

## General notes

Madagascar data are available starting in 1971.

Significant amounts of coal are imported and consumed in Ambatovy mine, one of the world's largest lateritic nickel mines. This has a significant impact on the energy supply requirements of Madagascar.

At the time of preparation of the 2022 edition, the official energy balance for year 2020 was not made available to the IEA Secretariat by the Ministère de l'Énergie et des hydrocarbures. Therefore, most 2020 data have been estimated by the IEA Secretariat.

At the time of publication of the 2021 edition, complete data were available for 2019, but not for 2018. Supply and demand of solid biofuels as well as demand and stock changes of oil products, are estimated by the IEA Secretariat for 2018.

Small quantities of anthracite imports could be included in other bituminous coal from 2011 onwards.

Oil demand fell significantly in 2002 due to the political and social situation at the time.

The only refinery in Madagascar ceased its activities in 2004.

## Sources

### Sources 1995 to 2020:

*Système d'Information Énergétique de Madagascar*, Ministère de l'Énergie et des hydrocarbures, Antananarivo, last accessed in June 2022: http://www.energie.mg/

*Bilan Energetique National*, Ministère de l'Énergie et des hydrocarbures, Antananarivo, various editions up to 2019

*Bulletin du Marché Pétrolier*, Ministère de l'Énergie et des hydrocarbures, Antananarivo, various editions up to 2nd semester 2020: http://www.energie.mg/

*Evolution annuelle des productions, ventes et nombre d'abonnés*, Office de Régulation de l'Electricité, Antananarivo, last accessed in June 2022: http://www.ore.mg/.



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*Tableau de Bord Economique,* Institut National de la Statistique, Antananarivo, January 2019.

*Données statistiques,* Officine Malgache des Hydrocarbures, Antananarivo, last accessed in April 2021: http://www.omh.mg/.

*Annual Sustainability Report,* Ambatovy Mine, Antananarivo, 2012 to 2018 editions.

AFREC Energy questionnaire, African Energy Commission, Algiers, 2016 to 2017.

*UN Comtrade*, United States Statistical Division, New-York, last accessed April 2021, http://comtrade.un.org/.

*The United Nations Energy Statistics Database*, United Nations Statistical Division, New York, various editions up to 2020.

*Forestry Statistics*, FAO, Rome, last accessed in October 2020: http://www.fao.org/faostat.

*Crop Statistics*, FAO, Rome, accessed in October 2020: http://www.fao.org/faostat.

IEA Secretariat estimates.

## Sources 1971 to 1994:

*UN Comtrade*, United States Statistical Division, New-York, accessed April 2020, http://comtrade.un.org/.

The UN Energy Statistics Database, United Nations Statistical Division, New York, various editions up to 2020.

*Evolution annuelle des productions, ventes et nombre d'abonnés*, Office de Régulation de l'Electricité, Antananarivo, accessed in May 2020: http://www.ore.mg/.

IEA Secretariat estimates.



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# Malaysia

## General notes

Data for Malaysia are available starting in 1971.

For natural gas production from the Joint-Development Areas (JDA) with Thailand and with Indonesia, Malaysia reports only the production that corresponds to Malaysia. The rest is reported as imports. For the JDA with Viet Nam, the production reported includes all the gas produced.

LPG data may include ethane. Kerosene type jet fuel data may include aviation gasoline. Other bituminous coal data may include other coal products.

In the 2022 edition, 2020 official energy balances from the Energy Commission were not available in time for publication. Most flows were therefore estimated by the IEA Secretariat.

In the 2021 edition, 2019 official energy balances from the Energy Commission were not available in time for publication. Most flows were therefore estimated by the IEA Secretariat based, where relevant, on International Trade Centre data, or on GDP and population developments.

In the 2021 edition, naphtha, lubricants, bitumen, paraffin wax and petroleum coke data from 2007 to 2009 were aggregated as other non-specified oil products.

In the 2020 edition, other vegetal material and residue flows from 1971 to 2008 were revised. Natural gas use in non-specified transformation from 2005 onwards was revised as new information became available. Natural gas own use by liquefaction/regasification plants for 2017 was estimated due to the lack of information.

In the 2019 edition, the whole time series of solid biofuels were revised in response to the request raised by Energy Commission of Malaysia.

In the 2012 edition, new information on the solid biofuels final consumption became available. This may lead to breaks in time series between 2008 and 2009.

Detailed information on oil products such as naphtha, petroleum coke, lubricants, bitumen and paraffin waxes is only available from 2007 to 2009. From 2010



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onwards, these quantities are presented in aggregate form under the category other non-specified oil products.

From 2009 onwards, electricity generation from co-generators, small renewable power producers and self-generators is available. As a consequence, breaks in time series may appear for electricity between 2008 and 2009.

# Sources

## Sources 2000 to 2020:

Direct communication with the Energy Commission, Putrajaya.

*National Energy Balance,* Malaysia, Energy Commission, Putrajaya, 2009 to 2019.

*JODI Oil World database*, Joint Organisations Data Initiative (JODI), Riyadh, accessed in June 2022: https://www.jodidata.org/oil/ .

*Renewable energy statistics 2021*, International Renewable Energy Agency (IRENA), Abu Dhabi.

Trade Map, International Trade Centre, Geneva, accessed in June 2021: http://www.intracen.org/.

*Electricity Supply Industry in Malaysia*, Performance and Statistical Information, Malaysia Energy Commission, Putrajaya, 2009 to 2016.

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*Monthly exports of oil palm products*, Malaysia Palm Oil Board, Kuala Lumpur.

*Asia-Pacific Economic Cooperation annual energy questionnaires*, Asia Pacific Energy Research Centre (APERC), Tokyo, 2009, 2011.

*National Energy Balance Malaysia,* Ministry of Energy, Water and Communication, Kuala Lumpur, 2002 to 2008.

## Sources up to 2000:

Direct communication with Petroliam Nacional Berhad, Kuala Lumpur, April 2001.



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## Sources for biofuels and waste:

*Monthly exports of oil palm products*, Malaysia Palm Oil Board, Kuala Lumpur.

*The United Nations Energy Statistics Database*, United Nations Statistical Division, New York.

*Forestry Statistics,* Food and Agriculture Organisation (FAO), Rome, accessed in June 2022: http://www.fao.org/faostat.

IEA Secretariat estimates.



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# 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.



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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.



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# 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.

Statistics Mauritius website, under the Ministry of Public Utilities, Port Louis, accessed in July 2021: statsmauritius.gov.mu.

*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.



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# 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.



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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 Moldovian 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.



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# Mongolia

## General notes

Data for Mongolia are available starting in 1985. Prior to 1985, they are included in the “Other non OECD Asia” aggregate.

In the 2022 edition, disaggregated 2020 coal balance table comprising of hard coal and brown coal data is provided by National Statistics Office of Mongolia. This led to the breaks in time series between 2019 and 2020 for coking coal, bituminous coal and lignite.

In the 2021 edition, 2017 and 2018 electricity generation from hydro, wind and solar PV were revised as new data from Ministry of Energy became available.

In the 2018 edition, data for renewable electricity production became available. This might create breaks in time series between 2002 and 2003.

In the 2015 edition, data allowing a disaggregation of coal by type became available. In addition, time series were revised from 2005 forward. Breaks in time series between 2004 and 2005 may result.

## Sources

### Sources 1985 to 2020:

Direct communication with the National Statistics Office of Mongolia, Ulaanbaatar.

*Mongolian Statistical Information Service*, National Statistical Office, Ulaanbaatar, accessed in May 2022: www.1212.mn.

*Renewable energy statistics 2021*, International Renewable Energy Agency (IRENA), Abu Dhabi, 2021.

*Mongolian Statistical Yearbook*, National Statistical Office, Ulaanbaatar, various editions up to 2020.

*Energy sector production data*, Ministry of Energy, Ulaanbaatar, 2017 to 2020.

*Mongolian Statistical Bulletin, December 2009,* National Statistical Office, Ulaanbaatar, 2009.



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Online database, Asian Development Bank, Mandaluyong, accessed in 2006: www.adb.org.

IEA Secretariat estimates.

## Sources for biofuels and waste:

*Forestry Statistics,* Food and Agriculture Organisation (FAO), Rome, accessed in May 2022: http://www.fao.org/faostat.

IEA Secretariat estimates.



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# 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.



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# 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.



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Electricity consumption by economic sector from direct communication with Office National de l'Electricité, Casablanca.

## Sources up to 1991:

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*Le Maroc en Chiffres 1986,* Ministère du Plan, Direction de la Statistique, Rabat, 1987.

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Rapport sur les Données Energétiques Nationales 19791981, Ministère de l'Energie et des Mines, Rabat, 1982.

## Sources for biofuels and waste:

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.



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# Mozambique

## General notes

Data for Mozambique are available starting in 1971.

The Mozal aluminium smelter opened in 2000, leading to significant changes in trends of electricity demand.

In the 2022 edition, new information from the Ministry of Energy became available to the IEA regarding Kerosene-type Jet Fuel consumption in Mozambique, leading to revisions of the time series between 2011 and 2019 for International Aviation Bunkers and Domestic Aviation consumption.

In the 2021 edition, the Ministry of Energy revised its energy balances for 2011 – 2018, leading to revisions of all products and flows. Breaks in time series might occur between 2010 and 2011. Data on bitumen importation and consumption, bagasse production and electricity generation from bagasse were added for the first time.

In the 2020 edition, petroleum coke data is included from 2000 onwards. Due to the opening of a new pit in Moatize mine, breaks in time series may happen for coal between 2016 and 2017.

## Sources

### Sources 1992 to 2020:

Direct communication with Ministério dos Recursos Minerais e Energia (MIREME), Maputo.

Direct communication with the National Petroleum Institute, Maputo.

Direct communication with the African Energy Commission (AFREC), Algiers.

*Annual Statistical Yearbook 1993, 1994, 1995*, Eskom, Johannesburg, 1994, 1995, 1996, citing Electricidade de Mozambique, Maputo, as source.

*The United Nations Energy Statistics Database*, United Nations Statistical Division, New York.

*Petroleum and Other Liquids exports by destination*, US Energy Information Administration (EIA), Washington DC, accessed in May 2022: http://www.eia.gov.



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*UN Comtrade*, United States Statistical Division, New York, accessed in May 2022: http://comtrade.un.org/.

*OAG (2022)*, *Origin-Destination of Commercial Flights* (database), OAG Aviation, Luton, www.oag.com/analytics/traffic-analyser.

IEA Secretariat estimates.

## Sources up to 1991:

IEA Secretariat estimates.

## Sources for biofuels and waste:

Direct communication with Ministério dos Recursos Minerais e Energia (MIREME), Maputo.

IEA Secretariat estimates.



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# Myanmar

## General notes

Data for Myanmar are available starting in 1971.

Data from the Myanmar Central Statistical Organisation are reported on a fiscal year basis, beginning on 1 April and ending on 31 March of the subsequent year.

At the time of preparation of the 2022 edition, the official annual data for 2020 were not complete. As a consequence, Myanmar's 2020 energy balance was estimated by the IEA Secretariat based on Myanmar Statistical Information Service and a variety of secondary sources.

In the 2021 edition, the IEA Secretariat revised 2018 figures for indigenous production of natural gas and 2017 and 2018 data for hydroelectricity due to new information available from Myanmar Central Statistical Organisation.

In the 2021 edition, use of renewable municipal waste in main activity producer electricity in 2017 and 2018 and, consequently, electricity generation was revised by the IEA Secretariat based on data from the International Renewable Energy Agency (IRENA). In the 2019 edition, a detailed breakdown by coal type data, renewable data and some oil products data became available from 2016 onwards. This might result in breaks in time series between 2015 and 2016.

In the 2018 edition, demand data for all energy products and coal trade data became available for 2016. This might result in breaks in time series between 2015 and 2016.

## Sources

### Sources 1992 to 2020:

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*Myanmar Statistical Yearbook,* Myanmar Central Statistical Organization, Nay Pyi Taw, various editions up to 2019.

*Renewable energy statistics 2021*, International Renewable Energy Agency (IRENA), Abu Dhabi, 2021.



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*Oil and Thailand,* Ministry of Energy, Department of Alternative Energy Development and Efficiency, Bangkok, 2007 to 2013.

Direct communication with the Ministry of Energy, Planning Department, Rangoon, 2006-2007.

*Review of the Financial Economic and Social Conditions,* Ministry of National Planning and Economic Development, Central Statistical Organisation, Rangoon, 1995, 1996.

*Statistical Yearbook,* Ministry of National Planning and Economic Development, Central Statistical Organisation, Rangoon, 1995, 1996.

*The United Nations Energy Statistics Database*, United Nations Statistical Division, New York.

The ASEAN Energy Statistics Database.

*Online database*, Asian Development Bank, Mandaluyong.

*Natural Gas in the World*, Cedigaz, Paris, various editions up to 2021.

IEA Secretariat estimates.



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## Sources up to 1991:

*Sectoral Energy Demand in Myanmar,* UNDP Economic and Social Commission for Asia and the Pacific, Bangkok, 1992.

*Selected Monthly Economic Indicators, paper no. 3,* Ministry of Planning and Finance, Central Statistical Organization, Rangoon, 1989.

## Sources for biofuels and waste:

Wood data have been submitted by the Ministry of Energy, Rangoon, from 1985 to 2003.

IEA Secretariat estimates based on 1990 data from *UNDP Sixth Country Programme Union of Myanmar,* World Bank, Programme Sectoral Review of Energy, by Sousing et. al., Washington DC, 1991.



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# Namibia

## General notes

Data for Namibia are available starting in 1991. Prior to that, data are included in the Other Africa region.

NamPower data are published on a fiscal year basis spanning from 1st of July Y-1 to 30th of June Y. Data for 2020 coming from NamPower correspond to 1st July 2019 to 30th June 2020 This can explain inconsistencies between data sources.

In the 2022 edition, solar PV (2018-2019) and solid biofuels (2019) data were revised based on new data made available by the International Renewable Energy Agency (IRENA) and the Food and Agriculture Organisation (FAO), respectively.

Electricity final consumption data allocated to non-specified other sectors may contain residential consumption of electricity.

In the 2020 edition, fuelwood production, fuelwood input to charcoal production and charcoal production were revised from 1991 onwards based on Food and Agriculture Organisation (FAO) data.

In the 2020 edition, other vegetal matters and residues production and use were revised from 2013 onwards based on population growth.

In the 2020 edition, LPG use was revised from 1996 onwards based on national data on sales and economic growth, while imports were revised from 2016 onwards based on the United Nations Comtrade database.

In the 2018 edition, charcoal exports were revised from 2000 onwards based on FAO data. This may create break in time series between 1999 and 2000.

## Sources

### Sources 1991 to 2020:

*NamPower Annual Report*, Namibia Power Corporation, Windhoek, various editions up to 2021.

*Solar Heat Worldwide*, AEE - Institute for Sustainable Technologies, Gleisdorf, IEA Solar Heating & Cooling Programme, various editions up to 2022.



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IEA Secretariat estimates.

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*The United Nations Energy Statistics Database*, United Nations Statistical Division, New York.

*Forestry Statistics*, Food and Agriculture Organisation (FAO), Rome, accessed in February 2022: http://www.fao.org/faostat.

IEA Secretariat estimates.



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# Nepal

## General notes

Data for Nepal are available starting in 1971.

Data are reported by Nepal on a fiscal year basis. Data for 2020 correspond to 1 July 2020 – 30 June 2021.

In the 2021 edition, due to lack of official country data from Economic Survey by Ministry of Finance and Nepal Oil Corporation, production and consumption of coal and biofuels, renewable electricity generation and consumption of oil products for 2019 year have been estimated by the IEA Secretariat.

In the 2021 edition, trade of bitumen and bituminous coal from 2012 onwards were revised based on official customs data.

## Sources

### Sources up to 2020:

Direct communication with the Water and Energy Commission Secretariat (WECS), Ministry of Water Resources, Kathmandu.

*A Year in Review,* Nepal Electricity Authority, Durbar Marg, Kathmandu, various editions up to fiscal year 2020/21.

*Economic Survey 2019/20*, Ministry of Finance, Kathmandu.

*Foreign Trade Statistics 2020/21,* Department of Customs, Ministry of Finance, Kathmandu.

*Annual Report,* International Civil Aviation Organization **(**ICAO), 2020, United Nations, New York.

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*Energy Sector Synopsis Report*, Water and Energy Commission Secretariat (WECS), Kathmandu, July 2010.

IEA Secretariat estimates.



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## Sources up to 1996:

*The United Nations Energy Statistics Database*, United Nations Statistical Division, New York.

IEA Secretariat estimates.

## Sources for biofuels and waste:

Water and Energy Commission Secretariat (WECS), Ministry of Water Resources, Kathmandu.

IEA Secretariat estimates.



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# Nicaragua

## General notes

Data for Nicaragua are available starting in 1971.

In the 2021 edition, 2018 data has been revised to include information from the Ministerio de Energía y Minas, which was not available at the time of the 2020 edition's publication. This revision affects most energy products and flows.

In addition specific revisions have been made to gasoline consumption from 2003 and jet fuel kerosene supply and consumption from 2010 to utilise the ministry's energy balance information and estimates for domestic aviation consumption and aviation bunkers have been revised from 2017. This may create a break in the time series.

The 2021 edition also includes new national data on the use of animal waste for the production of biogas in anaerobic bio-digesters. This creates a break in the time series between 2018 and 2019 for solid biofuels.

In the 2020 edition, data between 2005 and 2017 were revised to account for energy balance information available from the Ministerio de Energía y Minas. At the time of publication, 2018 data were not fully available. For this reason, 2018 data published in 2020 included estimates from the Latin American Energy Organization (OLADE).

## Sources

### Sources up to 2020:

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*Energy Information System of Latin America and the Caribbean (sieLAC),* Latin American Energy Organization (OLADE), Quito, accessed in March 2022: http://sielac.olade.org/.

*Generación Bruta por Tipo de Planta*, Instituto Nicaragüense de Energía, Managua, editions 1991 to 2020, last accessed in May 2022: https://www.ine.gob.ni/.



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*Consumo de Combustible por Tipo de Planta*, Instituto Nicaragüense de Energía, Managua, editions 1991 to 2020, last accessed in May 2022: https://www.ine.gob.ni/.

*Consumo nacional de hidrocarburos,* Instituto Nicaragüense de Energía, Managua, various editions up to 2020, last accessed in May 2022: https://www.ine.gob.ni/.

*Importaciones de hidrocarburos,* Instituto Nicaragüense de Energía, Managua, editions 1998 to 2020, last accessed in May 2022: https://www.ine.gob.ni/.

*Centroamérica: Estadísticas de Hidrocarburos,* Comisión Económica para América y el Caribe (CEPAL), United Nations, Mexico City, various editions up to 2019.

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*Balance Energético Nacional*, Ministerio de Energía y Minas, Managua, 1999 to 2007.

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# Niger

## General notes

Data for Niger are available starting in 1971. Data prior to 2000 were added in the 2021 edition and sourced from the United Nations Statistics Division (UNSD). This addition led to breaks in time series between 2000 and 2001, particularly in solid biofuels time series. In previous editions, data for this time period were included in the “Other Africa” region.

At the time of preparation of the 2021 edition, no official data were available from Niger for 2017 to 2019. As a consequence, the statistics and balances for these years have been created based on available economic indicators from the United Nations Statistics Division (UNSD) and newly available energy data from the Système d'Informations Energétiques de l'Union Economique et Monétaire Ouest-Africaine (SIE-UEMOA). Data for 2017 to 2019 have been revised to reflect this new source. Electricity flows, diesel flows, crude oil production, and LPG consumption in electricity plants have also been revised for 2016.

Natural gas production and consumption in electricity plants for 2018 and 2019 and LPG consumption in autoproducer electricity plants for 2010 to 2019 are new in the 2021 edition.

At the time of preparation of the 2021 edition, electricity generation data in GWh are not available for individual secondary oil products. Consequently, total electricity generation from oil products is reported under non-specified oil products for all years. The division of electricity generation by main activity producers and autoproducers is also not available for 2016 to 2019 and has been estimated based on 2015 data.

In the 2019 edition, the IEA secretariat started to estimate domestic aviation. The revisions made to integrate this information lead to breaks in time series between 2000 and 2001.

## Sources

### Sources up to 2020:

Système d'Informations Energétiques de l'Union Economique et Monétaire Ouest-Africaine (SIE-UEMOA), UEMOA Commission, Ouagadougou, last accessed in March 2022: http://sie.uemoa.int/.



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OAG (2021), *Origin-Destination of Commercial Flights* (database), OAG Aviation, Luton, www.oag.com/analytics/traffic-analyser.

Direct communication with the Ministry of Energy and Oil, Niamey.

IEA Secretariat estimates.

## Sources for biofuels and waste:

Système d'Informations Energétiques de l'Union Economique et Monétaire Ouest-Africaine (SIE-UEMOA), UEMOA Commission, Ouagadougou, last accessed in March 2022: http://sie.uemoa.int/.

Direct communication with the Ministry of Energy and Oil, Niamey.

IEA Secretariat estimates.



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# Nigeria

## General notes

Data for Nigeria are available starting in 1971.

Nigeria is one of the ten countries that benefit from EU Support to IEA Data for Affordable and Sustainable Energy System for Sub-Saharan Africa.

Crude oil production and export data may include field condensate.

Statistical differences may include stocks and unofficial trade flows.

Inputs of motor gasoline and gas/diesel to back-up electricity generation, as well as the associated electricity outputs, which may be substantial in Nigeria, may not be properly reported.

In the 2022 edition, electricity output from hydro (2015, 2018-2019) and solar PV (2013-2015) was updated to align with revisions to data provided by the International Renewable Energy Agency (IRENA).

In the 2022 edition, gas/diesel oil consumption in the road transport sector was re-estimated from 2018 to 2019 based on sectoral GDP growth reported by the Central Bank of Nigeria.

In the 2022 edition, fuel oil, bitumen, and non-specified oil products production was revised for 2019 based on data from the Joint Organisations Data Initiative (JODI). Consequently, non-specified oil products imports and transfers and refinery feedstocks transfers and transformation were revised for 2019 based on IEA Secretariat estimates and data from the Nigerian National Petroleum Corporation.

In the 2019 edition, the IEA Secretariat started to estimate domestic aviation. The revisions made to integrate this information led to breaks in time series between 2009 and 2010.

In the 2018 edition, new information became available through the department of Petroleum Resources. Breaks in time series can be observed between 2009 and 2010 for motor gasoline, jet kerosene, diesel, and fuel oil; and between 2013 and 2014 for lubricants. Electricity losses have been fixed at 15% starting from 2007.

In the 2017 edition, new information became available through the Nigerian National Petroleum Corporation for natural gas liquids. Break in time series can be observed between 2012 and 2013.



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In the 2017 edition, naphtha data were added. Breaks in time series can be observed in other oil products and naphtha in 2003 and 2015.

In the 2015 edition, new information became available indicating that on-grid power generation has been fuelled by natural gas for many years. This may lead to breaks in time series between 1996 and 1997.

# Sources

## Sources 1992 to 2020:

Direct communication with the Energy Commission of Nigeria, Abuja.

Direct communication with the African Energy Commission, Algiers, Algeria.

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*Annual Petroleum Bulletin*, Nigerian National Petroleum Corporation (NNPC), Abuja, various editions from 1998 to 2020.

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IEA Secretariat estimates.

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*Basic Energy Statistics for Nigeria,* Nigerian National Petroleum Corporation, Lagos, 1984.

*NNPC Annual Statistical Bulletin,* Nigerian National Petroleum Corporation, Lagos, 1983 to 1987.

*The Economic and Financial Review,* Central Bank of Nigeria, Lagos, various editions.

## Sources for biofuels and waste:

IEA Secretariat estimates based on 1991 data from *Forests and Biomass Sub-sector in Africa,* African Energy Programme of the African Development Bank, Abidjan, 1996.

Forestry Statistics, Food and Agriculture Organisation (FAO), Rome, various editions up to 2021.



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# 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.



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# Oman

## General notes

Data for Oman are available starting in 1971.

The interconnected nature of the Mina-Al-Fahal and Suhar oil refineries is reflected in the fuel oil data, leading to breaks in time series for some products between 2007 and 2008.

The 2021 edition includes revisions to crude oil refinery input in 2018, revisions to gasoline imports for 2018, revisions to kerosene residential consumption across the time series and revisions to jet fuel kerosene allocation between international aviation bunkers and domestic aviation from 2009 onwards, in order to reflect new information available and improved estimates. In the 2020 edition, solar photovoltaic production was included from 2013 onwards, based on capacity data from the International Renewable Energy Agency (IRENA).

In the 2014 edition, data on electricity from the Authority for Electricity Regulation became available; as a result, breaks in time series between 2004 and 2005 may be observed.

In 2006, the Suhar Refinery came online. Breaks in time series may be observed in oil products between 2005 and 2006.

## Sources

### Sources 2005 to 2020:

*Statistical Yearbook*, National Centre for Statistics and Information (NSCI), Muscat, various editions from 1999 to 2021.

*Annual report*, Authority for Electricity Regulation (AER), Oman, various editions from 2005 to 2021.

*Annual report,* Oman LNG Company, Ghala, various editions from 2009 to 2021.

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IEA Secretariat estimates.

## Sources 1992 to 2004:

Direct communication with the Ministry of National Economy, Muscat.

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Direct communication with the Ministry of Electricity & Water, Office of the Under Secretary, Ruwi, 1998 to 2001.

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*Annual Report*, Central Bank of Oman, Muscat, 1993.

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*Quarterly Bulletin on Main Economic Indicators,* Directorate General of National Statistics, Muscat, 1989.

*Statistical Yearbook,* Directorate General of National Statistics, Development Council, Muscat, 1985, 1986, 1988 and 1992.



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# Pakistan

## General notes

Data for Pakistan are available starting in 1971.

Data are reported on a fiscal year basis. Data for year Y represent the fiscal year that goes from 1st of July year Y to 30th of June year Y+1.

As Pakistan publishes oil products stock changes at an aggregated level, the IEA Secretariat estimates detailed stock changes by product.

Own use of electricity by industries with autoproducer electricity plants may not be captured.

For bitumen and lubricants, data for stock variations may include unreported trade or consumption.

At the time of preparation of the 2022 edition, 2020 official data for Pakistan were not available yet. 2020 data are therefore entirely estimated by the IEA Secretariat based on available secondary sources.

In the 2021 edition, the 2018 figures of electricity, non-combustible renewables, primary and secondary oil products, natural gas and coal products have been revised due to 2018 Energy Yearbook of Pakistan being available.

In the 2019 edition, various improvements were made in the following areas: oil refineries own use of all products has been split more accurately between fuel oil, LPG and refinery gas to take into account official data (2010-2016); official information on LPG stock changes has been introduced (2010-2016); LPG consumption in other non-specified sector has been revised to take into account official data (2001-2016); motor gasoline data has been revised to include production and imports of HOBC (High Octane Blending Component) as per official information (1996-2016); and imports of LNG have been taken into account based on official information (2014-2016).

In the 2009 edition, time series data for natural gas for the years 2004-2007 were revised due to the inclusion of the North-West Frontier Province data (now called KPK) and Pakistan Steel Mills. Breaks in time series may occur between 2003 and 2004.



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*Natural Gas in the World*, Cedigaz, Paris, various editions up to 2021.

*Renewable energy statistics 2022*, International Renewable Energy Agency (IRENA), Abu Dhabi, 2022.

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*Statistical Supplement 1993/1994,* Finance Division, Economic Adviser's Wing, Government of Pakistan, Islamabad, 1995.

IEA Secretariat estimates.

## Sources up to 1991:

*Monthly Statistical Bulletin, no. 12,* Federal Bureau of Statistics, Islamabad, December 1989.

*1986 Bulletin,* State Bank of Pakistan, Islamabad, 1987.

## Sources for biofuels and waste:

IEA Secretariat estimates based on 1991 data from *Household Energy Strategy Study (HESS), Islamabad,* 1991.



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# Panama

## General notes

Data for Panama are available starting in 1971.

International aviation bunkers figures for jet kerosene may include exports.

Import figures for diesel and residual fuel oil are calculated by excluding bunker use.

In the 2022 edition, the IEA Secretariat revised fuel oil and diesel imports and international marine bunkers data for 2018 and 2019 due to newly available information from Autoridad Marítima de Panamá.

In the 2021 edition, the IEA Secretariat revised electricity generation from oil products from 2010 onwards. This can lead to a break in time series between 2009 and 2010.

In the 2021 edition, the final consumption of diesel in agriculture and forestry was reclassified as fishing due to newly available information from the *Compendio Estadístico Energético*.

In the 2020 edition, the IEA Secretariat revised Panama data from 2010 onwards based on the national energy balances from the Ministry of Economics and Finance. This might affect electricity trade and losses, motor gasoline stock changes and road consumption, fuel oil imports and international marine bunkers, bituminous coal imports and inputs to main activity producer electricity plants.

In the 2020 edition, the final consumption of motor gasoline in agriculture and forestry was reclassified as fishing due to newly available information from the *Compendio Estadístico Energético.*

In the 2020 edition, LPG imports, exports, stock changes, final consumption in non-specified industry, in non-specified transport and in residential and commercial and public services from 2010 onwards were revised due to newly available data.

In the 2020 edition, the IEA Secretariat reported use of coal in autoproducers electricity plants as a new plant within the mining sector, Minera Panamá, started its operations in 2018.



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In the 2020 edition, due to the beginning of commercial operations of the Costa Norte plant on 1st of September 2018, the IEA Secretariat reported natural gas imports, use by main activity producers and corresponding electricity generation in 2018, based on available information from the Compendio Estadístico Energético.

In the 2019 edition, time series for fuelwood data were revised based on data from the Latin American Energy Organization (OLADE). Break in time series can be observed between 1999 and 2000.

From 2003 onwards, there has been no domestic production of oil products due to refinery closure.

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# 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.



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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.

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# Peru

## General notes

Data for Peru are available starting in 1971.

The 2021 edition includes revisions to coke oven coke from 2012, to reclassify a proportion of this as petroleum coke in line with ministry published data. There are also revisions to diesel stock changes from 2016 and non-specified oil production and NGL transfers from 2010, to incorporate additional information reported in the Balance Nacional de Energía.

In the 2020 edition, marine bunkers data for 2017 and 2018 is now reported by the Ministerio de Energía y Minas, as well as 2018 aviation bunkers. Electricity generation data is revised from 2016 to incorporate additional information from the Anuario Estadístico de Electricidad. NGL data was revised from 2004. Following information from national energy balances, transfers have been revised and refinery feedstocks data became available from 2012 onwards. Breaks in time series may occur between 2011 and 2012.

Liquid biofuels are included in the energy balances from 2010 onwards.

Between 2015 and 2016, there is a break in time series due to a restructuring of energy balance for demand side of energy products.

In the 2019 edition, an allocation between domestic and international aviation consumption of jet kerosene was estimated by the IEA Secretariat since 2010 and up to 2017. This may lead break in time series between 2009 and 2010.

In the 2018 edition, crude oil and NGL figures were revised for the years 2004-2015 due to change of the methodology. This may lead to different trends compared to previous editions of this publication.

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IEA Secretariat estimates.



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# Philippines

## General notes

Data for the Philippines are available starting in 1971.

In the 2021 edition, electricity consumption data for industry (1990-2011, 2016-2018), commercial and public services, agriculture and fishing sector (1990-2007) were revised as new information from the Ministry of Energy became available. Similarly, solid biofuels including fuelwood, bagasse, charcoal (1971-2018) and animal waste (1990-2009), as well as liquid biofuels including biogasoline and biodiesel (2005-2009, 2015, 2017) and municipal waste (2009) were revised as new information from Asia Pacific Energy Research Centre (APERC) became available.

In the 2021 edition, other bituminous coal and sub-bituminous coal data from 1990 onwards for supply side and input to power plants flow were revised as Ministry of Energy confirmed that only sub-bituminous coal is produced, traded and consumed in the Philippines.

In the 2020 edition, electricity final consumption was revised from 2016 onwards due to new information provided by the Department of Energy.

In the 2018 edition, data for 2012-2016 for bagasse has been revised. This may lead to breaks in time series between 2011 and 2012.

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IEA Secretariat estimates.



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# Qatar

## General notes

Data for Qatar are available starting in 1971.

Crude oil production and export data do not include field condensates.

Natural gas liquids (NGL) include field condensates, propane, butane and ethane production from natural gas processing plants. NGL produced from liquefied natural gas production plants and gas-to-liquids plants may be excluded.

Propane and butane from natural gas processing plants are transferred to liquefied petroleum gas (LPG). Ethane from natural gas processing plants is transferred to ethane.

Information on the use of LPG and ethane in the petrochemical sector is from 2005 onward. This may lead to breaks in time series for these products between 2004 and 2005.

In 2010, a new ethane cracker began operations in Ras Laffan, Qatar, with production capacity of 1.3 million tonnes per year. Breaks in time series in LPG and ethane production can be seen between 2009 and 2010.

Electricity production from autoproducers includes generation by desalination plants since 1988. Own use of electricity includes use by desalination plants since a breakdown is not available. Electricity consumption in industry includes electricity consumption by the energy sector.

Three satellite power stations located outside of Doha are included as main electricity producers up to 2014. In 2015, these power stations are not reported and are likely included as part of RAF-A station as auto production.

At the time of preparation of the 2022 edition, several of the usual sources were not available and 2020 oil and gas data were often estimated based on economic developments. OAPEC data was mainly used for oil products production.

In the 2022 edition, NGL transfers to Ethane and Ethane non-energy use were revised for the period 2011-2019, as new information from ethylene production plants became available to the IEA Secretariat.



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In the 2022 edition, Natural Gas consumption in Iron and Steel Industry data were revised for the period 2006-2019, as new information from Qatar Steel became available to the IEA Secretariat.

In the 2022 edition, Electricity Losses and Final Consumption were revised for year 2018, as new information from Kahramaa became available to the IEA Secretariat.

In the 2014 edition, revisions were made for refinery intake of crude oil production based on Qatar Petroleum reports.

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# 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.

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IEA Secretariat estimates.



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# Russian Federation

## General notes

Data for the Russian Federation are available starting in 1990. Prior to that, they are included in Former Soviet Union.

For 2020, all data have been estimated by the IEA Secretariat based on preliminary supply side data submitted during the 2020/21 cycle, the 2020 energy balances published by Rossstat, and other publically available sources.

Similarly, the 2021p data have been estimated by the IEA Secretariat based on official publically available sources.

For data prior to 2020, annual statistics are based on annual joint IEA/Eurostat/UNECE questionnaires submissions received from Rosstat, the official data provider to the IEA. Data may differ from secondary sources, and discrepancies are being investigated.

In 2007, the Federal State Statistics Service introduced a new classification, the Russian Classification of Economic Activities (OKVED), oriented towards harmonization with the Statistical Classification of Economic Activities in the European Community (NACE Rev.1). Data for the years prior to 2005 were submitted to the IEA Secretariat according to the Russian Classification of the Industries of the Economy (OKONKH). Therefore, breaks in time series for final consumption sectors may occur between 2004 and 2005.

## Coal

Coal statistics provided by Rosstat may differ from those collected by Rosinformugol. Blast furnace gas values since 2012 utilise a different methodology to that of prior years (where heat from other sources than blast furnace gas had been attributed to blast furnace gas). Some coal trade from partners of the Customs Union has been estimated by the IEA Secretariat and additionally removed from indigenous production where it may be reported in data of other organisations.

## Oil

For 2020, due to data availability, sectoral demand trends have been kept uniform for a given oil product. Furthermore, stock changes for several oil products have been used as a balancing item or kept zero.



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Due to the classification system (Russian Classification of Product by Economic Activities) used by the Russian administration, breaks between 2017 and 2018 occur in the time series of some products. In particular, there is a break in stocks for other oil products between 2017 and 2018 and an absence of data for refinery gas, which results in a reduction of total oil consumption in the chemical sector and refinery fuel use from 2018 onwards.

In the 2019 edition, naphtha exports and non-energy consumption in the chemical and petrochemical sector from 2011 to 2016 have been revised by the IEA Secretariat based on information provided by Rosstat. Prior to 2011 domestic consumption of naphtha was calculated as residual in the Russian balance and is likely to be overestimated.

Recent refinery upgrade projects have resulted in an increase in the production of gasoline and diesel affecting the refinery yield spread in 2017 and onwards.

Condensate quantities reported by Rosstat are included under natural gas liquids (NGL) rather than crude oil.

Jet kerosene output is confidential and estimated based on historical refinery throughput growth rate. No information on vacuum gas oil is available.

Jet kerosene consumption split between international and domestic aviation is unknown so consumption is equally split between the two flows.

LPG refinery output may include output from gas separation plants.

Information on international marine bunkers consumption is submitted from 2010 with high fluctuation in time series.

From 2017, data for gas/diesel oil deliveries to international marine bunkers was estimated by the IEA Secretariat.

2018 and 2019 data for non-energy use of LPG and white spirit in the chemical and petrochemical sector were estimated by the IEA Secretariat.

2019 data for output and consumption of naphtha in the chemical sector were estimated by the IEA Secretariat.

2018 and 2019 data for gas/diesel, fuel oil and white spirit output were estimated by the IEA Secretariat.

2018 and 2019 data for exports of gas/diesel oil, fuel oil and other oil products were estimated by the IEA Secretariat.



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2019 data for output of other oil products was estimated by the IEA Secretariat.

Restrictions on refuelling of international vessels in Russian ports were lifted in December 2016 as a result consumption of oil products in navigation increased in 2017.

Interproduct transfers of jet kerosene to gas diesel oil represent quantities blended with marine diesel to improve the cold flow properties of artic marine diesel.

## Natural gas

In the 2021 edition, the Russian Federation revised 2018 natural gas stock levels, leading to revised figures for 2018 statistical differences and total energy supply.

In the 2017 edition, the Russian Federation revised natural gas data back to 2013.

From 2009, all data concerning LNG trade and LNG production have been estimated by the IEA Secretariat.

Oil and gas extraction includes natural gas consumed by oil refineries.

## Biofuels and waste

Charcoal data are reported with solid biofuels from 2010 to 2014.

Solid biofuels indigenous production and input to charcoal production plants are estimated by the IEA Secretariat starting in 2015.

The geothermal input to main activity electricity plant was estimated by IEA Secretariat for 2013 and 2014.

## Electricity and heat

For 2020, due to data availability, for a given fuel, the ratio of electricity output by plant type has been held at 2019 values. Similarly, the efficiencies of most combustible fuel plants have been kept at 2019 levels.

In 2017, the Russian administration transitioned to a new classification system (the new Russian National Classifier of Types of Economic Activity). As a result, some breaks in-series may occur between 2016 and 2017.



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Data for electric boilers may include heat pumps, as disaggregated data for heat pumps are not collected by Rosstat.

The split between main activity producer and autoproducer plants, and electricity-only and CHP-plants is as provided by Rosstat. This deviates significantly from the definitions used by the IEA.

For 2018, the decrease in heat consumption in the *Machinery* sector is due to reduced economic activity in that sector.

The decrease in heat output from gas/diesel oil in Autoproducer CHP plants from 2016 onwards is due to fuel switching to natural gas.

The 2015 data for electricity and heat show a substantial drop in heat production on autoproducer plants fuelled by natural gas. These figures have been confirmed by the Russian authorities.

The 2013 data for electricity and heat show a substantial drop in the efficiency of autoproducer heat plants fuelled by natural gas as well as a decrease in production and consumption of heat. These figures have been confirmed by the Russian authorities.

Heat from other sources is produced from recovered waste heat.

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# Rwanda

## General notes

Rwanda data are available from 1971 onwards.

Prior to 2000, all data are based on the United Nations Statistics Division data and IEA Secretariat estimates. Breaks in time series appear in UNSD data.

Trade of bituminous coal is based on the United Nations trade data. Peat production is estimated by the IEA Secretariat based on Energy Planning Department data.

In the 2022 edition, Electricity generation, trade and demand data were provided by the Rwanda Utilities Regulatory Authority (RURA) for years 2019 and 2020. Electricity generation from regionally shared hydro power plants is now reported in Hydro main activity producer electricity plants for years 2019 and 2020, while it is reported in Electricity imports until 2018. Data up to 2018 are estimated by the IEA Secretariat based on UNSD data and data provided by the Energy Planning Department, and have been revised by the IEA Secretariat.

In the 2022 edition, the IEA Secretariat received the Rwanda Household Survey 2019/2020 published by the National Institute of Statistics of Rwanda (NISR). This survey provides information on residential, commercial and industrial consumption of biofuels for year 2020. Therefore the published 2020 data on biofuels demand is based on this source, and the time series has been revised according to current information. Biofuels production data is still estimated by the IEA Secretariat.

The break observed in Charcoal production and Fuelwood input to charcoal production plants time series between 1997 and 1998 is due to a break included in data from FAO.

In the 2022 edition, Oil products trade and demand data in Rwanda for years 2019 and 2020 were provided by RURA. From 2000 to 2009, oil products data are mainly extracted from the AFREC database. Between 2010 and 2015, most of oil data come from the Energy Planning Department. More recent data have been estimated by the IEA Secretariat based on population, economic developments or AFREC trends.

In the 2022 edition, Natural gas data for years 2019 and 2020 are estimated by the IEA Secretariat based on RURA data regarding electricity generation in



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natural gas power plants. Data up to 2018 are estimated by the IEA Secretariat using RURA, UNSD Energy Planning Department data.

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# 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-especified industry was revised fom 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



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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.



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# Senegal

## General notes

Data for Senegal are available starting in 1971.

Senegal is one of the ten countries that benefit from EU Support to IEA Data for Affordable and Sustainable Energy System for Sub-Saharan Africa.

In the 2021 edition, previously reported hydroelectricity production was revised as imports from 2009 onwards, as the dam is not located within the borders of the country.

In addition, in the 2021 edition, the electricity output was split per oil product from 2017 onwards thanks to new information available. Thanks to improvements in the data collection system, the final consumption of electricity is monitored more accurately in 2019. This may lead in breaks in time series between 2018 and 2019.

Finally, in the 2021 edition, quantities of diesel used to start ignite the power plants were reported for the first time, related to the 2019 diesel consumption.

In the 2020 edition, data for 2017 have been revised based on new data received from the Ministère de l'Energie et des Mines.

In the 2018 edition, data for 2014 and 2015 are revised based on information received from the Ministère de l'Energie et des Mines.

In the 2014 edition, the time series for solid biofuels were revised from 2009 onwards based on newly available information. Breaks in time series may occur between 2008 and 2009.

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# 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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Joint IEA/Eurostat/UNECE annual energy questionnaire on renewables (1990-2020).

Direct communication with the Ministry of Mining and Energy, Belgrade.

IEA Secretariat estimates.



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# 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.



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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.

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*The United Nations Energy Statistics Database*, United Nations Statistical Division, New York.

IEA Secretariat estimates.



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# 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.



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## 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.



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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.



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# South Sudan

## General notes

Data for South Sudan are available from 2012. Prior to 2012, they are included in Sudan.

In the 2022 and 2021 editions, the IEA Secretariat did not receive data related to 2020 or 2019 at the time of the publication; supply, transformation and use of energy have been estimated by the IEA Secretariat for 2020 and 2019.

In the 2022 edition, multiple products and flows were revised for 2018 based on new data provided by the African Energy Commission (AFREC).

In the 2021 edition, revisions to source data from 2016-2018 have resulted in changes to several products, including crude oil, solar PV, electricity, LPG, gas/diesel oil, and jet kerosene.

In the 2018 edition, revisions in 2015 data are due to new information available through the AFREC questionnaire.

Crude oil production and exports were halted for most of 2012, and only continued in April 2013. Both production and exports have been estimated by the IEA Secretariat for 2014.

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# Former Soviet Union

## General notes

Data for the Former Soviet Union (FSU) are available starting in 1971 up to 1989.

Data for individual countries of the FSU are available starting in 1990, and most of the information related to years 1990 and 1991 was estimated by the IEA Secretariat. Because of large breaks in reporting occurring in the early 1990's, breaks in time series may occur in 1990 for all regional totals.

Coal production statistics refer to unwashed and unscreened coal up to 1990. IEA coal statistics normally refer to coal after washing and screening for the removal of inorganic matter. Also, see notes under "Classification of Fuel Uses" and "Heat", in section on Notes on data quality.

The commodity balances presented for the FSU include IEA Secretariat estimates of fuel consumption in the main categories of transformation. These estimates are based on secondary sources and on isolated references in FSU literature.

In older editions of this publication, intra-FSU trade was excluded.

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# Sri Lanka

## General notes

Data for Sri Lanka are available starting in 1971.

Refinery losses may include own use of refinery fuel.

Breaks in time series may occur between 1999 and 2000 due to newly available energy balances provided by the Sri Lanka Sustainable Energy Authority in 2009.

Stock changes may include statistical difference for several secondary oil products until 2017.

In the 2022 edition, data from 2011 onwards were revised as new information became available from Sri Lanka Sustainable Energy Authority.

In the 2021 edition, final consumption data for fuelwood in residential and commercial and public services was estimated by the IEA Secretariat.

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IEA Secretariat estimates.



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# Sudan

## General notes

Data for Sudan are available starting in 1971. South Sudan became an independent country on 9 July 2011. From 2012 onwards, data for South Sudan are reported separately and therefore, breaks in the Sudan time series may occur between 2011 and 2012.

The IEA Secretariat could not obtain official balances from Sudan for data after 2012. In the 2022 edition, data from the Joint Organisations Data Initiative (JODI) Oil World database replaced oil product estimates when available for 2013 to 2018. After 2018, most of the oil products data are estimated based on Organization of Arab Petroleum Exporting Countries (OAPEC) data, while some flows such as kerosene consumption and diesel exports and bunkers have been estimated based on macroeconomic indicators.

Up to 2018, most of the electricity data are estimated based on Arab Union of Producers, Transporters and Distributors of Electricity (AUPTDE) data, when available. As of the time of publication of the 2022 edition, AUPTDE data are not available after 2018. Therefore, 2019 and 2020 electricity consumption data have been estimated based on macroeconomic indicators, while electricity production and trade data were retrieved from the Africa Energy Portal and Central Bank of Sudan, respectively.

In the 2021 edition, 2018 jet kerosene flows were revised to reflect data made available by OAG. Breaks in time series may occur between 2017/2018. Revisions were also made to lubricants consumption (1999-2005).

In the 2019 edition, due to revisions in the OAPEC data for oil products, breaks in time series might occurs from 2014 onward.

In the 2016 edition, new information on refinery activity became available. Breaks in time series for oil products can be seen between 2015 and 2016.

In the 2015 edition, the Kosti power plant began operation in Sudan, with 500 MW capacity. The plant uses crude oil for fuel, and break in time series can be seen for crude oil imports and input into main activity power plants in 2015.



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# Suriname

## General notes

Data for Suriname are available starting in 2000. Prior to 2000, data for Suriname are included in the “Other non-OECD Americas” region.

In the 2021 edition, new information became available on crude oil refinery input and transfers, which led to revisions to these flows from 2016 onwards. There have also been revisions to both gasoline and diesel consumption flows from 2016 onwards to utilise new information. These changes may result in breaks in the time series.

In the 2020 edition, new information became available on electricity generation and consumption, as well as trade of oil products. This leads to revisions in electricity generation since 2011, electricity consumption since 2013 and trade of oil products since 2010. Breaks in time series may therefore occur in the time series.

In the 2019 edition, new information became available on the expansion of the refinery at Tout Lui Faut and the resulting increase in diesel and gasoline production. The IEA Secretariat consequently revised 2015 and 2016 data. The change of data sources may cause break in time series and increased statistical difference.

The production of aluminium in Suriname stopped in 2015. However, this does not lead to a significant drop in electricity consumption in the industrial sector due to the opening of a new gold mine. The gold mining sector consumes a significant amount of the electricity produced in Suriname.

The electricity output from Afobaka dam is included in autoproducer generation up to 2015 and in main activity from 2016 onwards, reflecting that it is no longer related to another economic activity.

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# Syrian Arab Republic

## General notes

Data for the Syrian Arab Republic are available starting in 1971.

Imports of crude oil and secondary oil products may include informal imports.

Due to the on-going conflict in Syria, no official government data sources were available since 2012.

In the 2021 edition and 2022 edition, data are primarily based on secondary sources, media reports and IEA Secretariat estimates.

In the 2021 edition, the import of crude oil as well as production and trade of LPG, motor gasoline, naphtha, jet fuel, kerosene, diesel, fuel oil and non-specified oil products for 2018 were revised using newly available information from OAPEC.

In the 2021 edition, electricity distribution losses from 2009 onwards and final consumption from 2011 onwards were revised due to a methodological change.

In the 2021 edition, fuelwood and charcoal data from 1971 onwards were revised using FAO data. This leads to break in time series between 1997 and 1998.

In the 2020 edition, the final consumption of LPG, motor gasoline, naphtha, jet fuel, kerosene, diesel, fuel oil and non-specified oil products in 2016 and 2017 was revised due to new information from OAPEC.

In the 2019 edition, oil products consumption was revised from 2013 onwards based on information from OAPEC.

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IEA Secretariat estimates.



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# Chinese Taipei

## General notes

Data for Chinese Taipei are available starting in 1971.

Refinery gains observed across the time series are due to the fact that backflows of LPG, fuel oil and motor gasoline are not accurately reported. The Bureau of Energy, Ministry of Economic Affairs asked the IEA Secretariate to reflect the data as it is currently reported until it is able to align its reporting with international recommendations.

In the 2021 edition, the IEA Secretariat integrated revisions submitted by the Bureau of Energy, Ministry of Economic Affairs, for 1982-2018. The revisions affect all products and years, as well as calorific values and densities.

In the 2021 edition, the IEA Secretariat continued working with the Bureau of Energy, Ministry of Economic Affairs, to align methodologies and conversion factors. As a consequence, the reporting of additives for the whole time series was revised.

In the 2021 edition, the Bureau of Energy, Ministry of Economic Affairs also reported for the first time use of coke oven gas in the chemical and petrochemical sector. Their work on coke oven gas also resulted in a revision of is calorific values between 2005 and 2018.

In the 2020 edition, data for the period 2005-2017 were modified based on revisions by the Bureau of Energy, Ministry of Economic Affairs. This leads to breaks in time series between 2004 and 2005, specifically in the power sector where the split between autoproducers and main activity producer plants was made available. Revisions also affect crude oil input and additives in order to reflect the refinery sector more accurately.

In the 2018 edition, data were revised for the period 2002-2015 based on new balances submitted by the Bureau of Energy and changes in methodology. Breaks in time series might occur. Breaks in time series may also occur between 2010 and 2011 as more detailed information became available for refinery feedstocks and oil products.

In the 2012 edition, data for the period 1982-2009 were revised based on new balances submitted by the Bureau of Energy. Breaks in time series may occur between 1981 and 1982.



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IEA Secretariat estimates.



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# Tajikistan

## General notes

Data for Tajikistan are available starting in 1990. Prior to that, they are included in Former Soviet Union.

Tajikistan is one of the 11 EU4Energy focus countries.

In the 2022 edition, due to new information received by the statistics office, crude oil production, bitumen imports and electricity generation by main activity producer CHP plants using natural gas were revised for 2019 as well as the net calorific value of other bituminous coal for all flows from 2016 onwards.

In the 2020 and 2021 edition, a portion of crude oil imports and crude oil production, respectively, were estimated by the IEA Secretariat to avoid refinery gains. This may lead to breaks in the time series between 2017 and 2018 and between 2018 and 2019.

In the 2019 edition, new information on coal products became available to the statistics office for 2016. This may lead to breaks in time series between 2015 and 2016.

In the 2018 edition data for 2015 has been revised to accommodate new information received from the statistics office.

In the 2016 edition, breaks in time series occur between 2011 and 2012 and between 2013 and 2014, as new information became available from the statistics office.

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IEA Secretariat estimates



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IEA Secretariat estimates.



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# Tanzania

## General notes

Data for Tanzania are available starting in 1971.

LPG data are reported on a fiscal year basis starting in 2012. Data for 2020 correspond to 1 July 2020 – 30 June 2021.

In the 2022 edition, motor gasoline data were revised from 2011-2019 to align with the calendar year based on monthly import data published by the Energy and Water Utilities Regulatory Authority (EWURA).

In the 2021 edition, new information available led to revision of historical time series for solid biofuels.

In the 2019 edition, the IEA Secretariat came across new information on the shares of international and domestic aviation in Tanzania. The revisions made to integrate this information led to breaks in time series between 2009 and 2010.

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IEA Secretariat estimates.



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# 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



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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.



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# Togo

## General notes

Data for Togo are available starting in 1971.

In the 2022 edition, where possible 2019 data have been substituted with official data from SIE-UEMOA energy statistics.

At the time of preparation of the 2021 edition, 2019 official data for Togo were not available yet. 2019 data are therefore entirely estimated by the IEA Secretariat based on available secondary sources or, when other sources were not available, based on economic developments.

In the 2021 edition, newly available information led to the reporting of half of the hydroelectricity generation of Togo as exported to Benin, for the first time in 2019 data.

In the 2020 edition, the IEA Secretariat accessed official data for the 2013-2018 period. Natural gas imports and use in electricity generation are reported for the first time by Togo from 2014 onwards.

In the 2020 edition, solar photovoltaic off grid production was estimated by the IEA Secretariat based on International Renewable Energy Agency (IRENA) capacities from 2013 to 2018.

In the 2014 edition, Togo submitted official data for the years 2009-2012. Breaks in time series between 2008 and 2009 may occur for this reason.

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IEA Secretariat estimates.

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IEA Secretariat estimates.



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# 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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# 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.

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# Turkmenistan

## General notes

Data for Turkmenistan are available starting in 1990. Prior to that, they are included in Former Soviet Union.

Turkmenistan is one of the 11 EU4Energy focus countries.

Very little data from Turkmenistan are currently available. Supply data are available from secondary sources and consumption is estimated. To indicate the lack of data, certain figures for the period 2015-2020 have deliberately been kept equal to the previous year's figures. This is the case of the use of natural gas in transformation and final consumption, input of crude oil to refineries, trade and output of secondary oil products from refineries, electricity and heat commodity balances.

In the 2022 edition, natural gas exports and consumption data from 2011 onwards have been revised according to newly available information.

In the 2022 edition, in an effort to report the consumption of jet kerosene more accurately and thanks to new information available, the IEA Secretariat estimated the split between international and domestic aviation from 2016 onwards.

In the 2021 edition, natural gas indigenous production and exports data from 2001 to 2007 (excluding 2004) have been revised according to newly available information. This also impacts the estimation of natural gas liquids production and liquefied petroleum gases final consumption for the period 2001-2003.

In the 2021 edition, information became available on the operations of a new gas-to-liquids plant. Its output is reported in other hydrocarbons and then transferred to the corresponding secondary oil products.

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IEA Secretariat estimates.



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# Uganda

## General notes

Uganda data are available from 1971 onwards.

In the 2022 edition, more detailed information on fuel consumption by industry sub-sector was provided by the Ministry of Energy and Mineral Development for 2020. For electricity and primary solid biofuels, all industry consumption is allocated to non-specified industry consumption up to 2020. It is disaggregated into specific sub-sectors in 2020, creating a break in the time series between 2019 and 2020. For charcoal, liquefied petroleum gases, motor gasoline, other kerosene, and gas/diesel oil, industry consumption was re-allocated from non-specified industry to the sub-sector identified in the new 2020 data for the whole time series.

In the 2021 edition, new data became available to the IEA secretariat, leading to revisions of the whole time series for solid biofuels (fuelwood, bagasse and charcoal).

Also in the 2021 edition, new data available lead to revision of the oil products from 2000 onward, and the addition of bitumen to the products for the whole time series. Electricity data were also revised for the whole time series.

In the 2020 edition, the IEA Secretariat estimated 2007 – 2018 data based on AFREC and IRENA data.

In the 2020 edition, the Secretariat estimated the share of domestic and international aviation consumption based on OAG data from 2005 onwards; breaks in time series might occurs between 2004 and 2005.

Prior to 2007, data are based on the United Nations Statistics Division data and IEA Secretariat estimates.

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IEA Secretariat estimates.



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# 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.



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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.



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## 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.

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IEA Secretariat estimates.



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# United Arab Emirates

## General notes

Data for the United Arab Emirates 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.

In the 2022 edition, the IEA Secretariat revised several supply and demand flows of NGL, ethane, naphtha and LPG from 2015 and 2019 due to new available information. Furthermore, crude oil refinery input in 2016 was revised to better reflect official data from the Federal Competitiveness and Statistics Authority.

In the 2021 edition, oil densities for several products were revised to align with the UAE's official values. This implies revisions especially to the NGL, LPG, lubricants, ethane and naphtha time series.

In the 2021 edition, the IEA Secretariat revised non-energy use final consumption data for oil and gas in the petrochemical sector from 2015 to 2018, in order to take into account developments in this sector in the UAE, including the third expansion of the Borouge Cracker in 2015. Products affected by these revisions are NGLs, naphtha, ethane and LPG, as well as natural gas.

In the 2020 edition, production, trade and consumption flows of natural gas liquids, crude oil and most of the secondary oil products have been revised due to newly available information and historical changes from the Federal Competitiveness and Statistics Authority (FCSA) and from the Organization of Petroleum Exporting Countries (OPEC) for the period 1980-2017.

In the 2020 edition, new information on electricity was made available by the FCSA. This led to revisions in production and imports series as well as natural gas consumption for power generation from 2007 onwards.

In the 2020 edition, the IEA Secretariat estimated electricity own use in the power and heat industry and electricity used for desalination, based on new information made available by the FCSA from 2007 onwards. This might cause a break in electricity own use time series between 2006 and 2007.

In the 2020 edition, wind production was estimated based on capacities published by the International Renewable Energy Agency (IRENA), from 2013 onwards.



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In the 2018 edition, information on asphalt, lubricants, and other oil products were made available. Breaks in time series for these products can be seen between 2015 and 2016.

Sources for electricity data in 2016 show reclassification from other non-specified consumption to commercial and public services. A break in time series can be observed between 2015 and 2016.

In the 2018 edition, revisions in oil products supply and stocks can be observed since 2009 due to newly available data.

In the 2015 edition, time series for oil, gas, and coal data were revised according to data from FCSA. Breaks in time series can be observed in 2009 for coal, crude oil production and trade.

In 2015, Ruwais refining complex expansion was completed, significantly increasing refined oil products production and oil industry own use of refinery inputs.

In the 2013 edition, time series on electricity imports and exports were revised due to new information available on international trade at the interconnectors for the United Arab Emirates. This may lead to revisions to these time series from 2007.

Time series revisions in natural gas liquids (NGL) production were advised by the FCSA. Breaks in time series can be observed in 2011 for NGL.

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# Uruguay

## General notes

Data for Uruguay are available starting in 1971.

In the 2022 edition, LPG data for 2019 and petroleum coke data for 2018 and 2019 have been revised due to new available information on their calorific values for those years.

In the 2021 edition, communication with the Dirección Nacional de Energía led to data revisions, increasing the detail of the energy balance. A methanol time series is now available from 2010, included in biogasoline. Hydrogen production from a pilot project is now available from 2016 and included in biogases. Biogas from thermal processes in the paper industry is not reported separately for confidentiality reasons; they are included with solid biofuels. As a result of those additions, the series for primary solid biofuels and biogasoline are revised from 2010 onwards. The series for naphtha is also revised from 1971 to 1989.

In the 2020 edition, historical data across multiple years and products were revised in line with the latest historical data available from Dirección Nacional de Energía. Data were revised from 1971 onwards for coal, oil, oil products and electricity, from 1981 onwards for hydro, from 1998 onwards for natural gas and from 2010 onwards for solar photovoltaic.

In 2017, La Teja refinery was mostly inactive which leads to sharp decrease in refinery outputs. Refinery activity recovered in 2018.

The pronounced growth in production of biofuels and waste from 2007 to 2010 results from the development of the pulp and paper industry.

The power produced from the Salto Grande hydroelectric plant, located on the Uruguay River between Concordia in Argentina and Salto in Uruguay is equally shared between the two countries. Exports include power produced in Salto Grande and exported to Argentina.

The refinery was shut down for maintenance in 1993-1994. This explains the low refinery output observed in 1993 and the absence of output in 1994.



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IEA Secretariat estimates.



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# Uzbekistan

## General notes

Data for Uzbekistan are available starting in 1990. Prior to that, they are included in Former Soviet Union.

Uzbekistan is one of the 11 EU4Energy focus countries.

In the 2022 edition, the State Committee of the Republic of Uzbekistan on Statistics submitted data on electricity, coal, natural gas and oil through the joint IEA/Eurostat/UNECE annual energy questionnaires with improved disaggregation of data. This led to breaks in time series between 2019 and 2020.

In the 2021 edition, the State Committee of the Republic of Uzbekistan on Statistics submitted data on electricity, coal, natural gas and oil through the joint IEA/Eurostat/UNECE annual energy questionnaires, with revisions for the historical data of non-bio jet kerosene, diesel and bitumen. Revisions may also affect diesel and gasoline between 2013 and 2016.

Also in the 2021 edition, new data available led to the addition of heat transmission and distribution losses from 1990 onwards.

In the 2020 edition the State Committee of the Republic of Uzbekistan on Statistics submitted data on electricity, coal, natural gas and oil through the joint IEA/Eurostat/UNECE annual energy questionnaires. Historical time series were therefore revised by the IEA Secretariat from 1998 to 2017. Motor gasoline has been further revised from 1990 onwards and aviation gasoline from 1996.

From the 2020 edition onwards, the State Committee of the Republic of Uzbekistan on Statistics started publishing national energy balance. As a result of this, 2018 and 2019 data contains more disaggregation of demand data across products, and breaks in the time series exist between 2017 and 2018.

For biofuels and waste, natural gas demand and non-energy oil products few data are available up to 2017. Supply data are available from secondary sources and consumption is estimated.

Fuel input to electricity and heat plant and outputs are estimated by the IEA Secretariat, with estimates being better informed from 2018 onwards by data from State Committee of the Republic of Uzbekistan.



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Imports of crude oil are partially estimated by the IEA Secretariat, and might contain other products which are inputs to the refining process.

In the 2018 edition, data on heat were made available from the State Committee of the Republic of Uzbekistan; breaks in time series may occur in 2008.

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IEA Secretariat estimates.



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# Venezuela

## General notes

Data for Venezuela are available starting in 1971.

In the 2022 edition, the production and exports of other bituminous coal for 2019 were revised due to new available information.

In the 2021 and 2022 edition, as for the 2020 edition, no data were available from Petróleos de Venezuela S.A. (PDVSA) for 2018, 2019 and 2020. Thus, all crude oil and oil products data are estimated by the IEA Secretariat based on data from the Organization of the Petroleum Exporting Countries (OPEC).

In the 2021 edition, the IEA Secretariat revised their estimates for LPG non-energy use in the petrochemical sector for 2018 to account for the lack of feedstock availability in the country.

In the 2020 edition, natural gas data were revised from 2008 onwards, following new information from PDVSA on the industrial split of natural gas, and IEA Secretariat estimates.

In the 2020 edition, the oil balance was revised in order to reflect the available data from the Ministerio de Petróleos and PDVSA. As a result, a series of revisions is listed below. Crude oil production, exports and refinery inputs were revised from 1999 to reflect *Petróleo y Otros Datos Estadísticos* (PODE) information and PDVSA information up to 2017. Orimulsion and lease condensate were revised from 2001 onwards. Natural gas liquids were revised from 1999. Refinery feedstocks were revised from 1999 to incorporate information from PODE and PDVSA; this includes multiple unspecified products, and leads to structural breaks in the time series between 1998 and 1999. Feedstocks imports can also include méthyl tert-butyl ether (MTBE). Ethane data are available from 1999 onwards. Production problems led to propane having a significant role in petrochemical activities. LPG data are available from 1999 onwards, and include propane, iso-butane, normal-butane and propane-butane mixes. Naphtha data are available from 1999 onwards, including refinery production and natural gasoline/pentane output from gas separation plants.

In the 2020 edition, an allocation between domestic and international aviation consumption of jet kerosene was estimated by the IEA Secretariat since 2012. This may lead break in time series between 2011 and 2012.



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Motor gasoline production, transfers and use in road transport have been revised from 1999 onwards. Transfers include residual naphtha only. Export is estimated between 1999 and 2006. Import data from 2010-2017 are sourced from PDVSA.

Paraffin waxes, refinery gas and petcoke have been revised from 1999 to reflect data from PODE. Exports are estimated by the IEA Secretariat. Other non-specified oil products are partially estimated by the IEA Secretariat and include multiple unspecified products, as well as sulphur. Fuel oil production and exports are estimated by the IEA Secretariat from 2016 onwards. Diesel production is estimated from 2017 onwards.

The multiple revisions made in the 2020 edition lead to structural breaks between 1998 and 1999.

Up to 2017, crude oil production data are obtained from PDVSA with lease condensate removed.

Lease condensate quantities are included in natural gas liquids (NGL) from 2000. This may lead to breaks in time series between 1999 and 2000.

Revised data for the years 2005-2011 were provided by the Latin American Energy Organization (OLADE). These revisions may lead to breaks in time series between 2004 and 2005 and differences in trends in comparison to previous editions.

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IEA Secretariat estimates.



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# Viet Nam

## General notes

Data for Viet Nam are available starting in 1971.

Data for stock changes may contain statistical differences for some energy products.

Data for international marine bunkers of fuel oil are estimated to be 80% of water transport fuel oil consumption reported in Viet Nam energy balances since 1990.

The breakdown of natural gas input to main activity producer and autoproducer electricity plants, and the corresponding electricity output have been estimated by IEA Secretariat since 2011.

In the absence of detailed information, coal data are broken down by type by the IEA Secretariat.

In the 2022 edition, new data source, *Vietnam Energy Statistics*, became available for 2015-2019 and preliminary 2020 data. This led to a series of revisions for 2015-2019 data.

In the 2021 edition, data for 2016-2018 were revised as new information from Asia Pacific Energy Research Centre (APERC) became available. This might lead to a break in time series between 2015 and 2016 for the following products and flows: anthracite, bituminous coal, sub-bituminous coal, solid biofuels, natural gas, crude oil, NGL, LPG, motor gasoline, kerosene type jet fuel, other kerosene, gas/diesel, fuel oil, lubricants, bitumen and electricity for production, trade, stock changes, international/domestic bunkers, transformation, industry, transport, residential, commercial and agriculture sector.

In the 2021 edition, charcoal production and residential consumption data prior to 2016 were revised using the charcoal production efficiency derived from the revised balances submitted by Viet Nam to APERC.

In the 2021 edition, peat production and import data from 2011 onwards were revised to 0 based on new information from revised balances submitted by Viet Nam to APERC.

In the 2021 edition, coking coal production data from 2011 onwards were retrieved from Thai Nguyen Iron and Steel Joint Stock Company (TISCO). Input to coke oven of coking coal and iron and steel sector consumption of coke oven



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coke were then estimated. Coke oven coke trade data were revised using UN Comtrade database.

In the 2021 edition, the revised balances submitted by Viet Nam to APERC include new detailed information on solid and liquid biofuels produced and used in the country. Detailed time series for bagasse, other solid vegetal matters and biogasoline have been created for the years 2016 to 2019.

In the 2020 edition, data for condensate were revised from 2005 to 2014 based on new information from APERC. Fuelwood input to charcoal production plants from 2000 to 2014 were revised due to the revision of rural population data.

In the 2020 edition, new information on international/domestic aviation bunker and rail consumption became available in the 2018 Vietnam Energy Balance Tables.

In the 2019 edition, some 2015 and 2016 data were revised to adapt to Vietnam Energy Balance Tables updated format. This may lead to breaks in time series for some flows between 2014 and 2015.

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# Yemen

## General notes

Data for Yemen are available starting in 1971.

Due to the ongoing conflict in Yemen, no official government data sources were available since 2017. From the 2019 edition, data are primarily based on secondary sources, media reports and IEA Secretariat estimates.

In the 2022 edition, crude oil production and refinery input figures as well as NGL and oil products production were revised from 2016 onwards due to new available information or revisions from secondary sources.

In the 2022 edition, the IEA Secretariat estimated crude oil, jet kerosene and naphtha exports from 2016 onwards due to new information available.

In the 2021 edition, refinery production of LPG, motor gasoline, kerosene and fuel oil has been revised by the IEA Secretariat from 2016 onwards due to new information available.

In the 2021 edition, due to new available information the IEA Secretariat revised charcoal figures from 1989 onwards.

In the 2020 edition, revisions to crude oil data in 2016 and 2017 and natural gas data in 2017 are due to revisions in secondary sources.

In the 2020 edition, natural gas liquids production and corresponding processing into LPG were revised from 2014 onwards based on IEA Secretariat oil and gas experts' estimates.

In the 2020 edition, solar photovoltaic electricity generation was revised by the IEA Secretariat for 2016 and 2017 based on International Renewable Energy Agency (IRENA) estimates.

In the 2018 edition, revisions to electricity inputs and consumption from 2014-2015 are based on IEA Secretariat estimates.

Oil and gas activity was halted in 2015 due to military conflict, affecting oil and oil products data from 2015-2016. In 2016, no exports occurred.

Revisions to 2014 oil data are due to receipt of Ministry of Planning reports.



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Oil and gas pipeline sabotage was reported in 2012 due to unrest in Yemen. Breaks in time series between 2011 and 2012 as well as between 2012 and 2013 may be observed because of this.

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IEA Secretariat estimates.



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# Former Yugoslavia

## General notes

Data for individual countries of the Former Yugoslavia are available starting in 1990, and most of the information on 1990 and 1991 was estimated by the IEA Secretariat. Because of large breaks in reporting which occurred in the early 1990's, breaks in time series may occur in 1990 for all regional totals.

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# Zambia

## General notes

Data for Zambia are available starting in 1971.

Zambia is one of the ten countries that benefit from EU Support to IEA Data for Affordable and Sustainable Energy System for Sub-Saharan Africa.

In August 2016, a coal thermal power plant with an installed capacity of 300 MW was commissioned in Maamba, Sinazongwe District.

Crude oil imports reported by Zambia's Energy Regulation Board (ERB) include petroleum feedstocks comprised of crude oil, naphtha, condensate, and gasoil.

In the 2022 edition, gas/diesel oil consumption flows were revised from 2018 to 2019 to better align with total gas/diesel oil demand reported by ERB. Jet kerosene imports were also revised from 2017 to 2019 to reflect ERB data.

In the 2021 edition, new information on the refinery activity available led to revisions of the inputs and outputs value in our data from 2016 onward.

In the 2021 edition, new information available led to revisions of the production of primary solid biofuels and charcoal from 2000 onward.

In the 2015 edition, information on refinery yields was obtained and applied to the refinery production from 2001. Therefore, breaks in time series may occur between 2000 and 2001.

A fire damaged the sole oil refinery (Indeni) in Zambia in 2000. Therefore, breaks in time series may occur between 1999 and 2000, as well as between 2000 and 2001.

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# Zimbabwe

## General notes

Data for Zimbabwe are available starting in 1971.

In the 2022 edition, electricity supply and demand data were revised for year 2019, using new information provided by ZERA.

Supply side for coal products is estimated using trade figures and trade growth trends. In the 2022 edition, when latest demand side data was not available a ratio based on supply side growth is used. A mining company was commissioned in 2011, leading to a rapid increase in coal production. Due to limited availability of coal consumption data, the IEA Secretariat has estimated coal stocks for Zimbabwe. Breaks in time series may occur between 2013 and 2014 because of this.

Supply side for oil products is estimated using trade figures and trade growth trends. In the 2022 edition, when latest demand side data was not available a ratio based on supply side growth is used.

Biofuels data is calculated based on the population growth rate when no official sources is available.

More detailed data on energy consumption is available from the Census of Industrial Production (ZimStat) since 2009. Breaks in time series may occur between 2008 and 2009 because of this.

More detailed data on road fuel imports is available since 2011. Breaks in time series may occur between 2010 and 2011 because of this.

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# Other Africa

## General notes

Time series for this region are obtained by summing data corresponding to individual countries (see lists in section I.5, Geographical coverage). As a consequence, intra-regional trade is included as part of total trade. Therefore, trade is likely to be overstated.

The UN Statistics Division Energy statistics database is the main data source for the countries included in the region. At the time when this edition was prepared data up to 2019 were available. All data points for 2020 have therefore been estimated equal to 2019 values or based on developments in population and GDP in the region as well as renewables capacity growth. All 2019 estimated data points for the 2021 edition have been revised based on the officially reported data. Besides, some data points may be revised between 1971 and 2019 due to revisions or new available information in the UN Energy Statistics database.

In the 2022 edition, Kingdom of Eswatini, Madagascar, Rwanda and Uganda were removed from the aggregate for the full time series and are available separately.

In the 2021 edition, Niger (previously included for 1971-1999 data), was removed from the aggregate for the full time series and is available separately. Furthermore, Djibouti statistics have been included for the period 1971-1989.

In the 2021 edition, new information on the industrial use of electricity, gasoline, other kerosene, gas/diesel oil, petroleum coke, bitumen, bituminous coal and primary solid biofuels resulted in a reallocation of industrial consumption flows from 1990 onwards.

In the 2021 edition, newly available information regarding the conversion factors of primary solid biofuels led to a revision of the whole time series.

In the 2020 edition, Equatorial Guinea data were removed from this aggregate for the full time series; Botswana data were removed from 1971 to 1980.

In the 2019 edition, La Réunion data were removed from this aggregate from 2011 onwards. From 2011 onwards, they are included in French data. Breaks in time series might occur for biogas between 2010 and 2011.



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In the 2015 edition, data for bagasse use in the transformation sector in autoproducer electricity plants, main activity producer CHP plants and autoproducer CHP plants became available for the years 2011-2013. This may lead to breaks in time series between 2010 and 2011.Sources

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IEA Secretariat estimates.



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# Other non-OECD Americas

## General notes

Time series for this region are obtained by summing data corresponding to individual countries (see lists in section I.5, Geographical coverage). As a consequence, intra-regional trade is included as part of total trade. Therefore, trade is likely to be overstated.

The UN Statistics Division Energy Statistics database is the main data source for the countries not listed individually and included in the region. At the time when this edition was prepared data up to 2019 were available. All data points for 2020 have therefore been estimated equal to 2019 values or based on developments in population and GDP in the region as well as renewables capacity growth. All 2019 estimated data points for the 2021 edition have been revised based on the officially reported data. Besides, in the 2022 edition some data points may be revised due to revisions of the UN Statistics Division database.

From 2017 data onwards, Puerto Rican electricity generation and the corresponding fuels' consumption are included in the data submitted by the United States. This creates inconsistencies between supply and demand of natural gas in Other non-OECD Americas from 2017, as natural gas trade statistics are reported in this regional aggregate, as well as breaks in electricity generation time series between 2016 and 2017. Puerto Rico coal trade data and all oil data from 2002 are similarly reported by the United States and therefore not included in this regional aggregate.

In the 2022 edition, the whole time series of electricity consumption in non-specified industry, commercial and public services and non-specified other were significantly revised due to new available information. Furthermore, we retrieved new data on fuel oil imports and use in main activity producer electricity in Puerto Rico between 1990 and 2002.

In the 2022, we added biogasoline and biodiesel statistics as new information became available.

In the 2021 edition, other bituminous coal input to main activity producer electricity plants and the corresponding electricity output was revised from 2000 onwards due to newly available data.

In the 2021 edition, new available information regarding the conversion factor of fuelwood resulted in a revision of the whole time series.



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The refinery in Aruba was shut down for 17 months in 2009-2011, then in September 2012. This may lead to breaks in time series in 2010 as well as for the period 2011-2013.

Energy data for the French Départements d'Outre-Mer (Guadeloupe, Martinique and French Guyana) are included in Other non-OECD Americas until 2010. From 2011 onwards, they are included in French data.

Energy data for Bonaire, Saba, Saint Eustratius and Sint Maarten are included in Other non-OECD Americas since 2012.

Data for Suriname are no longer included in Other non-OECD Americas from 2000 onwards. This may lead to breaks in time series between 1999 and 2000.

# Sources

## Sources up to 2020:

*The United Nations Energy Statistics Database*, United Nations Statistical Division, New York, accessed in April 2022.

Renewable energy statistics 2021, International Renewable Energy Agency (IRENA), Abu Dhabi, 2021.

*US Energy Information administration,* Washington DC: https://www.eia.gov/state/?sid=RQ.

*Annual Statistical Digest*, Central Bank of Aruba, Oranjestad, various editions up to 2015.

*The economy of Curaçao and Sint Maarten in Data and Charts Yearly Overview*, Central Bank of Curaçao and Sint Maarten, Willemstad, various editions up to 2018.

IEA Secretariat estimates.



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# Other non-OECD Asia

## General notes

Time series for this region are obtained by summing data corresponding to individual countries (see lists in Geographical coverage section). As a consequence, intra-regional trade is included as part of total trade. Therefore, trade is likely to be overstated.

The UN Statistics Division Energy statistics database is the main data source for the countries included in the region. At the time when this edition was prepared, data up to 2019 were available. All data points for 2020 have therefore been estimated equal to 2019 values or based on developments in population and GDP in the region as well as renewables capacity growth. All 2019 estimated data points for the 2021 edition have been revised based on the officially reported data. Besides, some data points may be revised between 2000 and 2019 due to revisions or new available information in the UN Energy Statistics database.

It is assumed by the IEA Secretariat that half of municipal waste data reported is renewable and the other half is non-renewable.

In the 2021 edition, new information on the industrial use of electricity, primary solid biofuels and several secondary oil products led to a reallocation of industrial consumption flows from 2000 onwards.

In the 2021 edition, the IEA Secretariat revised electricity generation from 2000 onwards, crude oil production from 2005 onwards, kerosene jet fuel consumption in domestic aviation from 1971 to 1999 and in international aviation bunkers from 2000 to 2010 due to new available information.

In the 2020 edition, Lao People's Democratic Republic energy data from 2000 onwards were removed from the "Other non-OECD Asia" region and presented individually.

In the 2020 edition, natural gas liquids (NGL) production from 2004 onwards was revised based on IEA Secretariat experts' estimates. Electricity generation from other liquid biofuels was re-estimated based on the revision of calorific values.

In the 2020 edition, data for the years 2000 to 2017 were modified based on revisions in the UNSD database. The most notable revisions include: natural gas own use in energy industry and total final consumption from 2000 to 2009; LPG



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production and exports data from 2005 onwards; input of motor gasoline and fuel oil to electricity autoproducers from 2007 to 2010; other vegetal material and residue production and total final consumption from 2000 to 2010; and municipal waste production and input to electricity autoproducers from 2001 onwards.

The opening of a liquefied natural gas (LNG) terminal in Papua New Guinea in 2014 may lead to breaks in time series for natural gas supply data.

# Sources

## Sources up to 2020:

*The United Nations Energy Statistics Database*, United Nations Statistical Division, New York, accessed in April 2022.

*Renewable energy statistics 2022*, International Renewable Energy Agency (IRENA), Abu Dhabi, 2022.

IEA Secretariat estimates.



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# 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 questionnaires[18]: "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*[19], 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.

[18] See link to the annual questionnaires: https://www.iea.org/areas-of-work/data-and-statistics/questionnaires/

[19] https://unstats.un.org/UNSD/energy/ires/default.htm.



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# Estimation

In addition to adjustments addressing differences in definitions, estimations[20] 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

[20] 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.



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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



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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 $m^3$.

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



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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, countries of non-OECD Europe and Eurasia and China used to adopt a different methodology from that recommended in IRES. 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 methodology[21]. 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.

## Biofuels and waste

The IEA publishes data on production, domestic supply and consumption of biofuels and waste for all countries and all regions.

[21] For autoproducer plants, the international methodology restricts the inclusion of heat in transformation processes to that sold to third parties.



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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 table 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.



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# Units and conversions

## General conversion factors for energy

| *To* | TJ | Gcal | Mtoe | MBtu | GWh |
|---|---|---|---|---|---|
| From: | multiply by: | | | | |
| terajoule (TJ) | 1 | $2.3885 \times 10^{2}$ | $2.3885 \times 10^{-5}$ | $9.478 \times 10^{2}$ | $2.778 \times 10^{-1}$ |
| gigacalorie (Gcal) | $4.1868 \times 10^{-3}$ | 1 | $1.000 \times 10^{-7}$ | 3.968 | $1.163 \times 10^{-3}$ |
| million tonnes of oil equivalent (Mtoe) | $4.1868 \times 10^{4}$ | $1.000 \times 10^{7}$ | 1 | $3.968 \times 10^{7}$ | $1.163 \times 10^{4}$ |
| million British thermal units (MBtu) | $1.055 \times 10^{-3}$ | $2.520 \times 10^{-1}$ | $2.520 \times 10^{-8}$ | 1 | $2.931 \times 10^{-4}$ |
| gigawatt hour (GWh) | 3.600 | $8.598 \times 10^{2}$ | $8.598 \times 10^{-5}$ | $3.412 \times 10^{3}$ | 1 |

## Conversion factors for mass

| *To* | kg | t | lt | st | lb |
|---|---|---|---|---|---|
| *From:* | multiply by: | | | | |
| kilogramme (kg) | 1 | $1.000 \times 10^{-3}$ | $9.842 \times 10^{-4}$ | $1.102 \times 10^{-3}$ | 2.205 |
| tonne (t) | $1.000 \times 10^{3}$ | 1 | $9.842 \times 10^{-1}$ | 1.102 | $2.205 \times 10^{3}$ |
| long ton (lt) | $1.016 \times 10^{3}$ | 1.016 | 1 | 1.120 | $2.240 \times 10^{3}$ |
| short ton (st) | $9.072 \times 10^{2}$ | $9.072 \times 10^{-1}$ | $8.929 \times 10^{-1}$ | 1 | $2.000 \times 10^{3}$ |
| pound (lb) | $4.536 \times 10^{-1}$ | $4.536 \times 10^{-4}$ | $4.464 \times 10^{-4}$ | $5.000 \times 10^{-4}$ | 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 | $8.327 \times 10^{-1}$ | $2.381 \times 10^{-2}$ | $1.337 \times 10^{-1}$ | 3.785 | $3.785 \times 10^{-3}$ |
| U.K. gallon (gal U.K.) | 1.201 | 1 | $2.859 \times 10^{-2}$ | $1.605 \times 10^{-1}$ | 4.546 | $4.546 \times 10^{-3}$ |
| barrel (bbl) | $4.200 \times 10^{1}$ | $3.497 \times 10^{1}$ | 1 | 5.615 | $1.590 \times 10^{2}$ | $1.590 \times 10^{-1}$ |
| cubic foot ($ft^3$) | 7.481 | 6.229 | $1.781 \times 10^{-1}$ | 1 | $2.832 \times 10^{1}$ | $2.832 \times 10^{-2}$ |
| litre (l) | $2.642 \times 10^{-1}$ | $2.200 \times 10^{-1}$ | $6.290 \times 10^{-3}$ | $3.531 \times 10^{-2}$ | 1 | $1.000 \times 10^{-3}$ |
| cubic metre ($m^3$) | $2.642 \times 10^{2}$ | $2.200 \times 10^{2}$ | 6.290 | $3.531 \times 10^{1}$ | $1.000 \times 10^{3}$ | 1 |



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# 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) |



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# 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 |
| UNIPEDE: | International Union of Producers and Distributors of Electrical Energy |

| | |
|---|---|
| c | confidential |
| e | estimated |
| .. | not available |
| x | not applicable |



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