WORLD ENERGY BALANCES
FEBRUARY 2021 EDITION
(SELECTED ECONOMIES)

DATABASE DOCUMENTATION
In an effort to provide users with more timely information, with the February 2021 edition of the World Energy Balances database the IEA is releasing balances for selected economies, for which data up to 2019 have been already received and validated, including key OECD and key emerging economies.

This documentation provides support information for the February 2021 edition of the IEA World energy balances database. Further 2021 editions are expected to include a progressively broader coverage: the April 2021 edition will cover the full set of OECD plus other selected emerging economies; while the August edition will cover the global set of data.

Please address your inquiries to stats@iea.org.

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# TABLE OF CONTENTS

1. CHANGES FROM LAST EDITION ................................................................. 4
2. DATABASE STRUCTURE ........................................................................... 5
3. FLOW DEFINITIONS ............................................................................... 7
4. PRODUCT DEFINITIONS ......................................................................... 27
5. GEOGRAPHICAL COVERAGE ............................................................... 40
6. COUNTRY NOTES AND SOURCES ....................................................... 44
7. METHODOLOGICAL NOTES ................................................................. 121
8. NOTES ON DATA QUALITY .................................................................... 124
9. UNITS AND CONVERSIONS ................................................................. 128
10. ABBREVIATIONS .................................................................................. 131
1. CHANGES FROM LAST EDITION

In an effort to enhance timeliness of data, the IEA is pleased to include full coverage of selected OECD and emerging economies in this early release. The countries included are:

OECD countries: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Hungary, Ireland, Latvia, Lithuania, Luxembourg, Poland, Portugal, Slovenia, Sweden, Switzerland, United Kingdom and United States.

Non-OECD countries: Argentina, Brazil, Bulgaria, People's Republic of China, Costa Rica, Croatia, Cyprus, Ecuador, El Salvador, Guyana, India, Indonesia, Malta, Morocco, Panama, Paraguay, Singapore, South Africa, Thailand and Uruguay.
2. DATABASE STRUCTURE

The database *World Energy Balances* includes annual data for selected economies and contains the following:

- **countries**: 39 countries (see section *Geographical coverage*);
- **years**: 1960-2019 (OECD countries);
  1971-2019 (non-OECD countries);

The database includes the following four files:

**EARLYBAL.IVT**  **Summary energy balances**
- Energy balances in matrix form (19 product categories; 79 flows) (ktoe; TJ);
- Electricity and heat output by type of producer (10 flows) (GWh; TJ; ktoe).

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

**EARLYIND.IVT**  **Indicators**
- 52 energy, economic and coupled indicators (various units).

**EARLYCONV.IVT**  **World conversion factors**
- net calorific values by flow for 15 coal products (toe/t; kJ/kg);
- average net calorific values for 23 oil products and 5 biofuel products (toe/t; kJ/kg);
- volume to mass ratio for 22 oil products and 4 biofuel products (barrels/tonne);
Detailed definitions of each flow and product are presented in sections *Flow definitions* and *Product definitions*. 
# 3. FLOW DEFINITIONS

<table>
<thead>
<tr>
<th>Flow</th>
<th>Short name</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production</td>
<td>INDPROD</td>
<td>Comprises the production of primary energy, i.e. hard coal, lignite, peat, crude oil, NGLs, natural gas, biofuels and waste, nuclear, hydro, geothermal, solar and the heat from heat pumps that is extracted from the ambient environment. Production is calculated after removal of impurities (e.g. sulphur from natural gas). Calculation of production of hydro, geothermal, etc. and nuclear electricity is explained in section Units and conversions.</td>
</tr>
<tr>
<td>Imports</td>
<td>IMPORTS</td>
<td>Comprise amounts having crossed the national territorial boundaries of the country whether or not customs clearance has taken place.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>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.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>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 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.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>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.</td>
</tr>
</tbody>
</table>
### Supply

<table>
<thead>
<tr>
<th>Flow</th>
<th>Short name</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exports</td>
<td>EXPORTS</td>
<td>Comprise amounts having crossed the national territorial boundaries of the country whether or not customs clearance has taken place.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>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.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>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.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>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.</td>
</tr>
<tr>
<td>International marine bunkers</td>
<td>MARBUNK</td>
<td>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).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>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.</td>
</tr>
<tr>
<td>International aviation bunkers</td>
<td>AVBUNK</td>
<td>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.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>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.</td>
</tr>
<tr>
<td>Stock changes</td>
<td>STOCKCHA</td>
<td>Reflects the difference between opening stock levels on the first day of the year and closing levels on the last day of the year of stocks on national territory held by producers, importers, energy transformation industries and large consumers. A stock build is shown as a negative number, and a stock draw as a positive number.</td>
</tr>
<tr>
<td>Total energy supply</td>
<td>TES</td>
<td>Total energy supply (TES) is made up of production + imports - exports - international marine bunkers - international aviation bunkers ± stock changes. Note, exports, bunkers and stock changes incorporate the algebraic sign directly in the number.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>For World, TES is defined as production + imports - exports ± stock changes. Note, exports, bunkers and stock changes incorporate the algebraic sign directly in the number.</td>
</tr>
</tbody>
</table>
### Supply

<table>
<thead>
<tr>
<th>Flow</th>
<th>Short name</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transfers</td>
<td>TRANSFER</td>
<td>Comprises interproduct transfers, products transferred and recycled products. 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. 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. 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).</td>
</tr>
<tr>
<td>Statistical differences</td>
<td>STATDIFF</td>
<td>Includes the sum of the unexplained statistical differences for individual fuels, as they appear in the basic energy statistics. It also includes the statistical differences that arise because of the variety of conversion factors in the coal and oil columns.</td>
</tr>
</tbody>
</table>
### Transformation processes

<table>
<thead>
<tr>
<th>Flow</th>
<th>Short name</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transformation processes</td>
<td>TOTTRANF</td>
<td>Transformation processes comprise the conversion of primary forms of energy to secondary and further transformation (e.g. coking coal to coke, crude oil to oil products, and fuel oil to electricity). Inputs to transformation processes are shown as negative numbers and output from the process is shown as a positive number. Transformation losses will appear in the “total” column as negative numbers.</td>
</tr>
<tr>
<td>Main activity producer electricity plants</td>
<td>MAINELEC</td>
<td>Refers to plants which are designed to produce electricity only. If one or more units of the plant is a CHP unit (and the inputs and outputs cannot be distinguished on a unit basis) then the whole plant is designated as a CHP plant. Main activity producers generate electricity for sale to third parties, as their primary activity. They may be privately or publicly owned. Note that the sale need not take place through the public grid.</td>
</tr>
<tr>
<td>Autoproducer electricity plants</td>
<td>AUTOELEC</td>
<td>Refers to plants which are designed to produce electricity only. If one or more units of the plant is a CHP unit (and the inputs and outputs cannot be distinguished on a unit basis) then the whole plant is designated as a CHP plant. 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.</td>
</tr>
<tr>
<td>Main activity producer CHP plants</td>
<td>MAINCHP</td>
<td>Refers to plants which are designed to produce both heat and electricity (sometimes referred to as co-generation power stations). If possible, fuel inputs and electricity/heat outputs are on a unit basis rather than on a plant basis. However, if data are not available on a unit basis, the convention for defining a CHP plant noted above 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.</td>
</tr>
<tr>
<td>Autoproducer CHP plants</td>
<td>AUTOCHP</td>
<td>Refers to plants which are designed to produce both heat and electricity (sometimes referred to as co-generation power stations). If possible, fuel inputs and electricity/heat outputs are on a unit basis rather than on a plant basis. However, if data are not available on a unit basis, the convention for defining a CHP plant noted above 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.</td>
</tr>
<tr>
<td>Flow</td>
<td>Short name</td>
<td>Definition</td>
</tr>
<tr>
<td>------------------------------------------</td>
<td>------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Main activity producer heat plants</td>
<td>MAINHEAT</td>
<td>Refers to plants (including heat pumps and electric boilers) designed to produce heat only and who sell heat to a third party (e.g. residential, commercial or industrial consumers) under the provisions of a contract. Main activity producers generate heat for sale to third parties, as their primary activity. They may be privately or publicly owned. Note that the sale need not take place through the public grid.</td>
</tr>
<tr>
<td>Autoproducer heat plants</td>
<td>AUTOHEAT</td>
<td>Refers to plants (including heat pumps and electric boilers) designed to produce heat only and who sell heat to a third party (e.g. residential, commercial or industrial consumers) under the provisions of a contract. 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.</td>
</tr>
<tr>
<td>Heat pumps</td>
<td>THEAT</td>
<td>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.</td>
</tr>
<tr>
<td>Electric boilers</td>
<td>TBOILER</td>
<td>Includes electric boilers used to produce heat.</td>
</tr>
<tr>
<td>Chemical heat for electricity production</td>
<td>TELE</td>
<td>Includes heat from chemical processes that is used to generate electricity.</td>
</tr>
<tr>
<td>Blast furnaces</td>
<td>TBLASTFUR</td>
<td>Includes the production of recovered gases (e.g. blast furnace gas and oxygen steel furnace gas). The production of pig-iron from iron ore in blast furnaces uses fuels for supporting the blast furnace charge and providing heat and carbon for the reduction of the iron ore. Accounting for the calorific content of the fuels entering the process is a complex matter as transformation (into blast furnace gas) and consumption (heat of combustion) occur simultaneously. Some carbon is also retained in the pig-iron; almost all of this reappears later in the oxygen steel furnace gas (or converter gas) when the pig-iron is converted to steel. In the 1992/1993 annual questionnaires, member countries were asked for the first time to report in 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%.</td>
</tr>
<tr>
<td>Gas works</td>
<td>TGASWKS</td>
<td>Includes the manufacture of town gas. Note: in the summary balances this item also includes other gases blended with natural gas (TBLENDGAS).</td>
</tr>
</tbody>
</table>

Note: in the summary balances this item also includes other gases blended with natural gas (TBLENDGAS).
## Transformation processes

<table>
<thead>
<tr>
<th>Flow</th>
<th>Short name</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coke ovens</td>
<td>TCOKEOV</td>
<td>Includes the manufacture of coke and coke oven gas.</td>
</tr>
<tr>
<td>Patent fuel plants</td>
<td>TPATFUEL</td>
<td>Includes the manufacture of patent fuels.</td>
</tr>
<tr>
<td>BKB/peat briquette plants</td>
<td>TBKB</td>
<td>Includes the manufacture of BKB and peat briquettes.</td>
</tr>
<tr>
<td>Oil refineries</td>
<td>TREFINER</td>
<td>Covers the use transformation of hydrocarbons for the manufacture of finished oil products.</td>
</tr>
<tr>
<td>Petrochemical plants</td>
<td>TPETCHEM</td>
<td>Covers backflows returned from the petrochemical industry. Note that backflows from oil products</td>
</tr>
<tr>
<td></td>
<td></td>
<td>that are used for non-energy purposes (i.e. white spirit and lubricants) are not included here,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>but in non-energy use.</td>
</tr>
<tr>
<td>Coal liquefaction plants</td>
<td>TCOALLIQ</td>
<td>Includes coal, oil and tar sands used to produce synthetic oil.</td>
</tr>
<tr>
<td>Gas-to-liquids (GTL) plants</td>
<td>TGTL</td>
<td>Includes natural gas used as feedstock for the conversion to liquids, e.g. the quantities of</td>
</tr>
<tr>
<td></td>
<td></td>
<td>fuel entering the methanol production process for transformation into methanol.</td>
</tr>
<tr>
<td>For blended natural gas</td>
<td>TBLENDGAS</td>
<td>Includes other gases that are blended with natural gas.</td>
</tr>
<tr>
<td>Charcoal production plants</td>
<td>TCHARCOAL</td>
<td>Includes the transformation of solid biofuels into charcoal.</td>
</tr>
<tr>
<td>Non-specified (transformation)</td>
<td>TNONSPEC</td>
<td>Includes the transformation of natural gas for hydrogen manufacture and other non-specified</td>
</tr>
<tr>
<td></td>
<td></td>
<td>transformation.</td>
</tr>
</tbody>
</table>

## Flows used in the summary balances

| Liquefaction plants              | LIQUEFAC     | Is equal to the sum of TCOALLIQ and TGTL.                                                      |
| Other transformation             | TNONSPEC     | Is equal to the sum of TCHARCOAL and TNONSPEC.                                                 |
# Energy industry own use and Losses

<table>
<thead>
<tr>
<th>Flow</th>
<th>Short name</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy industry own use</td>
<td>TOTENGY</td>
<td>Energy industry own use covers the amount of fuels used by the energy producing industries (e.g. for heating, lighting and operation of all equipment used in the extraction process, for traction and for distribution). It includes energy consumed by energy industries for heating, pumping, traction and lighting purposes [ISIC Rev. 4 Divisions 05, 06, 19 and 35, Group 091 and Classes 0892 and 0721].</td>
</tr>
<tr>
<td>Coal mines</td>
<td>EMINES</td>
<td>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).</td>
</tr>
<tr>
<td>Oil and gas extraction</td>
<td>EOILGASEX</td>
<td>Represents the energy which is used for oil and gas extraction. Flared gas is not included.</td>
</tr>
<tr>
<td>Blast furnaces</td>
<td>EBLASTFUR</td>
<td>Represents the energy which is used in blast furnaces.</td>
</tr>
<tr>
<td>Gas works</td>
<td>EGASWKS</td>
<td>Represents the energy which is used in gas works.</td>
</tr>
<tr>
<td>Gasification plants for biogases</td>
<td>EBIOGAS</td>
<td>Represents own consumption of biogas necessary to support temperatures needed for anaerobic fermentation.</td>
</tr>
<tr>
<td>Coke ovens</td>
<td>ECOKEOVS</td>
<td>Represents the energy used in coke ovens.</td>
</tr>
<tr>
<td>Patent fuel plants</td>
<td>EPATFUEL</td>
<td>Represents the energy used in patent fuel plants.</td>
</tr>
<tr>
<td>BKB/peat briquette plants</td>
<td>EBKB</td>
<td>Represents the energy used in BKB and peat briquette plants.</td>
</tr>
<tr>
<td>Oil refineries</td>
<td>EREFINER</td>
<td>Represents the energy used in refineries for the operation of equipment, heating and lighting.</td>
</tr>
<tr>
<td>Coal liquefaction plants</td>
<td>ECOALLIQ</td>
<td>Represents the energy used in coal liquefaction plants.</td>
</tr>
<tr>
<td>Liquefaction (LNG) / regasification plants</td>
<td>ELNG</td>
<td>Represents the energy used in LNG and regasification plants.</td>
</tr>
<tr>
<td>Gas-to-liquids (GTL) plants</td>
<td>EGTL</td>
<td>Represents the energy used in gas-to-liquids plants.</td>
</tr>
<tr>
<td>Own use in electricity, CHP and heat plants</td>
<td>EPOWERPLT</td>
<td>Represents the energy used in electricity, CHP and heat plants.</td>
</tr>
<tr>
<td>Pumped storage plants</td>
<td>EPUMPST</td>
<td>Represents electricity consumed in hydro-electric plants for pumped storage.</td>
</tr>
<tr>
<td>Nuclear industry</td>
<td>ENUC</td>
<td>Represents the energy used in the nuclear industry.</td>
</tr>
<tr>
<td>Charcoal production plants</td>
<td>ECHARCOAL</td>
<td>Represents the energy used in charcoal production plants.</td>
</tr>
<tr>
<td>Non-specified (energy)</td>
<td>ENONSPEC</td>
<td>Represents use in non-specified energy sector.</td>
</tr>
</tbody>
</table>
## Energy industry own use and Losses

<table>
<thead>
<tr>
<th>Flow</th>
<th>Short name</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Losses</td>
<td>DISTLOSS</td>
<td>Represents losses in energy distribution, transmission and transport.</td>
</tr>
</tbody>
</table>

### Flow used in the summary balances

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

<table>
<thead>
<tr>
<th>Flow</th>
<th>Short name</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total final consumption</td>
<td>TFC</td>
<td>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). Backflows from the petrochemical industry are not included in final consumption (see from other sources under supply and petrochemical plants in transformation). 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.</td>
</tr>
<tr>
<td>Industry</td>
<td>TOTIND</td>
<td>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.</td>
</tr>
<tr>
<td>Mining and quarrying</td>
<td>MINING</td>
<td>[ISIC Rev. 4 Divisions 07 and 08 and Group 099] Mining (excluding fuels) and quarrying.</td>
</tr>
<tr>
<td>Construction</td>
<td>CONSTRUC</td>
<td>[ISIC Rev. 4 Divisions 41 to 43]</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>MANUFACT</td>
<td>Manufacturing refers to the sum of the following industrial sub-sectors: • Iron and steel • Chemical and petrochemical • Non-ferrous metals • Non-metallic minerals • Transport equipment • Machinery • Food and tobacco • Paper, pulp and print • Wood and wood products • Textile and leather Definitions of the sub-sectors can be found under the listing for each respective sub-sector below.</td>
</tr>
<tr>
<td>Iron and steel</td>
<td>IRONSTL</td>
<td>[ISIC Rev. 4 Group 241 and Class 2431]</td>
</tr>
<tr>
<td>Chemical and petrochemical</td>
<td>CHEMICAL</td>
<td>[ISIC Rev. 4 Divisions 20 and 21] Excluding petrochemical feedstocks.</td>
</tr>
<tr>
<td>Non-ferrous metals</td>
<td>NONFERR</td>
<td>[ISIC Rev. 4 Group 242 and Class 2432] Basic industries.</td>
</tr>
<tr>
<td>Non-metallic minerals</td>
<td>NONMET</td>
<td>[ISIC Rev. 4 Division 23] Such as glass, ceramic, cement, etc.</td>
</tr>
<tr>
<td>Transport equipment</td>
<td>TRANSEQ</td>
<td>[ISIC Rev. 4 Divisions 29 and 30]</td>
</tr>
<tr>
<td>Machinery</td>
<td>MACHINE</td>
<td>[ISIC Rev. 4 Divisions 25 to 28] Fabricated metal products, machinery and equipment other than transport equipment.</td>
</tr>
<tr>
<td>Flow</td>
<td>Short name</td>
<td>Definition</td>
</tr>
<tr>
<td>------------------------------------------------</td>
<td>------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Food and tobacco</td>
<td>FOODPRO</td>
<td>[ISIC Rev. 4 Divisions 10 to 12]</td>
</tr>
<tr>
<td>Paper, pulp and print</td>
<td>PAPERPRO</td>
<td>[ISIC Rev. 4 Divisions 17 and 18]</td>
</tr>
<tr>
<td>Wood and wood products</td>
<td>WOODPRO</td>
<td>[ISIC Rev. 4 Division 16] Wood and wood products other than pulp and paper.</td>
</tr>
<tr>
<td>Textile and leather</td>
<td>TEXTILES</td>
<td>[ISIC Rev. 4 Divisions 13 to 15]</td>
</tr>
</tbody>
</table>
| Industry not elsewhere specified               | INONSPEC   | Including but not limited to: [ISIC Rev. 4 Divisions 22, 31 and 32]任何未在上述行业中所包括的行业。要点：大多数国家在供应有关工业消耗的数据时有困难。在这种情况下，使用“未指定行业”行。

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 [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. World aviation 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 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.). |
### Final consumption

<table>
<thead>
<tr>
<th>Flow</th>
<th>Short name</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pipeline transport</td>
<td>PIPELINE</td>
<td>Includes energy used in the support and operation of pipelines transporting gases, liquids, slurries and other commodities, including the energy used for pump stations and maintenance of the pipeline. Energy for the pipeline distribution of natural gas or coal gases, hot water or steam (ISIC Rev. 4 Division 35) from the distributor to final users is excluded and should be reported in 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.</td>
</tr>
</tbody>
</table>
| 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 at a country level (except for the world total). |
| Residential                 | RESIDENT   | Includes consumption by households, excluding fuels used for transport. Includes households with employed persons [ISIC Rev. 4 Divisions 97 and 98], which is a small part of total residential consumption. |
| Commercial and public services | COMMPUB    | [ISIC Rev. 4 Divisions 33, 36-39, 45-47, 52, 53, 55-56, 58-66, 68-75, 77-82, 84 (excluding Class 8422), 85-88, 90-96 and 99] |
| Agriculture/forestry        | AGRICULT   | Includes deliveries to users classified as agriculture, hunting and forestry by the ISIC, and therefore includes energy consumed by such users whether for traction (excluding agricultural highway use), power or heating (agricultural and domestic) [ISIC Rev. 4 Divisions 01 and 02]. |
### Final consumption

<table>
<thead>
<tr>
<th>Flow</th>
<th>Short name</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fishing</td>
<td>FISHING</td>
<td>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].</td>
</tr>
<tr>
<td>Final consumption not elsewhere specified</td>
<td>ONONSPEC</td>
<td>Includes all fuel use not elsewhere specified as well as consumption in the above-designated categories for which separate figures have not been provided. Military fuel use for all mobile and stationary consumption is included here (e.g. ships, aircraft, road and energy used in living quarters) regardless of whether the fuel delivered is for the military of that country or for the military of another country.</td>
</tr>
<tr>
<td>Non-energy use</td>
<td>NONENUSE</td>
<td>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. 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.</td>
</tr>
<tr>
<td>Non-energy use industry/transformation/energy</td>
<td>NEINTREN</td>
<td>Non-energy in industry, transformation processes and energy industry own use.</td>
</tr>
<tr>
<td><em>Memo: Non-energy use in industry</em></td>
<td>NEIND</td>
<td>Non-energy in industry (please see above for more details on industry sub-sector definitions).</td>
</tr>
<tr>
<td><em>Memo: Non-energy use in iron and steel</em></td>
<td>NEIRONSTL</td>
<td>Non-energy use in iron and steel (please see above for more details on industry sub-sector definitions).</td>
</tr>
<tr>
<td><em>Memo: Non-energy use chemical/petrochemical</em></td>
<td>NECHEM</td>
<td>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]. Note: this flow was called “of which petrochemical feedstocks” in previous editions.</td>
</tr>
<tr>
<td>Memo: Non-energy use in non-ferrous metals</td>
<td>NENONFERR</td>
<td>Non-energy use in non-ferrous metals (please see above for more details on industry sub-sector definitions).</td>
</tr>
<tr>
<td>Memo: Non-energy use in non-metallic minerals</td>
<td>NENONMET</td>
<td>Non-energy use in non-metallic minerals (please see above for more details on industry sub-sector definitions).</td>
</tr>
<tr>
<td>Memo: Non-energy use in transport equipment</td>
<td>NETRANSEQ</td>
<td>Non-energy use in transport equipment (please see above for more details on industry sub-sector definitions).</td>
</tr>
</tbody>
</table>
## Final consumption

<table>
<thead>
<tr>
<th>Flow</th>
<th>Short name</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Memo: Non-energy use in machinery</td>
<td>NEMACHINE</td>
<td>Non-energy use in machinery (please see above for more details on industry sub-sector definitions).</td>
</tr>
<tr>
<td>Memo: Non-energy use in mining and quarrying</td>
<td>NEMINING</td>
<td>Non-energy use in mining and quarrying (please see above for more details on industry sub-sector definitions).</td>
</tr>
<tr>
<td>Memo: Non-energy use in food/beverages/tobacco</td>
<td>NEFOODPRO</td>
<td>Non-energy use in food/beverages/tobacco (please see above for more details on industry sub-sector definitions).</td>
</tr>
<tr>
<td>Memo: Non-energy use in paper/pulp and printing</td>
<td>NEPAPERPRO</td>
<td>Non-energy use in paper/pulp and printing (please see above for more details on industry sub-sector definitions).</td>
</tr>
<tr>
<td>Memo: Non-energy use in wood and wood products</td>
<td>NEWOODPRO</td>
<td>Non-energy use in wood and wood products (please see above for more details on industry sub-sector definitions).</td>
</tr>
<tr>
<td>Memo: Non-energy use in construction</td>
<td>NECONSTRUC</td>
<td>Non-energy use in construction (please see above for more details on industry sub-sector definitions).</td>
</tr>
<tr>
<td>Memo: Non-energy use in textiles and leather</td>
<td>NETEXTILES</td>
<td>Non-energy use in textiles and leather (please see above for more details on industry sub-sector definitions).</td>
</tr>
<tr>
<td>Memo: Non-energy use in non-specified industry</td>
<td>NEINONSPEC</td>
<td>Non-energy use in non-specified industry (please see above for more details on industry sub-sector definitions).</td>
</tr>
<tr>
<td>Non-energy use in transport</td>
<td>NETRANS</td>
<td>Non-energy use in transport.</td>
</tr>
<tr>
<td>Non-energy use in other</td>
<td>NEOTHER</td>
<td>Non-energy use in other sectors such as residential, commercial/public services, agriculture/forestry and fishing.</td>
</tr>
</tbody>
</table>
## Electricity output (GWh)

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

## Heat output

<table>
<thead>
<tr>
<th>Flow</th>
<th>Short name</th>
<th>Definition</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Heat output</td>
<td>HEATOUT</td>
<td>Shows the total heat generated by plants separated into CHP plants and heat plants.</td>
<td></td>
</tr>
<tr>
<td>Heat output-main activity producer CHP plants</td>
<td>HEMAINC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heat output-autoproducer CHP plants</td>
<td>HEAUTOC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heat output-main activity producer heat plants</td>
<td>HEMAINH</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heat output-autoproducer heat plants</td>
<td>HEAUTOH</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
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**.

<table>
<thead>
<tr>
<th>Flow</th>
<th>Short name</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average net calorific value</td>
<td>NAVERAGE</td>
<td>Available for primary and secondary oil products, liquid biofuels and charcoal.</td>
</tr>
<tr>
<td>NCV of production</td>
<td>NINDPROD</td>
<td>Available for coal products, peat, oil shale, and primary oil products.</td>
</tr>
<tr>
<td>NCV of other sources</td>
<td>NOSOURCES</td>
<td>Available for coal products, peat, oil shale, and primary oil products.</td>
</tr>
<tr>
<td>NCV of imports</td>
<td>NIMPORTS</td>
<td>Available for coal products, peat, oil shale, and primary oil products.</td>
</tr>
<tr>
<td>NCV of exports</td>
<td>NEXPORTS</td>
<td>Available for coal products, peat, oil shale, and primary oil products.</td>
</tr>
<tr>
<td>NCV of coke ovens</td>
<td>NCOKEOVS</td>
<td>Only available for coal products, peat, oil shale.</td>
</tr>
<tr>
<td>NCV of blast furnaces</td>
<td>NBLAST</td>
<td>Only available for coal products, peat, oil shale.</td>
</tr>
<tr>
<td>NCV in main activity producer electricity plants</td>
<td>NMAIN</td>
<td>Only available for coal products, peat, oil shale.</td>
</tr>
<tr>
<td>NCV in autoproducer electricity plants</td>
<td>NAUTOELEC</td>
<td>Only available for coal products, peat, oil shale.</td>
</tr>
<tr>
<td>NCV in main activity CHP plants</td>
<td>NMAINCHP</td>
<td>Only available for coal products, peat, oil shale.</td>
</tr>
<tr>
<td>NCV in autoproducer CHP plants</td>
<td>NAUTOCHP</td>
<td>Only available for coal products, peat, oil shale.</td>
</tr>
<tr>
<td>NCV in main activity heat plants</td>
<td>NMAINHEAT</td>
<td>Only available for coal products, peat, oil shale.</td>
</tr>
<tr>
<td>NCV in autoproducer heat plants</td>
<td>NAUTOHEAT</td>
<td>Only available for coal products, peat, oil shale.</td>
</tr>
<tr>
<td>NCV in industry</td>
<td>NIND</td>
<td>Only available for coal products, peat, oil shale.</td>
</tr>
<tr>
<td>NCV for other uses</td>
<td>NOTHER</td>
<td>Only available for coal products, peat, oil shale.</td>
</tr>
<tr>
<td>Volume to mass ratio</td>
<td>BBLTONRATIO</td>
<td>This ratio (barrels/tonne), inverse of density, is used to calculate the oil demand by product (in barrels) presented within the <em>World Energy Statistics</em> files.</td>
</tr>
<tr>
<td>Flow</td>
<td>Short name</td>
<td>Notes</td>
</tr>
<tr>
<td>------------------------------------------</td>
<td>------------</td>
<td>------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Total energy supply (TES) (Mtoe)</td>
<td>TES</td>
<td>Total energy supply, expressed in Mtoe.</td>
</tr>
<tr>
<td>Total final consumption (TFC) (Mtoe)</td>
<td>TFC</td>
<td>Total final consumption, expressed in Mtoe.</td>
</tr>
<tr>
<td>Population (millions)</td>
<td>POP</td>
<td></td>
</tr>
</tbody>
</table>

For OECD countries:
The main source of these series for 1970 to 2019 when available is the OECD National Accounts Statistics database [ISSN: 2221-433X (online)], last published in book format as National Accounts of OECD Countries, Volume 2020 Issue 1: Detailed Tables, OECD 2020. Data for 1960 to 1969 have been estimated using the growth rates from the population series published in the OECD Factbook 2015 (online database version). Growth rates from the OECD Factbook 2015 were also used to estimate data for Slovenia (prior to 1995). Data for Latvia (prior to 1995) and Lithuania (prior to 1995) are IEA Secretariat estimates based on GDP growth rates from the World Bank.

For non-OECD countries:

* Please refer to the section on Geographical coverage.
## Indicators

<table>
<thead>
<tr>
<th>Flow</th>
<th>Short name</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDP (billion USD, 2015 prices and exchange rates)</td>
<td>GDP</td>
<td><strong>For OECD countries:</strong>&lt;br&gt;The main source of these series for 1970 to 2019 is the OECD National Accounts Statistics database [ISSN: 2221-433X (online)], last published in book format as National Accounts of OECD Countries, Volume 2020 Issue1: Detailed Tables, OECD 2020. GDP data for France, Sweden and the United Kingdom for 1960 to 1969 and Denmark for 1966 to 1969 were taken from the same source. GDP data for 1960 to 1969 for the other countries have been estimated using the growth rates from the series in the OECD Economic Outlook No 98 and other data previously published by the OECD. Growth rates from these sources were also used to estimate data for the Czech Republic (prior to 1990), Hungary (prior to 1991) and Poland (prior to 1990). Growth rates from CHELEM-CEPII online databases, Bureau van Dijk, 2020 were used to estimate data for Latvia (prior to 1994) and Lithuania (prior to 1995).&lt;br&gt;The GDP data have been compiled for all individual countries at market prices in 2015 US dollars.&lt;br&gt;<strong>For non-OECD countries:</strong>&lt;br&gt;The main source of the GDP data is World Development Indicators.&lt;br&gt;GDP figures for Bulgaria (1971-1979), Croatia (1990-1994), and Cyprus (1971-1974) have been estimated based on the growth rates of the CHELEM-CEPII online database, Bureau van Dijk, 2020.</td>
</tr>
</tbody>
</table>
### Indicators

<table>
<thead>
<tr>
<th>Flow</th>
<th>Short name</th>
<th>Notes</th>
</tr>
</thead>
</table>
| GDP (billion USD, 2015 prices and PPPs) | GDPPPP     | **For OECD countries:**  
Sources and estimations for GDP PPP data for OECD countries are the same as for GDP USD, for more details please refer to the above box “GDP (billion 2015 USD using exchange rates)”.  
**For non-OECD countries:**  
The main source of the GDP PPP data is *World Development Indicators*, The World Bank, Washington, D.C., 2020. However, this source is available for GDP PPP (constant 2011 US dollars scaled to the levels of 2015 using current PPP US dollars) only from 1990. Therefore, prior to 1990 GDP PPP data have been calculated based on the PPP conversion factor (GDP) to market exchange rate ratio.  
GDP PPP figures for Croatia (1900-1994) have been estimated using GDP/GDP PPP ratio provided by World Bank.  
The GDP PPP reflect the power purchasing parity rates based on the 2011 International Comparison Program (ICP), published in 2014. |
| Energy production (Mtoe)          | INDPROD    | Total primary energy production, expressed in Mtoe.                                                                                     |
| Net imports (Mtoe)                | NETIMP     | Imports minus exports for total energy, expressed in Mtoe.                                                                            |
| Oil supply (Mtoe)                 | OILTES     | Primary supply of oil, expressed in Mtoe.                                                                                              |
| Net oil imports (Mtoe)            | OILIMP     | Imports of oil minus exports of oil, expressed in Mtoe.                                                                                |
| Electricity generation (TWh)      | ELOUTPUT   | Shows the total amount of electricity generated by power plants separated into electricity plants and CHP plants, expressed in TWh.     |
| Electricity consumption (TWh)     | ELECONS    | Domestic consumption, i.e. gross production + imports - exports - losses, expressed in TWh.                                           |
| Total self-sufficiency            | TOTSELF    | Production divided by TES expressed as a ratio.                                                                                         |
| Coal self-sufficiency             | COALSELF   | Production divided by TES expressed as a ratio. Includes coal, peat and oil shale.                                                      |
| Oil self-sufficiency              | OILSELF    | Production divided by TES expressed as a ratio.                                                                                         |
| Gas self-sufficiency              | GASSELF    | Production divided by TES expressed as a ratio.                                                                                         |
| Share of fossil in TES            | FOSSILTES  | TES of fossil fuels divided by total TES expressed as a ratio. Fossil fuels include coal, oil shale, peat and peat products, oil and natural gas. |
| Share of fossil in electricity generation | FOSSILELE | Output of electricity produced based on fossil fuels divided by total output of electricity expressed as a ratio. Fossil fuels include coal, oil shale, peat and peat products, oil and natural gas. |
## Indicators

<table>
<thead>
<tr>
<th>Flow</th>
<th>Short name</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Share of renewable sources in TES</td>
<td>RENTES</td>
<td>Renewable sources TES divided by total TES, expressed as a ratio. Renewable sources include hydro, geothermal, solar, wind, tide, wave, biofuels and the renewable fraction of municipal waste.</td>
</tr>
<tr>
<td>Share of renewable sources in electricity generation</td>
<td>RENEL</td>
<td>Output of electricity produced from renewable sources divided by total output of electricity, expressed as a ratio. Renewable sources include electricity from hydro, geothermal, solar, wind, tide, wave, biofuels and the renewable fraction of municipal waste.</td>
</tr>
<tr>
<td>TES/population</td>
<td>TESPOP</td>
<td>Expressed as toe per capita.</td>
</tr>
<tr>
<td>TES/GDP</td>
<td>TESGDP</td>
<td>Expressed as toe per thousand 2015 USD. Based on national GDP.</td>
</tr>
<tr>
<td>TES/GDP PPP</td>
<td>TESGDPPP</td>
<td>Expressed as toe per thousand 2015 USD PPP.</td>
</tr>
<tr>
<td>GDP/TES</td>
<td>GDPTES</td>
<td>Expressed as thousand 2015 USD per toe. Based on national GDP.</td>
</tr>
<tr>
<td>GDP/TES PPP</td>
<td>GDPPPPTES</td>
<td>Expressed as thousand 2015 USD PPP per toe.</td>
</tr>
<tr>
<td>Oil supply/ population</td>
<td>OILSUPPOP</td>
<td>Expressed as toe per capita.</td>
</tr>
<tr>
<td>Oil supply/GDP</td>
<td>OILSUPGDP</td>
<td>Expressed as toe per thousand 2015 USD. Based on national GDP.</td>
</tr>
<tr>
<td>Oil supply/GDP PPP</td>
<td>OILSUPGDPPP</td>
<td>Expressed as toe per thousand 2015 USD PPP.</td>
</tr>
<tr>
<td>Net oil imports/GDP</td>
<td>OILIMPGDP</td>
<td>Expressed as toe per thousand 2015 USD. Based on national GDP.</td>
</tr>
<tr>
<td>Net oil imports/GDP PPP</td>
<td>OILIMPGDPPP</td>
<td>Expressed as toe per thousand 2015 USD PPP.</td>
</tr>
<tr>
<td>Electricity consumption/ population</td>
<td>ELEPOP</td>
<td>Expressed as kWh per capita. Electricity consumption equals domestic supply less losses.</td>
</tr>
<tr>
<td>Electricity consumption/GDP</td>
<td>ELEGDP</td>
<td>Expressed as kWh per 2015 USD. Based on national GDP. Electricity consumption equals domestic supply less losses.</td>
</tr>
<tr>
<td>Electricity consumption/GDP PPP</td>
<td>ELEGDPPPP</td>
<td>Expressed as kWh per 2015 USD. Electricity consumption equals domestic supply less losses.</td>
</tr>
<tr>
<td>TFC/population</td>
<td>TFCPOP</td>
<td>Expressed as toe per capita.</td>
</tr>
<tr>
<td>TFC/GDP</td>
<td>TFCGDP</td>
<td>Expressed as toe per thousand 2015 USD. Based on national GDP.</td>
</tr>
<tr>
<td>TFC/GDP PPP</td>
<td>TFCGDPPP</td>
<td>Expressed as toe per thousand 2015 USD PPP.</td>
</tr>
<tr>
<td>Transport/population</td>
<td>TRANPOP</td>
<td>Expressed as toe per capita.</td>
</tr>
<tr>
<td>Transport/GDP</td>
<td>TRANGDP</td>
<td>Expressed as toe per thousand 2015 USD. Based on national GDP.</td>
</tr>
</tbody>
</table>
### Indicators

<table>
<thead>
<tr>
<th>Flow</th>
<th>Short name</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transport/GDP PPP</td>
<td>TRANGDPPP</td>
<td>Expressed as toe per thousand 2015 USD PPP.</td>
</tr>
<tr>
<td>Residential/population</td>
<td>RESPOP</td>
<td>Expressed as toe per capita.</td>
</tr>
<tr>
<td>Residential/GDP</td>
<td>RESGDP</td>
<td>Expressed as toe per thousand 2015 USD. Based on national GDP.</td>
</tr>
<tr>
<td>Residential/GDP PPP</td>
<td>RESGDPPP</td>
<td>Expressed as toe per thousand 2015 USD PPP.</td>
</tr>
<tr>
<td>Services/population</td>
<td>SERVPOP</td>
<td>Expressed as toe per capita.</td>
</tr>
<tr>
<td>Services /GDP</td>
<td>SERVGD</td>
<td>Expressed as toe per thousand 2015 USD. Based on national GDP.</td>
</tr>
<tr>
<td>Services /GDP PPP</td>
<td>SERVGDPPP</td>
<td>Expressed as toe per thousand 2015 USD PPP.</td>
</tr>
<tr>
<td>Industry/population</td>
<td>INDPOP</td>
<td>Expressed as toe per capita.</td>
</tr>
<tr>
<td>Industry /GDP</td>
<td>INDGDP</td>
<td>Expressed as toe per thousand 2015 USD. Based on national GDP.</td>
</tr>
<tr>
<td>Industry /GDP PPP</td>
<td>INDGDPPPP</td>
<td>Expressed as toe per thousand 2015 USD PPP.</td>
</tr>
<tr>
<td>Industrial production index</td>
<td>IPI</td>
<td>Only available for OECD countries.</td>
</tr>
<tr>
<td>(2015=100)</td>
<td></td>
<td>The main source of these series is the OECD database Main Economic</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Indicators, July 2019.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Industrial production refers to the goods produced by establishments</td>
</tr>
<tr>
<td></td>
<td></td>
<td>engaged in mining (including oil extraction), manufacturing, and</td>
</tr>
<tr>
<td></td>
<td></td>
<td>production of electricity, gas and water. These are Sections B, C,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>D and E of ISIC Rev. 4 or NACE Rev. 2 classifications. From 1991,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>the industrial production index for Germany refers to unified</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Germany and has been linked to the series for western Germany.</td>
</tr>
<tr>
<td>Index of industry consumption/industrial production</td>
<td>INDIPI</td>
<td>For OECD countries only</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Expressed as an index where 2015=100.</td>
</tr>
<tr>
<td>Index of industry oil</td>
<td>OILINDIPI</td>
<td>For OECD countries only</td>
</tr>
<tr>
<td>consumption/industrial</td>
<td></td>
<td>Expressed as an index where 2015=100.</td>
</tr>
<tr>
<td>production</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total thermal efficiency of</td>
<td>THERMELE</td>
<td></td>
</tr>
<tr>
<td>electricity only plants</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(main and auto) (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total thermal efficiency of</td>
<td>THERMEFF</td>
<td></td>
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<tr>
<td>electricity and heat plants</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## 4. PRODUCT DEFINITIONS

<table>
<thead>
<tr>
<th>Product</th>
<th>Short name</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hard coal (if no detail)</td>
<td>HARDCOAL</td>
<td>This item is only used if the detailed breakdown is not available. It includes anthracite, coking coal, other bituminous coal.</td>
</tr>
<tr>
<td>Brown coal (if no detail)</td>
<td>BROWN</td>
<td>This item is only used if the detailed breakdown is not available. It includes lignite and sub-bituminous coal.</td>
</tr>
<tr>
<td>Anthracite</td>
<td>ANTCOAL</td>
<td>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.</td>
</tr>
<tr>
<td>Coking coal</td>
<td>COKCOAL</td>
<td>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.</td>
</tr>
<tr>
<td>Other bituminous coal</td>
<td>BITCOAL</td>
<td>Other bituminous coal is used mainly for steam raising and space heating purposes and includes all bituminous coal that is not included under coking coal nor anthracite. It is usually more than 10% volatile matter and a relatively high carbon content (less than 90% fixed carbon). Its gross calorific value is greater than 24 000 kJ/kg on an ash-free but moist basis.</td>
</tr>
<tr>
<td>Sub-bituminous coal</td>
<td>SUBCOAL</td>
<td>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.</td>
</tr>
<tr>
<td>Lignite</td>
<td>LIGNITE</td>
<td>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.</td>
</tr>
<tr>
<td>Patent fuel</td>
<td>PATFUEL</td>
<td>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.</td>
</tr>
</tbody>
</table>
## Coal

<table>
<thead>
<tr>
<th>Product</th>
<th>Short name</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coke oven coke</td>
<td>OVENCOKE</td>
<td>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).</td>
</tr>
<tr>
<td>Gas coke</td>
<td>GASCOKE</td>
<td>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.</td>
</tr>
<tr>
<td>Coal tar</td>
<td>COALTAR</td>
<td>Coal tar is a result of the destructive distillation of bituminous coal or of the low-temperature carbonisation of brown coal. Coal tar is the liquid by-product of the distillation of coal to make coke in the coke oven process. Coal tar can be further distilled into different organic products (e.g. benzene, toluene, naphthalene), which normally would be reported as a feedstock to the petrochemical industry.</td>
</tr>
<tr>
<td>BKB</td>
<td>BKB</td>
<td>Brown coal briquettes are composition fuels manufactured from lignite, produced by briquetting under high pressure with or without the addition of a binding agent. The heading energy industry own use includes consumption by briquetting plants.</td>
</tr>
<tr>
<td>Gas works gas</td>
<td>GASWKSGS</td>
<td>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.</td>
</tr>
<tr>
<td>Coke oven gas</td>
<td>COKEOVGS</td>
<td>Coke oven gas is obtained as a by-product of the manufacture of coke oven coke for the production of iron and steel.</td>
</tr>
<tr>
<td>Blast furnace gas</td>
<td>BLFURGS</td>
<td>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.</td>
</tr>
<tr>
<td>Other recovered gases</td>
<td>OGASES</td>
<td>By-product of the production of steel in an oxygen furnace, recovered on leaving the furnace. The gases are also known as converter gas, LD gas or BOS gas. 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.</td>
</tr>
</tbody>
</table>
### Peat and Peat products

<table>
<thead>
<tr>
<th>Product</th>
<th>Short name</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peat</td>
<td>PEAT</td>
<td>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.</td>
</tr>
<tr>
<td>Peat products</td>
<td>PEATPROD</td>
<td>Products such as peat briquettes derived directly or indirectly from sod peat and milled peat.</td>
</tr>
</tbody>
</table>

### Oil shale

<table>
<thead>
<tr>
<th>Product</th>
<th>Short name</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oil shale and oil sands</td>
<td>OILSHALE</td>
<td>Oil shale and oil sands are sedimentary rock which contains organic matter in the form of kerogen. Kerogen is a waxy hydrocarbon-rich material regarded as a precursor of petroleum. Oil shale may be burned directly or processed by heating to extract shale oil. Oil shale and tar sands used as inputs for other transformation processes are 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).</td>
</tr>
</tbody>
</table>

### Natural gas

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

<table>
<thead>
<tr>
<th>Product</th>
<th>Short name</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crude/NGL/refinery feedstocks</td>
<td>CRNGFEED</td>
<td>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.</td>
</tr>
<tr>
<td>Crude oil</td>
<td>CRUDEOIL</td>
<td>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.</td>
</tr>
<tr>
<td>Natural gas liquids</td>
<td>NGL</td>
<td>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).</td>
</tr>
<tr>
<td>Refinery feedstocks</td>
<td>REFFEEDS</td>
<td>A refinery feedstock is a processed oil destined for further processing (e.g. straight run fuel oil or vacuum gas oil) other than blending in the refining industry. It is transformed into one or more components and/or finished products. With further processing, it will be transformed into one or more components and/or finished products. This definition also covers returns from the petrochemical industry to the refining industry (e.g. pyrolysis gasoline, C4 fractions, gasoil and fuel oil fractions).</td>
</tr>
<tr>
<td>Additives/blending components</td>
<td>ADDITIVE</td>
<td>Additives are non-hydrocarbon substances added to or blended with a product to modify its properties, for example, to improve its combustion characteristics. Alcohols and ethers (MTBE, methyl tertiary-butyl ether) and chemical alloys such as tetraethyl lead are included here. The biomass fractions of biogasoline, biodiesel and ethanol are not included here, but under liquid biofuels. This differs from the presentation of additives in the <em>Oil Information</em> publication.</td>
</tr>
<tr>
<td>Other hydrocarbons</td>
<td>NONCRUDE</td>
<td>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).</td>
</tr>
</tbody>
</table>
## Oil products

<table>
<thead>
<tr>
<th>Product</th>
<th>Short name</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Refinery gas</td>
<td>REFINGAS</td>
<td>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 <em>oil refineries in energy industry own use</em>.</td>
</tr>
<tr>
<td>Ethane</td>
<td>ETHANE</td>
<td>Ethane is a naturally gaseous straight-chain hydrocarbon (C₂H₆). It is a colourless paraffinic gas which is extracted from natural gas and refinery gas streams.</td>
</tr>
<tr>
<td>Liquefied petroleum gases (LPG)</td>
<td>LPG</td>
<td>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 (C₃H₈) and butane (C₄H₁₀) or a combination of the two. They could also include propylene, butylene, isobutene and isobutenylene. LPGs are normally liquefied under pressure for transportation and storage.</td>
</tr>
<tr>
<td>Motor gasoline excl. biofuels</td>
<td>NONBIOGASO</td>
<td>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.</td>
</tr>
<tr>
<td>Aviation gasoline</td>
<td>AVGAS</td>
<td>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.</td>
</tr>
<tr>
<td>Gasoline type jet fuel</td>
<td>JETGAS</td>
<td>Gasoline type jet fuel includes all light hydrocarbon oils for use in aviation turbine power units, which distil between 100°C and 250°C. This fuel is obtained by blending kerosenes and gasoline or naphthas in such a way that the aromatic content does not exceed 25% in volume, and the vapour pressure is between 13.7 kPa and 20.6 kPa. Additives can be included to improve fuel stability and combustibility.</td>
</tr>
<tr>
<td>Kerosene type jet fuel excl. biofuels</td>
<td>NONBIOJETK</td>
<td>Kerosene type jet fuel is a medium distillate used for aviation turbine power units. It has the same distillation characteristics and flash point as kerosene (between 150°C and 300°C but not generally above 250°C). In addition, it has particular specifications (such as freezing point) which are established by the International Air Transport Association (IATA). It includes kerosene blending components. Kerosene type jet fuel excluding biofuels does not include the liquid biofuels blended with jet kerosene.</td>
</tr>
<tr>
<td>Product</td>
<td>Short name</td>
<td>Definition</td>
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</tr>
<tr>
<td>Other kerosene</td>
<td>OTHKERO</td>
<td>Kerosene (other than kerosene used for aircraft transport which is included with aviation fuels) comprises refined petroleum distillate intermediate in volatility between gasoline and gas/diesel oil. It is a medium oil distilling between 150°C and 300°C.</td>
</tr>
<tr>
<td>Gas/diesel oil excl. biofuels</td>
<td>NONBIODIES</td>
<td>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 180°C and 380°C. Several grades are available depending on uses: diesel oil for diesel compression ignition (cars, trucks, marine, etc.), light heating oil for industrial and commercial uses, and other gas oil including heavy gas oils which distil between 380°C and 540°C and which are used as petrochemical feedstocks. Gas/diesel oil excluding biofuels does not include the liquid biofuels blended with gas/diesel oil – see liquid biofuels.</td>
</tr>
<tr>
<td>Fuel oil</td>
<td>RESFUEL</td>
<td>Fuel oil defines oils that make up the distillation residue. It comprises all residual fuel oils, including those obtained by blending. Its kinematic viscosity is above 10 cSt at 80°C. The flash point is always above 50°C and the density is always higher than 0.90 kg/l.</td>
</tr>
<tr>
<td>Naphtha</td>
<td>NAPHTHA</td>
<td>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 30°C and 210°C. 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).</td>
</tr>
<tr>
<td>White spirit &amp; industrial spirit (SBP)</td>
<td>WHITESP</td>
<td>White spirit and industrial spirit (SBP) are refined distillate intermediates with a distillation in the naphtha/kerosene range. White spirit has a flash point above 30°C and a distillation range of 135°C to 200°C. Industrial Spirit (SBP) comprises light oils distilling between 30°C and 200°C, with a temperature difference between 5% volume and 90% volume distillation points, including losses, of not more than 60°C. In other words, SBP is a light oil of narrower cut than motor spirit. There are seven or eight grades of industrial spirit, depending on the position of the cut in the distillation range defined above.</td>
</tr>
<tr>
<td>Lubricants</td>
<td>LUBRIC</td>
<td>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.</td>
</tr>
</tbody>
</table>
## Oil products

<table>
<thead>
<tr>
<th>Product</th>
<th>Short name</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bitumen</td>
<td>BITUMEN</td>
<td>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.</td>
</tr>
<tr>
<td>Paraffin waxes</td>
<td>PARWAX</td>
<td>Paraffin waxes are saturated aliphatic hydrocarbons. These waxes are residues extracted when dewaxing lubricant oils, and they have a crystalline structure which is more or less fine according to the grade. Their main characteristics are that they are colourless, odourless and translucent, with a melting point above 45°C.</td>
</tr>
<tr>
<td>Petroleum coke</td>
<td>PETCOKE</td>
<td>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 &quot;green coke&quot; and &quot;calcined coke&quot;. This category also includes &quot;catalyst coke&quot; deposited on the catalyst during refining processes: this coke is not recoverable and is usually burned as refinery fuel.</td>
</tr>
<tr>
<td>Other oil products</td>
<td>ONONSPEC</td>
<td>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.</td>
</tr>
<tr>
<td>Product</td>
<td>Short name</td>
<td>Definition</td>
</tr>
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</tr>
<tr>
<td>Industrial waste</td>
<td>INDWASTE</td>
<td>Industrial waste of non-renewable origin consists of solid and liquid products (e.g. tyres) combusted directly, usually in specialised plants, to produce heat and/or power. Renewable industrial waste is not included here, but with solid biofuels, biogases or liquid biofuels.</td>
</tr>
<tr>
<td>Municipal waste (renewable)</td>
<td>MUNWASTER</td>
<td>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.</td>
</tr>
<tr>
<td>Municipal waste (non-renewable)</td>
<td>MUNWASTEN</td>
<td>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.</td>
</tr>
<tr>
<td>Primary solid biofuels</td>
<td>PRIMSBIO</td>
<td>Primary solid biofuels is defined as any plant matter used directly as fuel or converted into other forms before combustion. This covers a multitude of woody materials generated by industrial process or provided directly by forestry and agriculture (firewood, wood chips, bark, sawdust, shavings, chips, sulphite lyes also known as black liquor, animal materials/wastes and other solid biofuels). Note that for biofuels, only the amounts of biomass specifically used for energy purposes (a small part of the total) are included in the energy statistics. Therefore, the non-energy use of biomass is not taken into consideration and the quantities are null by definition.</td>
</tr>
<tr>
<td>Biogases</td>
<td>BIOGASES</td>
<td>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. Biogases are used mainly as a fuel but can be used as a chemical feedstock.</td>
</tr>
</tbody>
</table>

**Biofuels and Waste**

INTERNATIONAL ENERGY AGENCY
## Biofuels and Waste

<table>
<thead>
<tr>
<th>Product</th>
<th>Short name</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Biogasoline</td>
<td>BIOGASOL</td>
<td>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.</td>
</tr>
<tr>
<td>Biodiesels</td>
<td>BIODIESEL</td>
<td>Biodiesels includes biodiesel (a methyl-ester produced from vegetable or animal oil, of diesel quality), biodimethyl ether (dimethyl ether 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.</td>
</tr>
<tr>
<td>Bio jet kerosene</td>
<td>BIOJETKERO</td>
<td>Liquid biofuels derived from biomass and blended with or replacing jet kerosene.</td>
</tr>
<tr>
<td>Other liquid biofuels</td>
<td>OBIOLIQ</td>
<td>Other liquid biofuels includes liquid biofuels not reported in either biogasoline or biodiesels.</td>
</tr>
<tr>
<td>Non-specified primary biofuels and waste</td>
<td>RENEWNS</td>
<td>This item is used when the detailed breakdown for primary biofuels and waste is not available.</td>
</tr>
<tr>
<td>Charcoal</td>
<td>CHARCOAL</td>
<td>It covers the solid residue of the destructive distillation and pyrolysis of wood and other vegetal material.</td>
</tr>
<tr>
<td>Memo: Renewables</td>
<td>MRENEW</td>
<td>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.</td>
</tr>
</tbody>
</table>
## Electric and Heat

<table>
<thead>
<tr>
<th>Product</th>
<th>Short name</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elec/heat output from non-specified manufactured</td>
<td>MANGAS</td>
<td>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.</td>
</tr>
<tr>
<td>gases</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heat output from non-specified combustible fuels</td>
<td>HEATNS</td>
<td>This item is only used if the detailed breakdown is not available.</td>
</tr>
<tr>
<td>Nuclear</td>
<td>NUCLEAR</td>
<td>Energy released by nuclear fission or nuclear fusion.</td>
</tr>
<tr>
<td>Hydro</td>
<td>HYDRO</td>
<td>Hydro energy represents the potential and kinetic energy of water converted into electricity in hydroelectric plants.</td>
</tr>
<tr>
<td>Geothermal</td>
<td>GEOTHERM</td>
<td>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:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• for electricity generation using dry stream or high enthalpy brine after flashing</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• directly as heat for district heating, agriculture, etc.</td>
</tr>
<tr>
<td>Solar photovoltaics</td>
<td>SOLARPV</td>
<td>Electricity from photovoltaic cells.</td>
</tr>
<tr>
<td>Solar thermal</td>
<td>SOLARTH</td>
<td>Solar energy is the solar radiation exploited for hot water production and electricity generation, by:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• flat plate collectors, mainly of the thermosyphon type, for domestic hot water or for the seasonal heating of swimming pools</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• solar thermal-electric plants</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Passive solar energy for the direct heating, cooling and lighting of dwellings or other buildings is not included.</td>
</tr>
<tr>
<td>Tide, wave and ocean</td>
<td>TIDE</td>
<td>Tide, wave and ocean represents the mechanical energy derived from tidal movement, wave motion or ocean current and exploited for electricity generation.</td>
</tr>
<tr>
<td>Wind</td>
<td>WIND</td>
<td>Wind energy represents the kinetic energy of wind exploited for electricity generation in wind turbines.</td>
</tr>
<tr>
<td>Other sources</td>
<td>OTHER</td>
<td>Other sources includes production not included elsewhere such as fuel cells.</td>
</tr>
<tr>
<td>Electricity</td>
<td>ELECTR</td>
<td>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.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The difference between gross and net production is generally estimated as 7% for conventional thermal stations, 1% for hydro stations, and 6% for nuclear, geothermal and solar stations. Production in hydro stations includes production from pumped storage plants.</td>
</tr>
</tbody>
</table>
## Electricity and Heat

<table>
<thead>
<tr>
<th>Product</th>
<th>Short name</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heat</td>
<td>HEAT</td>
<td>Heat production includes all heat produced by main activity producer CHP and heat plants, as well as heat sold by autoproducer CHP and heat plants to third parties. Fuels used to produce quantities of heat for sale are included in the transformation processes under the rows 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.</td>
</tr>
</tbody>
</table>

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**INTERNATIONAL ENERGY AGENCY**
### Products for summary balances

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

<table>
<thead>
<tr>
<th>Product</th>
<th>Short name</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Memo: Geothermal, solar/wind/other, heat, electricity.</td>
<td>MTOTOTHER</td>
<td>Is equal to the sum of GEOTHERM, SOLARWIND, HEAT and ELECTR.</td>
</tr>
</tbody>
</table>
5. GEOGRAPHICAL COVERAGE

<table>
<thead>
<tr>
<th>Country/Region</th>
<th>Short name</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Argentina</td>
<td>ARGENTINA</td>
<td></td>
</tr>
<tr>
<td>Austria</td>
<td>AUSTRIA</td>
<td></td>
</tr>
<tr>
<td>Belgium</td>
<td>BELGIUM</td>
<td></td>
</tr>
<tr>
<td>Brazil</td>
<td>BRAZIL</td>
<td></td>
</tr>
<tr>
<td>Bulgaria</td>
<td>BULGARIA</td>
<td></td>
</tr>
<tr>
<td>People’s Republic of China</td>
<td>CHINA</td>
<td></td>
</tr>
<tr>
<td>Costa Rica</td>
<td>COSTARICA</td>
<td></td>
</tr>
<tr>
<td>Croatia</td>
<td>CROATIA</td>
<td>Data for Croatia are available starting in 1990. Prior to that, they</td>
</tr>
<tr>
<td></td>
<td></td>
<td>are included in Former Yugoslavia.</td>
</tr>
<tr>
<td>Cyprus</td>
<td>CYPRUS</td>
<td><strong>Note by Turkey:</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>The information in this document with reference to “Cyprus” relates to the</td>
</tr>
<tr>
<td></td>
<td></td>
<td>southern part of the Island. There is no single authority representing</td>
</tr>
<tr>
<td></td>
<td></td>
<td>both Turkish and Greek Cypriot people on the Island. Turkey recognizes the</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Turkish Republic of Northern Cyprus (TRNC). Until a lasting and equitable</td>
</tr>
<tr>
<td></td>
<td></td>
<td>solution is found within the context of the United Nations, Turkey shall</td>
</tr>
<tr>
<td></td>
<td></td>
<td>preserve its position concerning the “Cyprus” issue.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>**Note by all the European Union Member States of the OECD and the European</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Union:**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The Republic of Cyprus is recognised by all members of the United Nations</td>
</tr>
<tr>
<td></td>
<td></td>
<td>with the exception of Turkey. The information in this report relates to the</td>
</tr>
<tr>
<td></td>
<td></td>
<td>area under the effective control of the Government of the Republic of</td>
</tr>
<tr>
<td>Czech Republic</td>
<td>CZECH</td>
<td>Data start in 1971.</td>
</tr>
</tbody>
</table>

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, unless otherwise specified.
Countries, economies and territories

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<table>
<thead>
<tr>
<th>Country/Region</th>
<th>Short name</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Denmark</td>
<td>DENMARK</td>
<td>Excludes Greenland and the Faroe Islands, except prior to 1990, where data on oil for Greenland were included with the Danish statistics. The Administration is planning to revise the series back to 1974 to exclude these amounts.</td>
</tr>
<tr>
<td>Ecuador</td>
<td>ECUADOR</td>
<td></td>
</tr>
<tr>
<td>El Salvador</td>
<td>ELSALVADOR</td>
<td></td>
</tr>
<tr>
<td>Finland</td>
<td>FINLAND</td>
<td></td>
</tr>
<tr>
<td>France</td>
<td>FRANCE</td>
<td>Includes Monaco and excludes the overseas collectivities: New Caledonia; French Polynesia; Saint Barthélemy; Saint Martin; Saint Pierre and Miquelon; and Wallis and Futuna. Energy data for the following overseas departments: Guadeloupe; French Guiana; Martinique; Mayotte; and Réunion are included for the years from 2011 onwards, and excluded for earlier years.</td>
</tr>
<tr>
<td>Germany</td>
<td>GERMANY</td>
<td>Includes the new federal states of Germany from 1970 onwards.</td>
</tr>
<tr>
<td>Guyana</td>
<td>GUYANA</td>
<td></td>
</tr>
<tr>
<td>Hungary</td>
<td>HUNGARY</td>
<td>Data start in 1965.</td>
</tr>
<tr>
<td>India</td>
<td>INDIA</td>
<td>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.</td>
</tr>
<tr>
<td>Indonesia</td>
<td>INDONESIA</td>
<td></td>
</tr>
<tr>
<td>Ireland</td>
<td>IRELAND</td>
<td></td>
</tr>
<tr>
<td>Latvia</td>
<td>LATVIA</td>
<td>Data for Latvia are available starting in 1990. Prior to that, they are included in Former Soviet Union.</td>
</tr>
<tr>
<td>Lithuania</td>
<td>LITHUANIA</td>
<td>Data for Lithuania are available starting in 1990. Prior to that, they are included in Former Soviet Union.</td>
</tr>
<tr>
<td>Luxembourg</td>
<td>LUXEMBOU</td>
<td></td>
</tr>
<tr>
<td>Malta</td>
<td>MALTA</td>
<td></td>
</tr>
<tr>
<td>Morocco</td>
<td>MOROCCO</td>
<td></td>
</tr>
<tr>
<td>Panama</td>
<td>PANAMA</td>
<td></td>
</tr>
<tr>
<td>Paraguay</td>
<td>PARAGUAY</td>
<td></td>
</tr>
<tr>
<td>Poland</td>
<td>POLAND</td>
<td></td>
</tr>
</tbody>
</table>
### Countries, economies and territories

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<table>
<thead>
<tr>
<th>Country/Region</th>
<th>Short name</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Portugal</td>
<td>PORTUGAL</td>
<td>Includes the Azores and Madeira.</td>
</tr>
<tr>
<td>Singapore</td>
<td>SINGAPORE</td>
<td></td>
</tr>
<tr>
<td>Slovenia</td>
<td>SLOVENIA</td>
<td>Data start in 1990. Prior to that, they are included within Former Yugoslavia.</td>
</tr>
<tr>
<td>South Africa</td>
<td>SOUTHAFRIC</td>
<td>Nuclear and Hydro electricity generation data are reported on a fiscal year basis, beginning on the 1 July Y and ending on the 30 June Y+1.</td>
</tr>
<tr>
<td>Sweden</td>
<td>SWEDEN</td>
<td></td>
</tr>
<tr>
<td>Switzerland</td>
<td>SWITLAND</td>
<td>Includes Liechtenstein for the oil data. Data for other fuels do not include Liechtenstein.</td>
</tr>
<tr>
<td>Thailand</td>
<td>THAILAND</td>
<td></td>
</tr>
<tr>
<td>United Kingdom</td>
<td>UK</td>
<td>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.</td>
</tr>
<tr>
<td>United States</td>
<td>USA</td>
<td>Includes the 50 states and the District of Columbia but generally excludes all territories, and all trade between the U.S. and its territories. Oil statistics include Guam, Puerto Rico 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.</td>
</tr>
<tr>
<td>Uruguay</td>
<td>URUGUAY</td>
<td></td>
</tr>
</tbody>
</table>

---

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

INTERNATIONAL ENERGY AGENCY
**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’.

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<table>
<thead>
<tr>
<th>Country/Region</th>
<th>Short name</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>India</td>
<td>INDIA</td>
<td>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.</td>
</tr>
<tr>
<td>South Africa</td>
<td>SOUTHAFRIC</td>
<td>Nuclear and Hydro electricity generation data are reported on a fiscal year basis, beginning on the 1 July Y and ending on 30 June Y+1.</td>
</tr>
</tbody>
</table>
6. COUNTRY NOTES AND SOURCES

OECD COUNTRIES

General notes

The notes given in this document refer to data for the years 1960 to 2019 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 IEA information databases updated every year in July (Oil information, Natural Gas information, Coal information, Electricity information and Renewables information).

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

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

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

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

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

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=G ET_PDF_FILE&RevisionSelectionMethod=LatestRel eased&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 2018 there were high values of patent fuel imported and consumed in the paper and pulp industry, which was not the case in 2019.
• In the 2019 edition, revisions concerning the iron and steel industry were received for data since 2005. The revisions impacted the energy sector for coke oven gas and blast furnace gas.
• In 2018 data, blast furnace gas decreased following maintenance work in one of the blast furnaces. Additionally, other recovered gases (LD-gas) are reported separately following an improvement in reporting from the 2020 edition (in previous editions it was reported under blast furnace gas).
• The last lignite mine closed in the second quarter of 2004 and lignite use for power generation ceased in 2006.
• Since 1996, gas works gas data are reported with natural gas because it is distributed in the same network. The amount of gas works gas is negligible and it is mostly consumed by households.
• “Trockenkohle” is included with BKB because of its high calorific value.

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

Supply

• In the 2021 edition, the Austrian administration revised the stock levels (national territory) of motor gasoline (from 2006 onwards) and fuel oil (from 2005 onwards) but with the stock changes preserved as in the previous edition. A stock break appears for fuel oil between 2004 and 2005.
• In the 2016 edition, exports of naphtha are no longer reported from 2014, past values may refer to exports of petrochemical raw material.
• Deliveries of gas/diesel to international marine bunkers were revised back to 1990 after implementation of a new study results.
• Prior to 1990, a portion of naphtha is included with other oil products.

Transformation

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

Natural gas

Supply

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

Transformation

• In the 2018 edition, the time series for blast furnaces was reclassified from 1990 onwards, and thus moved from the Transformation to the Energy sector. This has resulted in increasing the efficiency of the blast furnaces process.
• Between 1995 and 1996 there is a break in time series for autoproducer electricity and CHP plants due to the availability of more detailed data.

Consumption

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

- Any inconsistencies in the time series for commercial/public services until 2011 are the result of this sub-sector being computed as a residual. Since 2012 the commercial/public services consumption figures are surveyed annually and the consumption quantities in small and medium enterprises in industry are the projected results of biannual sample surveys. The increase in pipeline transport consumption for 2013 is due to a new methodology of data collection. Historical revisions are pending. Prior to 2000, differences due to measurement are included with distribution losses.

Biofuels and waste

General notes

- Data for 1986 to 1989 for solid biofuels, industrial waste, biogases and liquid biofuels are IEA Secretariat estimates based on information published by OSTAT in 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

- Electricity-only plant data may include some CHP plants operating in electricity-only mode. In addition, fuel inputs to and electricity outputs from CHP plants are re-allocated from CHP to electricity-only plants if the implied CHP efficiency would fall below 75%.
- Fluctuating efficiencies from year to year for solid biofuel and industrial waste plants are related to operational decisions which are governed by a formula described in the Standard documentation Meta information on Energy balances for Austria and the Laender of Austria published in June 2016 on the Statistics Austria website.
- In the 2018 edition, electricity production from municipal waste main activity electricity plants was revised from 2003-2009. Additionally, electricity production from municipal waste main activity CHP plants was revised in 2014.
- A large autoproducer electricity plant was reclassified as an autoproducer CHP plant and therefore creates a break in time series for municipal waste in 2011.
- In 2009, inputs of other oil products to autoproducer CHP plants were reclassified as refinery gas and natural gas.
- Due to a change in the survey methodology, the heat produced in small plants (capacity inferior to 1 MW) is not reported starting in 2002.
- Heat from chemical processes used for electricity production is available from 2000.
- Electricity generation from geothermal started in 2002.
- Prior to 2002, data for biogases only include plants of 1 MW or larger.
- Prior to 1981, inputs to main activity producer electricity plants include inputs to CHP plants. All electricity production by CHP plants is included in electricity plants, and only production from combustible fuel sources is taken into account. Autoproducer CHP heat production is included in main activity producer CHP plants. For heat, own use is included in distribution losses.

Consumption

- In the 2020 edition, Austria revised consumption data back to 2013 based on a new methodology for disaggregating consumption across sectors.
- In the 2020 edition, a large portion of electricity consumption in blast furnaces was reallocated to iron and steel sector from 1990 to 2004. This creates breaks in-series in these time series between 2004 and 2005. Revisions to data for 2005 onwards are expected in a future edition.
Electricity consumption in Road includes trams, trolleybuses, subways, cableways, chair- and drag-lifts, as well as 100% electric vehicles.

In the 2019 edition, Austria revised data back to 2005 in order to present international reporting as consistent as possible with the national energy balances. In addition, consumption figures were revised based on more recent surveys of energy consumption in small and medium-sized enterprises. Outliers and the extrapolation methodology will be revised following the results of the next survey.

Electricity consumption in oil refineries includes consumption in gas works plants prior to 1991.

From 1990 to 2009, small amounts of electricity used in heat pumps have been included in the residential sector.

Starting in 1990, consumption of electricity in the field of electricity supply, district heating and water supply are included in other energy industry own use, prior to that it was included in commercial/public services.

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

### Belgium

#### Source

Observatoire de l’Energie, Brussels.

#### Coal

**General notes**

- 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 have been also revised back to 2013.
- In the 2016 edition, improved data collection has led to some breaks in time series. These revisions include hard coal classifications, products and processes in integrated iron and steel manufacture and may be extended further back in future editions.
- Data for anthracite prior to 2014 may include a small portion of other bituminous coal.
- Hard coal data prior to 1978 may include sub-bituminous coal.
- Other bituminous coal and sub-bituminous coal data reported in from other sources refer to coal recuperated from coal dumps.

#### Supply

- Supply-side data are obtained through surveying questionnaires instead of customs data.
- Transit trade is excluded. For each country (trade partner), the imported and exported quantities are compared and cleared. In the case of Belgium, this decreases the final figure of exports. 2019 data shows a rise in exports of other bituminous coal; the imports decreased during that year but some companies continued to export the stocks originated from those countries in 2019, leading to this rise.
- In the 2019 edition, the calorific values of imported bituminous coal were revised upwards by the Belgian administration since 2015, resulting in a significant increase in the coal primary energy supply. Historical revisions are pending.
- Conventional production of other bituminous coal ceased on 31 August 1992.

#### Transformation

- In the 2019 edition, anthracite previously reported as consumption in the iron and steel industry was reclassified as part of the transformation process in blast furnaces since 2013.
- In 2016, the decrease of other bituminous coal inputs to main activity producer electricity plants was due to the permanent closure of Langerlo, Belgium’s last coal-fired main activity electricity.
- In 2015, the decrease of coke oven gas inputs to autoproducer CHP plants is due to a power plant closure in 2015.
- In 2014 and 2015, coking coal inputs to coke ovens decreased due to a coke oven closure in June 2014.
- In 2014, the decrease of other bituminous coal inputs to main activity producer electricity plants is due to a power plant closure in 2014.

#### Consumption

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

- In the 2018 edition, industrial consumption for the period 2013 through 2015 was revised for coking coal and anthracite, as more accurate consumption data became available. Data for coking coal prior to 2013 may include a small portion of anthracite.
- The decrease of other bituminous coal and coke oven coke in the iron and steel industry in 2002 is due to the closure of several plants.
- The use of coke oven gas in chemical and petrochemical activities ceased in 1996.

**Oil**

*General notes*

- Between 2008 and 2009 breaks in series occur for naphtha and LPG in both transformation and final consumption in the petrochemical sector as a result of methodological improvements made by the Belgian administration.
- Data on biofuels are not available before 2009.
- Other hydrocarbons correspond to pure hydrogen used in refineries.

*Supply*

- In 2019, the increase in refinery gross output of petroleum coke is due to a new delayed coker unit.
- In 2018, increase in imports and deliveries for international marine bunkers of residual fuel oil is due to the inclusion of volumes of aromatic oils.
- In 2017 new legislation increased the biofuel blending target for motor gasoline from 4% of volume to 8.5% of volume. As part of this E10 gasoline was introduced and became the new standard product in the country.
- In the 2019 edition, the Belgian administration included new companies in their reporting; some of which are particularly active in the production and trade of lubricants and bitumen.
- Consumption in international marine bunkers dipped in 2014 and 2015 due to the closure of several bunkering companies. During 2015 these were replaced by new companies which became fully operational in 2016.
- Starting from 2013, a new data source was introduced for petroleum coke trade.

*Transformation*

- In 2017 the upgrade project of Antwerp refinery and petrochemical plant was completed. Two key projects were completed: new refinery capacity for the conversion of heavy fuel oil into low sulphur light products and increasing steam cracker flexibility to maximize the processing of low cost advantaged feedstock. The latter is reflected in feedstock needs. Output of lighter end products as well as petroleum coke is impacted by these upgrades.
- In 2002, patent fuel plants used fuel oil to increase the calorific value of patent fuel.

*Consumption*

- In the 2021 edition, the Belgian administration revised the consumption data for lubricants from 2010 onwards as a result of the identification of new active players in the market. Breaks may occur in the series between 2009 and 2010.
- In 2018, a project in a petrochemical plant in Antwerp has started in which refinery gases are treated to recover valuable hydrocarbons. These quantities are reported under LPG and reflect the increase observed for non-energy use in the petrochemical industry in 2018.
- The decrease of fuel oil in industry consumption since 1993 is due to the introduction of an excise tax as well as increased use of natural gas.

**Natural gas**

*Supply*

- The trade data from 2018 onwards include transit figures as a result of a change in methodology.
- Since 2009 gas trade in Belgium includes imported LNG which is regasified and subsequently exported to other countries.
- In the 2019 edition, the LNG consumption data in international marine bunkers are confidential.

*Transformation*

- The Belgian administration is in the process of revising 2010 and 2011 transformation sector data. As such, an unusually high quantity of natural gas is reported under not elsewhere specified (transformation).
- Between 2008 and 2009, there is a break in efficiency of natural gas autoproducer CHP plants due to a change in methodology regarding the reporting of unsold heat.
Consumption

- In 2018 refinery gas started being further purified into products, leading to a higher consumption by oil refineries.
- Consumption in the transport equipment sector decreased in 2015 due to the closure of a large industry of this sector in December 2014.
- In 2003, the large decrease in non-specified industry consumption is due to improvements in data collection.
- Since 2000, natural gas began to replace blast furnace gas in the iron and steel industry.

Biofuels and waste

General notes

- Renewable municipal waste includes a share of renewable industrial waste.
- Data for biodiesels and biogasoline are available starting in 2009.

Supply

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

Transformation

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

Consumption

- Consumption of bioethanol increased in 2017 due to legislation coming into effect on 1 January 2017, which increased the blending obligation for gasoline products.
- Industrial waste consumption in the chemical sector started in 2011.
- Other liquid biofuels consumed in power plants reported before 2011 can include biodiesel.
- New data on consumption cause breaks in time series for primary solid biofuels between 2011 and 2012.

Electricity and heat

General notes

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

Supply

- In 2019, the increase in electricity exports is mainly due to the opening of the NEMO-Link interconnector between Belgium and the United Kingdom.
- Electricity production from other sources mainly comprises production at a gas expansion station with heat recovery and at a hydraulic turbine in a waste water treatment plant.
- From 2013 onwards, reported heat distribution losses decreased due to a more precise estimation method.
- The production of electricity from wind is available from 1987.

Transformation

- In 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.
- 2009 was the first year of offshore wind production in Belgium. 2010 is the first year data are available.
- 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 2009 data, no information was available on heat production in main activity CHP plants for industrial waste.
- In 2003, combustion of municipal waste for electricity and heat generation purposes increased significantly. However, because a large portion of the heat produced is not used (sold), plant efficiencies dropped significantly between 2002 and 2003.
- In 2000, most autoproducer electricity plants using combustible fuels were reclassified as autoproducer CHP plants; the heat production from these plants was used for internal industrial processes and not sold to third parties until 2005.
- For 1998 and 1999, electricity production at main activity producer CHP plants with annual heat output below 0.5 TJ is reported with main activity producer electricity only plants.
- Prior to 1982, electricity production in main activity producer CHP plants is included in production from electricity plants. Also, inputs of fuels for electricity generation in main activity producer electricity plants include inputs for heat production in CHP plants.
Consumption

- In 2018, the methodology used to allocate 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 vehicle numbers and 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.

Czech Republic

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

General notes
Due to ongoing review of energy data for 2010-2014, revisions have been made in the 2017 edition. Full details are given under each fuel.
Data are available starting in 1971.

Coal

General notes

- Other bituminous coal data include sub-bituminous coal for all years, if present.
- In the 2018 edition, data for the Czech Republic were revised back to 2010 based on administrative data causing breaks in time series between 2009 and 2010. These revisions impacted mainly industrial consumption for lignite, BKB and other recovered gases.
- In the 2017 edition, coal consumption in the residential sector has been revised back to 2010 due to a new survey in households made by Czech Statistical Office, creating breaks in time series between 2009 and 2010.
- Increased production and consumption of other recovered gases in 2014 is due to improved tracking of by-products from various transformation processes. Tail gases from the production of carbon black from coal tar are reported here, as are off gases from the manufacture and cleaning of syngas from lignite for an IGCC plant.
- Coal which had been previously classified as sub-bituminous coal until the 2008 edition is now reported under lignite for all years.
- Revisions by the Czech administration have resulted in 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 2019 are expected to be revised upward in the next edition as more comprehensive data will be available.

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

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

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

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

Consumption

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

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

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

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

Oil

General notes

• Data prior to 1994 are estimated by the IEA Secretariat.

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

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

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

Transformation

- For 2016 data, an increased excise duty was imposed on biofuels, causing a decline in consumption.
- In 2016, a main activity producer CHP incineration plant fired by municipal waste was in test operation at Chotikov.

Consumption

- In the 2017 edition, due to a new survey in households made by the Czech Statistical Office in 2015 (ENERGO 2015), solid biofuels consumption in residential sector has been considerably revised upwards since 1990.
- Hospital waste previously reported as municipal waste is reported under industrial waste since 2008.

Electricity and heat

General notes

- In the 2021 edition, there were revisions for solar thermal from 2006 to 2018.
- In the 2017 edition, data for the Czech Republic were revised back to 2010 due to the acquisition of new administrative data, allowing access to more accurate and detailed data sources. As a result, there are breaks in several time series between 2009 and 2010.
- Data from 1990 onwards have been officially submitted by the Czech administration. This may lead to breaks in time series between 1989 and 1990.
- Electricity statistics from 1971 to 1989 have been estimated by the IEA Secretariat except for final consumption and trade which were submitted by the Czech administration.
- For 2017, apparent declines in autoproducer heat production by the chemical and petrochemical sector, and in consumption by petroleum refineries, occur due to the incorporation of an oil refinery into a neighbouring petrochemical enterprise.

Supply

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

Transformation

- In the 2020 edition, a revision of the methodology for reporting the production of autoproducer plants running on combustible fuels removed multiple breaks in time series between 2009 and 2010 for CHP and electricity-only plants that were introduced in the 2017 edition.
- For 2017, heat production from electric boilers and heat pumps is based on new survey data, whereas, data for prior years have been estimated by the Czech administration. As a result, some breaks in series may occur. Historic revisions are pending.
- Electricity generated from waste heat in CHP plants is included with the total production from combustible fuels.
- Data on heat own use and heat imports start in 2010 and 2009 respectively, following extensive revisions by the Czech administration in the 2017 edition due to the acquisition of new administrative data. Prior to this period, data are not available due to lack of sources.
- The production of electricity reported in the category other fuel sources refers to electricity produced from turbines driven by the mixture of air, ammonia and other non-coal gases derived from the petrochemical industry.
- From 2014, some autoproducer heat plants production figures became too small to appear in data collected.
- From 2012 data, new autoproducer heat plants were added to the data collection, causing a break in time series.
- In 2012, a main activity producer electricity plant using solid biofuels started to produce also heat and was reclassified as main activity CHP plant.
- A different reporting methodology used by the Czech administration for biofuels and waste causes some breaks in time series between 2002 and 2003.
In 1999 and 2000, various big enterprises have been divided, sold and merged. This causes breaks in the time series of all types of plants.

**Industrial waste** use in main activity producer electricity plants is included with **solid biofuels** from 1996.

Data on **biogases** and waste used in main activity producer CHP and autoproducer heat plants start in 1993.

Prior to 1990, electricity production in main activity producer CHP and autoproducer CHP plants is included in main activity producer electricity plants.

Prior to 1990, heat production excludes heat sold by industry. In addition, heat production prior to 1990 is reported under main activity heat plants because the breakdown by producer and plant type is not available before then.

The breakdown of net **electricity** production by source is not available prior to 1990.

Data on **heat** production, and the corresponding fuel inputs, have been estimated from 1980 to 1989 based on consumption in residential and commercial/public services. Prior to that, inputs are included in industry.

**Consumption**

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

**Denmark**

**Source**
Danish Energy Agency, Copenhagen.

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

**Coal**

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

**Supply**
- 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 cofiring with renewable fuels as a part of their Energy Strategy 2050.

**Oil**

**General notes**
- In the 2020 edition, as a result of resolved confidentiality issues, **biogasoline** and **biodiesel** are reported separately from 2012 onwards.
- Starting with 2013 data the Danish administration reports products transferred to refinery feedstocks. In previous years refinery output is reported net of product transfers.
- Between 1995 and 2004, **other hydrocarbon** imports and inputs to main activity producer CHP plants represent orimulsion.
- From 1990 onwards, Greenland and the Danish Faroes are not included in the oil data.
- Information on waste oil recycling and final consumption begins in 1989 and is reported in other oil products.
- In 1988, consumption of **gasoline type jet fuel** ceased.
- As of 1987, separate data for **paraffin waxes** are no longer available.
- Prior to 1975, **refinery gas** is reported net of consumption in refineries.

**Supply**
- Quantities of other hydrocarbons represent **natural gas** used by refineries.
Transformation
- Due to improved survey methods, inputs to electricity and heat generation have been reclassified, causing a break in time series between 1993 and 1994. The oil inputs used in industrial sub-sectors for producing surplus heat, which is delivered to district heating networks, are allocated to these industrial sub-sectors.
- In 1994, the marked increase in inputs to CHP production is due to increased electricity exports to Norway.
- From 1974 to 1979, consumption of fuel oil for the CHP production by autoproducers has been estimated.

Consumption
- Consumption data are based on a detailed survey sent to companies in Denmark every other year. For non-survey years, the consumption figures are estimated by the Danish Energy Agency.
- White spirit and lubricants deliveries are estimated by Denmark.
- For 1994 and 1995, industry detail is based on a new survey.
- Prior to 1990, gas/diesel oil and fuel oil consumption for fishing are included in domestic navigation.

Natural gas

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

Consumption
- The consumption of LNG for marine transport and international marine bunkers is not reported due to confidentiality.
- The breakdown for industrial consumption for the latest year is estimated by the Danish administration using the previous year’s industry sector sub-sectoral shares and updated the following year.

Biofuels and waste

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

Consumer
- In the 2020 edition, the consumption of municipal wastes in the commercial and public services sector for 2017 data was revised.
- In the 2016 edition, the Danish administration revised energy consumption in industry sectors causing some breaks in solid biofuels consumption between 2010 and 2011.
- The data on the consumption of municipal waste in the industry sector are delayed by one year and the Danish administration duplicates the previous year’s data until the data become available.
- The Danish administration estimates the growth in consumption of solid biofuels in the industry sector for the most recent year based on the growth in the transformation sector.

Electricity and heat

General notes
- In the 2020 edition, there are 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.
- 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.
- Biodiesels and biogasoline consumption for electricity and heat production are reported under other liquid biofuels, for confidentiality reasons.
- Data for other liquid biofuels main activity heat plants are available back to 1994.

Consumption

- For 2019, the breakdown of electricity and heat total final consumption is estimated by the Danish administration based on 2018 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.

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.

Transformation

- In 2017, the consumption of coal in main activity producer electricity plants decreased considerably following the move of a large plant to the national capacity reserve.
- The significant increases and decreases of other bituminous coal inputs into main activity producer electricity plants from year to year are due to coal replacing imported electricity and hydro power.
- Likewise, peat production is highly dependent upon favourable weather conditions and the pricing of other fuels. The decrease in peat and other bituminous coal usage in main activity electricity plants in 2008 was due to record electricity generation from hydro plants. A similar circumstance occurred in 2012.
• The first coking plant started operation in 1987, hence imports of coking coal and production of coke oven coke and coke oven gas started in that year.

**Consumption**

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

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

**Oil**

**General notes**

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

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

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

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

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

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

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

**Consumption**

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

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

**Natural gas**

**General notes**

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

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

**Supply**

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

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

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

**Consumption**

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

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

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

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

**Biofuels and waste**

**General notes**

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

• Data for biogases and industrial waste are available from 1996.
Supply

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

Transformation

- The use of **charcoal** in blast furnaces started in 2018 on a test basis.
- The amount of **biodiesel** used for blending with diesel fell greatly in 2016 after record levels for the past two years. Annual variation in the consumption of biofuels is possible and caused by Finland’s biofuel legislation, which gives distributors the possibility to fulfil the bio obligation flexibly in advance.

Consumption

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

Electricity and heat

Supply

- **Electricity** production in Finland is affected by connection to the Nord Pool power exchange. In periods of high rainfall, it is more economic to import electricity from other Nordic countries than to produce it. Therefore, production and trade are subject to variability.
- **Other sources** include hydrogen, purchased steam, and heat recovered from flue gas scrubbers. For 2017, the increase in heat production from other sources is due to the reporting of heat recovered from flue gas scrubbers for the first time.
- The increasing **heat** production from heat pumps in 2007 and 2008 is from the new Katri Vala district heating and cooling plant.
- **Heat from chemical processes** and associated electricity generation are available from 2000.

Transformation

- Electricity plants data may include some CHP plants operating in electricity-only mode. Likewise, heat plants data may include some CHP plants operating in heat-only mode.
- In the 2017 edition, fuel inputs and heat production from **peat** main activity heat plants have been revised since 2000 as new data became available for small peat heat plant units.
- In the 2016 edition, the allocation of **solar photovoltaic** between main activity and autoproducer plants was revised.
- From 2014 data, an autoproducer in the field of iron and steel industry running on **coke oven gases** and **blast furnace gases** was sold and is now reported as main-activity producer.
- The increase in heat production from **municipal waste** in 2014 is due to the opening of a new plant.
- In 2014, the new consumption of **other liquid biofuels** in main activity electricity plant corresponds to biopyrolysis oil made from wood chips.
- Data on **peat products** electricity and heat generation are available since 2008. Prior to that, they are included in **peat**.
- **Heat** output from autoproducer CHP plants is available starting in 1996 and from autoproducer heat plants starting in 2000; corresponding inputs may be under-reported.
- Before 1999, all electricity production from autoproducers running on **fuelwood** is allocated to CHP plants.
- Electricity and heat production from **biogases** are available from 1996.
- Prior to 1992, outputs from the use of **combustible renewables and waste** to generate electricity and/or heat were included in peat. Therefore, the IEA Secretariat estimated the breakdown of outputs from **municipal waste** and **solid biofuels** based on reported inputs.
- Inputs of **liquid fuels** and **natural gas** to CHP plants are included with the inputs of these fuels to main activity producer electricity only and heat only plants prior to 1978.
- **Electricity production from biofuels and waste** is not available between 1974 and 1976.

Consumption

- Electricity consumption in **road** is based on estimates by the Finnish VTT research centre, and includes all electricity consumption by electric vehicles, both 100% electric vehicles and plug-in hybrids.
- In the 2017 edition and following, an extended review of NACE sector encoding by the Finnish administration resulted in the revision of the sectoral **heat** consumption time series back to
2007, leading to breaks in time series between 2006 and 2007 in some heat consumption sectors.

- In 2016, the production of heat by autoproducers in the oil refineries sector ceased, following a change of ownership of some plants and their reclassification as main activity producers. This reclassification also resulted in an increase in reported heat consumption by oil refineries, as heat previously produced and consumed by oil refineries is now purchased.
- Between 2013 and 2014, heat consumption in the paper, pulp and printing sector shows an apparent decline because a power plant came under the ownership of a paper and pulp company.
- A new survey of the agriculture and forestry sector leads to breaks in the electricity consumption between 2007 and 2008.
- The split of heat consumption in the different industry sectors is available starting from 2007. Prior to that, it is aggregated in non-specified industry.
- Prior to 2000, consumption of heat in agriculture/forestry and commercial/public services is included under industry non-specified.
- Consumption of electricity in the industry sub-sector machinery includes consumption in transport equipment prior to 1995.

**France**

**Source**

Ministère de la Transition Écologique et Solidaire, Paris.

**General notes**

- In the 2018 edition, data for France were revised back to 2011 following changes in methodology and procedures used by the energy statistics sub-department (SDSE) within the Ministry for the ecological and inclusive transition. As a result, the revisions, to bring the reporting more in line with the international standards, impacted all fuels. Additional details are given under each fuel.
- From 2012, the energy consumption is more detailed due to a more precise national survey.
- From 2011 data onwards, France now includes Monaco, and the following overseas departments (Guadeloupe; French Guiana; Martinique; Mayotte; and Réunion); and excludes the overseas collectivities (New Caledonia; French Polynesia; Saint Barthélemy; Saint Martin; Saint Pierre and Miquelon; and Wallis and Futuna).

**Coal**

**General notes**

- Due to confidentiality reasons, blast furnace gas includes blast furnaces gas, coke oven gas and other recovered gases from 2018 onwards. This aggregation may lead to unusual figures and efficiencies in the energy balance and CO₂ emissions.
- The losses of blast furnace gas, coke oven gas and other recovered gases are included under statistical difference until 2016. From 2017 onwards these losses are reported under “other energy uses”.
- In 2018 edition, the calorific value of coking coal has been revised in agreement with Eurostat and the IEA. The revision was made for the period 1990 to 2016.
- In the 2017 edition, the French administration undertook comprehensive revisions on sectoral coal consumption back to 2011. Starting this edition, new information became available for anthracite, BKB and other recovered gases.
- From 2012, the energy consumption is more detailed due to a more precise national survey.
- Prior to 2011, other manufactured gases (oxygen steel furnace gas) are included in blast furnace gas.
- For 1989 to 1998, the IEA Secretariat has estimated industry consumption based on Consommations d’Energie dans l’Industrie, SESSI.
- Prior to 1985, consumption of colliery gas is included with the use of coke oven gas by autoproducers.
- Hard coal data prior to 1978 may include sub-bituminous coal.

**Transformation**

- In the 2021 edition, revisions were made on the split of other bituminous coal between Main Activity Producer Electricity Plants and Main Activity Producer CHP Plants for the period 2011-2018.
- In the 2021 edition, following a methodological change, a power plant was reallocated from main activity producer to autoproducer. Hence, there is no more figure for other manufactured gases in the first. This was done for 2018 and 2019.
• In 2017 the use of other bituminous coal into transformation for electricity increased by more than 20% to compensate lower generation from nuclear and hydro plants.

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

Consumption

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

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

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

Oil

General notes

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

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

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

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

• From 1991, additives and oxygenates data are available.

Supply

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

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

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

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

• From 2008 data, ethane refinery output is reported.

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

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

Transformation

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

Consumption

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

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

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

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

• The breakdown between international and domestic marine bunkers is estimated by the French administration.
• Between 2005 and 2006, a break is visible in LPG time series, as consumption from one chemical company was reclassified 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
• 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.
• 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
• The increase in natural gas consumption in the electricity sector for 2016 and 2017 has been mainly driven by the decrease in nuclear generation due to maintenance operations, which was compensated by gas-fired power plants.
• Gas for pipelines is included in distribution losses.
• Between 2005 and 2006, there is a break in the time series of the industry sub-sectors.

Biofuels and waste

General notes
• In the 2018 edition, following an analysis of biogases in the energy sector by the French administration, there are revisions in biogas indigenous production, inputs to the transformation sector, heat production and final consumption back to 2005. Electricity production from biogases is revised back to 2011. This causes breaks in time series between 2004 and 2005 as well as 2010 and 2011.
• Indigenous production, transformation and final consumption of industrial waste are reported from 2013. In the 2018 edition, indigenous production and transformation of industrial waste were added from 2007 - 2012. It follows that there is a break in time series between 2012 and 2013.
• In the 2018 edition, solid biofuels' indigenous production and inputs to main activity and autoproducer heat plants have been revised back to 2007 Electricity production has been revised back to 2013. This causes breaks in time series between 2006 and 2007 as well as 2012 and 2013.
• In the 2018 edition, indigenous production and inputs to main activity heat plants have been revised back to 2007 for municipal waste. Electricity production has been revised back to 2011. This causes breaks in time series between 2006 and 2007 as well as 2010 and 2011.
• Prior to 2007, production and consumption of industrial waste were included in municipal waste.
**Transformation**

- Plants using municipal waste were reclassified as autoproducer CHP plants from 1995, which leads to a break in time series.
- Breaks in time series in 2005 for municipal waste and solid biofuels are caused by sectoral reclassifications.

**Consumption**

- A revision of the solid biofuels and biogases time series created breaks in the direct use time series between 2004 and 2005.
- The breakdown of the final energy consumption of biogases was estimated by the French administration from 1970 to 2003.

**Electricity and heat**

**Supply**

- In the 2019 edition, heat supply and consumption data were revised due to improved information on heat production from renewables.
- All solar photovoltaic plants with capacity above 1 MWp are considered as main activity producers, while all plants with capacity below that value are considered autoproducers.
- Electricity production from other sources is available starting in 2007, representing production of electricity from purchased steam, and from 2018, hydrogen. The input is shown under non-specified transformation.
- Data on electricity production from wind are available from 1990.

**Transformation**

- In the 2021 edition, some main activity producers were reclassified as autoproducers.
- For 2018, inputs and outputs of coke oven gas, and other recovered gases are included under blast furnace gas for confidentially purposes.
- For 2011-2013, the implied efficiencies of heat pumps are much lower than expected. This is under investigation by the French Administration, and revisions are expected in future editions.
- The methodology for reporting inputs to CHP plants is under currently under review by the French administration and historical revisions are expected.
- For the 2018 edition, revisions for heat production in all plant types were received and accepted for many fuels from 2007 onwards, with the exception of natural gas, where the planned revisions for 2007 and 2008 are still pending implementation by the Secretariat.
- In the 2018 edition, electricity production from hydro was revised back to the year 2000, in some cases only amounting to plant reclassification.
- Electricity production from the Bouillante geothermal main electricity plant in Guadeloupe is included from 2011 onwards, when data coverage for France is extended to include the overseas departments. Electricity production from autoproducer geothermal started in 2011 and stopped in 2012 due to the maintenance of the only plant. This production restarted in 2016.
- The amount of heat not sold in autoproducer plants is included in total heat production up to 2007.
- In 2005, autoproducer CHP efficiencies for biogases drop due to the opening of a larger, less efficient plant.
- From 2000 several plants have been reclassified from electricity-only to CHP plants. This causes breaks in the time series between 1999 and 2000.
- Prior to 2000, inputs and outputs of oil products are not available separately and are reported together under other oil products. From 2000 to 2008, there are further classification problems for inputs and outputs of electricity and heat from oil products. The French administration is working to reconcile their data collection methods for the inputs and the outputs for electricity generation.
- A new method of survey and a reclassification between main activity producer electricity plants and autoproducer electricity plants may cause breaks in the time series for other bituminous coal between 1998 and 1999.
- There was re-classification of autoproducer plants using municipal waste in 1995, which leads to a break in the time series.
- Net electricity production by autoproducer CHP plants is available from 1989.
- Net electricity production by autoproducers prior to 1983 includes production from combustible fuel sources only.

**Consumption**

- In the 2021 edition, data were revised back to 2011 by the French administration to replace data from statistical surveys with new administrative data.
• In the 2019 edition, revisions for 2011 onwards were received for all electricity consumption flows, based on a correction to a survey. This has introduced a wider statistical difference than previously published, and is under review.

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

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

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

• Electricity consumption in Road includes consumption by 100% electric vehicles. These amounts are estimated by the French Administration based on vehicle numbers, and expected electricity usage. Consumption includes domestic charging - however, these amounts are currently subtracted from non-specified transport, rather than residential consumption.

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

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

• Prior to 2005, all the geothermal heat consumption was reported as direct use. From 2005 data, some quantities are reported as output of heat plants, resulting in breaks in time series for production, transformation and consumption.

• Electricity consumption in non-specified transport refers to ski lifts.

• Prior to 2011, electricity consumption in (sub)-urban and national rail is based on high voltage electricity supply to the rail sector. From 2011 onwards, consumption in (sub)-urban rail is based on electricity used for propulsion by the main operator, and estimates for the other operators.

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

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

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

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

**Germany**

**Source**


**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 par-
particularly affects BKB, lignite and coke oven coke.

**Supply**

- Hard coal mining in Germany ceased in 2018 with the last two hard coal mines being closed on December 21, 2018 due to profitability reasons. Anthracite, coking coal and other bituminous coal show null production in 2019.
- Data on stock changes in the coal production sector (provided individually for all coal products) are no longer available from 2019 onwards as the companies in this sector no longer operate. For the other sectors (electricity and heat producers, and industry), data on stock changes are only available for hard coal as an aggregate, and that is all reported under other bituminous coal.

**Transformation**

- Breaks in time series between 2014 and 2015 for coke oven gas and blast furnace gas are due to a reclassification of main activity producers and autoproducers.
- In 1997, BKB inputs to gas works plants stopped.
- For some years of the period 1990-2002, discrepancies can appear between the publications Coal Information and Electricity Information in Electricity and CHP plants for the products lignite, gas works gas, coke oven gas and blast furnace gas.

**Consumption**

- Consumption of non-renewable municipal waste and other solid biofuels as a reductant occurs in German blast furnaces, but is not currently quantified. Likewise, coal tar is a by-product of coke ovens, but not currently reported.
- The data providers for the commercial and residential sectors were coal producers and import statistics, the first reporting the biggest amounts. As the hard coal production ceased in Germany, coal producer do not longer operate, and this data is not available from 2019. As consequence, the year 2019 shows a significant decrease in consumption in these sectors. In 2019, there was no increase in the imports delivered to these sectors.

**Oil**

**General notes**

- In 2018, decreases in refinery intake and deliveries to the market can be attributed to the temporary shutdown of two high-capacity refineries.
- In 2018, there are breaks in time series for several products due to methodological changes involving the inclusion of companies with olefin plants into the reporting group and the possibility to identify semi-finished products as deliveries to the market.
- In 2017, the German administration included additional firms in the chemical sector to their data collection system. As a result, for 2017 data there is an increase in deliveries of oil products to the petrochemical sector.
- In 2016 the German administration reclassified the consumption of a chemical company from fuel oil to other oil products. This leads to a decrease in the supply and consumption of fuel oil with a corresponding increase for other oil products. Due to the assumptions made by the German administration about the energy consumption of the respective products, this also creates a break in time series in the split between energy and non-energy consumption for the chemical sector.
- In 2016 there are breaks in time series for white spirit due to an increase in data coverage. Historical revisions are expected in the next edition.
- From 2000 data, part of the product Andere Rückstände (other residues) is included with fuel oil instead of other oil products.
- Starting from 1994 data, there has been a reclassification of jet gasoline to kerosene type jet fuel.
- Prior to 1979 data, other products include paraffin waxes, bitumen, white spirit & SBP and lubricants for eastern Germany.
- The methodology to determine net calorific values has been changed for 2015 data. The values for crude oil and refinery feedstocks were revised back to 2003.

**Transformation**

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

- In 2018, owing to methodological changes, consumption data for **motor gasoline** in the chemical and petrochemical industry as well as in non-specified industry are reported for the first time.
- In 2018, consumption data for **motor gasoline** and **gas/diesel oil** in construction and agriculture/forestry are reported where they had previously been subsumed within the commercial and public services sector.
- Between 2002 and 2003, breaks in time series in consumption data are due to structural changes in energy statistics following the newly introduced Energy Statistics Act.
- In 1995 data, a break in **gas/diesel oil** consumption occurs as a result of an alignment with the Classification of the Economic Activities in the European Community (NACE).
- Beginning in 1994, final consumption by individual sector has been improved due to new survey methods instituted by the Minerölwirtschaftsverband.
- In 1989, end-use consumption of **gas/diesel oil** decreased due to an exceptionally warm winter and a lowering of consumer stocks.
- Prior to 1980 data, consumption of **fuel oil** in blast furnaces was included in the iron and steel sector
- Prior to 1970 data, consumption of **refinery gas** in the chemical industry is included with refineries’ own consumption.

Natural gas

**General notes**

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

Supply

- Starting in 2018, due to a change in the reporting methodology, **Imports** and **Exports** no longer include transit volumes, as was the case up until 2017.
- Since 2018 onwards, indigenous production is being phased out, leading to a decrease in **non-associated gas**.

Transformation

- In 2003, there is a break in time series for input to electricity and CHP plants (both autoproducers and main activity producers).
- Prior to 1995, inputs of **natural gas** for **main activity producer heat** plants are included with **main activity producer CHP** plants.

Consumption

- In the 2020 edition, the German administration included energy use in Agriculture/Forestry and Construction for the period 2010-2018. In the next reporting cycle, values for 2003-2010 are expected.
- Since 2018, gas distribution networks are included in pipeline transport, while it was only covering transmission networks before.
- Since 2003, there are no official data for the construction sector.
- Since 2003, consumption in agriculture and non-specified other, which were previously estimated, are no longer shown, and losses data have been included in statistical differences.
- Since 2003, gas consumption in coke ovens (transformation) was negligible.
- Between 2002 and 2003, there are breaks in time series for some sectors due to modifications in reporting methodology.
- Between 1994 and 1995, there are some breaks in time series due to the fact that the industry sub-sector breakdown is based on the 1995 NACE classification.
- Also, prior to 1995, end-use consumption data are based on Arbeitsgemeinschaft Energiebilanzen.
- Before 1970 there is no detailed breakdown available for the industry sector with the exception of iron and steel and chemical and petrochemical industries.

Biofuels and waste

**General notes**

- In the 2020 edition, there was a revision of nearly all renewables data back to 2003, basically related to error correction and new information. This leads to a break in series between 2002 and 2003.
- Starting with the 2020 edition, final consumption in the agriculture sector is now reported separately. Previously, it was included in commercial and public services.
Starting in 2008, municipal waste and industrial waste data were collected separately. This leads to breaks in the time series between 2007 and 2008.


**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.

**Supply**

- From 2018 onwards, own use of electricity at main electricity geothermal plants includes electricity used for pumping.
- In some instances, electricity generation from nuclear, hydro, solar, wind and biogases in autoproducer electricity plants is confidential or not available and therefore is included in main activity producer electricity plants.
- For 2017 onwards, own-use consumption of electricity by wind plants is assumed to be 2% at onshore and 1.5% for off-shore wind farms. For prior years, own-use only included electricity drawn from the grid while the turbines were not in operation.
- Since 2011, due to a reclassification of wind energy and solar photovoltaic in the official data of the German Federal Statistical Office, the production is now only reported under main activity producer plants.
- Electricity production from other sources is available starting in 2003. This refers to the production of electricity from turbines which are located at pressure drops in fluid transport and from purchased waste heat.
- Prior to 1991, electricity trade data includes only trade of the Former Federal Republic of Germany.
- Data on electricity production from wind and solar are available from 1986 and 1990, respectively.
- Starting in 1984, small amounts of heat have been exported to Denmark.

**Transformation**

- For 2018, the increase in electricity output from solar PV was in part due higher than average solar radiation during that year.
- For 2018, the increase in heat output from biogases was mainly due to an increase in survey coverage following an amendment to the Energy Statistics Law in 2017
- Electricity inputs to both mixed hydro and pure pumped storage pumping plants are reported under inputs to pure pumped storage.
- Detailed data by fuel are not available for total heat production. The non-allocated part is reported as heat production from non-specified combustible fuels.
• Weather conditions were not favourable for wind and solar generation in 2016.

• In 2015, a reclassification of some main activity producer electricity and CHP plants to autoproducer CHP plants powered by coke oven gas results in a break in time series for this period. Similarly, a reclassification of blast furnace gas main activity electricity plants into autoproducer plants results in a break in time series for the same period.

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

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

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

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

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

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

Consumption

• 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.

Hungary

Source
Hungarian Energy and Public Utility Regulatory Authority, Budapest.

General notes
Data are available starting in 1965.
The Hungarian administration submitted questionnaires to the IEA Secretariat for the first time with 1993 data.

Coal

General notes

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

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

Transformation

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

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

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

**Consumption**

- 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.
- 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.

**Consumption**

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

**Natural gas**

**General notes**

- Between 2012 and 2013 there are some breaks in time series for the energy, transport and industry sectors consumption due to a new methodology. Historical revisions are pending.
- Between 1996 and 1997 some breaks in time series exist due to a new methodology applied by the Hungarian administration.

**Supply**

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

**Transformation**

- Since 2010, data reported for non-specified transformation represent natural gas used for hydrogen manufacture used in refineries for hydrodesulphurization. Prior to this year, these quantities are reported under oil refineries.
- Since 1997 two autoproducer heat plants have been reclassified to main activity producer heat plants.

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

Electricity and heat

Supply

For 2017 onwards, inputs and outputs from power plants are reported at a unit level, while for prior years, data are reported at a plant level. As a result, breaks in series are observed between 2016 and 2017. In particular, for electricity output from main activity producer CHP and main activity producer nuclear power plants, and for heat output from industrial waste at autoproducer CHP and autoproducer heat plants.

In 2017, a main activity producer CHP plant was reclassified as an autoproducer. As a result, declines are observed in heat production from other bituminous coal and industrial waste, as heat reported as previously sold may now be considered as used onsite.

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

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

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

Transformation

In 2019, some breaks in series occur for plants fired by biogas and solid biofuels due to changes in plant classifications, and CHP methodologies.

In late 2017, a new geothermal power plant began operations.

For 2017, the decline in heat production from industrial waste is partly due to the reclassification of a main activity producer as an autoproducer.

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

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

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

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

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

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

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

Consumption

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

Ireland

Sources

Department of Communications, Energy and Natural Resources, Dublin.

Sustainable Energy Authority of Ireland, Cork.

Coal

General notes

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

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

In the 2021 edition, SEAI revised other bituminous coal consumption by sector for the period 2005-2011. The same methodology that was used from 2012 was applied to the period 2005-2011 to align the time series.
Due to confidentiality issues, patent fuel quantities are reported aggregated to anthracite figures.

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

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

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

Supply

Rainfall in 2012 led to the lowest peat harvest since IEA records began in 1960, requiring large stock drawdown and increased use of biofuels for electricity generation. In 2013, production targets were met before the end of the year however production continued in order to further build stocks to alleviate the potential impacts of future weather events.

Low production of peat in 1985 was due to a poor “harvest”, due to an unusually wet summer.

Production data for peat products (briquettes) are available from 1975.

Transformation

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

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

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

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

Consumption

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

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

Oil

General notes

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

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

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

Supply

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

Consumption

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

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

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

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

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

- From 1986, gas/diesel oil consumption in the agricultural sector is available.
- From 1970 to 1977, the split between commercial and public services and agricultural use of other kerosene has been estimated by the Secretariat. Consumption in commercial/public services includes quantities used by state-owned agricultural companies.

Natural gas

General notes

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

Supply

- Natural gas production has been increasing since 2015, as the Corrib Gas field began production at the end of that year.
- Since 1996, the increase in imports is due to the depletion of the Kinsale gas field and the availability of a new pipeline system to the United Kingdom.

Transformation

- Since 2006, a different methodology for allocating unsold steam from autoproducer CHP is used.
- Non specified transformation corresponds to natural gas blended with refinery gas.

Consumption

- In the 2020 edition, the results of the Business Energy Use Survey (BEUS) from 2009 to 2017, published by the Central Statistics Office, were used as a new basis for the breakdown of energy use in the consumption sector. Additionally data was revised for the 2001 to 2009 period in order to avoid a timeseries break.
- In the 2019 edition, the Irish administration revised the distribution losses based on new data coming from the Emissions Trading Scheme (ETS), which had a knock-on effect in the final consumption data, primarily for the industry sector.
- In 2011 the increase in non-ferrous metals consumption is due to a fuel switch to natural gas.
- Since 2009, the disaggregation of consumption into all the industry sub sectors excluding non-ferrous metals is done according to data from the Census of Industrial Production (CIP). The last energy consumption data available from the CIP are from 2009 and therefore the 2009-2015 sub-sector 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

- 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

- Starting in 2016, the increase of electricity production of solid biofuels is a result of a decarbonisation programme and comes from a plant which is co-firing peat and biomass.
- In 2012 and 2013, the renewable fraction of tyre-derived fuel (12%) used by a cement plant was reported by the administration under renewable municipal waste; the non-renewable fraction (88%) was reported under industrial waste.
Consumption

- In the 2021 edition, there were revisions to the residential sector for solid biofuels (excluding charcoal).
- In the 2020 edition, Ireland started reporting Pipeline transport based on the Emissions Trading Scheme data, available since 2005. The increase in 2016 is due to the coming on stream of the Corrib gas field.
- The Biofuels Obligation Scheme places an obligation on suppliers of mineral oil to ensure that 8.695% (by volume) of the gas/diesel oil they place on the market in Ireland is produced from renewable sources, e.g. bioethanol and biodiesel. The obligation was increased from the 1st January, 2017, from the previous level of 6.383%.
- Despite the Biofuels Obligation Scheme, bioethanol consumption decreased in 2017 because there was a reduction in overall motor gasoline use and of fuel tourism.
- Increases in biodiesel consumption in 2017 are related to the Biofuels Obligation Scheme and to increases in road freight, which is heavily dependent on diesel oil.
- The consumption of pure biodiesel in the industry sector and in road transport refers to one site, which is no longer in operation since 2014.

Electricity and heat

Supply

- In the 2019 edition, revisions were made by the Irish administration for the indigenous production of solar thermal for the years 2011 – 2016.
- Electricity production from wind begins in 1992 and from biogases in 1996. For wind, data for autoproducers are included in main activity producers prior to 2002 for confidentiality reasons.

Transformation

- In 2018 and 2019, electricity output from other bituminous coal declined due to shutdowns at Moneypoint power station.
- In 2017, a new municipal waste-fired main activity producer electricity plant (Meath 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.

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 2018, amendments to the legislation mandated a biofuel blending target of at least 4.5% of volume for gas/diesel oil used in temperate and severe winter conditions leading respectively to an increase of its consumption for road transport.
- In 2018 one of the main players in marine bunkering at Latvia’s largest port ceased operations. As a result deliveries of oil products to marine bunkers decreased in that year. As of 2019 the issues have been resolved and bunkering activity has resumed.

**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 auto-producer electricity plant fuelled by biogas between 2003 and 2004.

**Consumption**
- The increase in consumption of solid biofuels in not elsewhere specified (industry) in 2018 is related to increases in the manufacture of furniture sector.
- The increase in inland consumption of biodiesel in 2018 data is related to the implementation of favourable legislation (the “Biofuel Law”).
- The increase in supply for solid biofuels from 2016 to 2017 is due to increased usage in the industry sector.
- From 2014, biodiesel consumption has been decreasing due to policies which support the sale of arctic diesel fuel without renewable additives.

**Electricity and heat**

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

**Transformation**
- From 2012 onwards, the increase in electricity production from solid biofuels is due to the deployment of six new main activity producer CHP plants running on wood chips.
Consumption
- Prior to 2015 data, electricity consumed by trams at one of Latvia’s three tram operators was included under road.
- For 2012, the increase in electricity consumption in the iron and steel sector is due to a facility switching from an open-hearth furnace to an electric arc furnace.

Lithuania

Source
Statistics Lithuania, Vilnius.

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

Natural gas

Supply
- The export quantities since 2014 represent imported LNG which is regasified and subsequently exported to other countries.

Transformation
- Not elsewhere specified (transformation) data represent natural gas used for methanol manufacture, which is used as input in oil refineries.

Consumption
- Natural gas consumption for power generation has been falling significantly from 2010 onwards as gas-fired power and heating plants are being retired, largely replaced by biomass.
- There is a break between 2010 and 2011 in the not elsewhere specified (energy) timeseries due to natural gas being consumed for heat that was used to destroy radioactive waste after the decommissioning of the only Lithuanian nuclear plant at the end of 2009.

Biofuels and waste

Supply
- In 2019, the increase in the indigenous production of industrial waste (non-renewable) is the result of increased data availability.
- The production of charcoal has been over-estimated prior to 2017 due to the fact that it was not possible to report data less than 1 kt.
- Starting from 2016, some industrial waste (renewable) was collected via sorting. These wastes consist of non-recyclable paper, textiles and wood wastes and their production is included in solid biofuels.

Transformation
- The Fortum Klaipėda CHP plant produces electricity and heat from industrial waste (non-renewable), municipal waste and solid biofuels since the end of 2013. Since its inception, structural optimisation has been sought. Additionally, before 2016, calorific values of the fuels were calculated by taking samples of fuels and after this period, calculations were made from steam. For these reasons, there are fluctuations in fuel inputs, energy production and fuel ratios between industrial waste (non-renewable), municipal waste and solid biofuels since 2013.
- In 2013, an incinerator combusting industrial waste (non-renewable) and municipal waste began operations.

Electricity and heat

Transformation
- In 2009, the Ignalina nuclear power plant, the only nuclear plant in Lithuania, closed down.
- In March 2017, the Geoterma geothermal heat plant, the only geothermal heat plant in Lithuania, closed down.

Luxembourg

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

**General notes**
- For the 2011 edition, the Luxembourgian administration revised the time series from 2000 for most coal and coal products. Time series for BKB consumption were revised from 1990.
- Prior to 1978, some sub-bituminous coal may be included in hard coal.
- Steel production from blast furnaces ceased at the end of 1997.

Oil

**Consumption**
- In the late 1970s, the reduction in consumption of fuel oil in the iron and steel industry was due to substitution by coal.

Natural gas

**General notes**
- In 1982 there is a break in the time series in transformation and industry due to a change in methodology.

**Transformation**
- In the 2017 edition a main activity producer CHP plant was reclassified as one main activity electricity producer plant and one main activity producer heat plant. Data were revised back to 2014.
- Since 2002, the increase in the transformation sector is due to a new 350-MW combined cycle power plant.
- The last main activity producer electricity gas-consuming plant closed in 2016.

**Consumption**
- In 2015, Luxembourg integrated supplementary data from ETS companies and industrial consumption was revised back to the year 2000.
- The breakdown of total final consumption for the latest year is preliminary and will be finalised in the next edition of the book.
- Since 2012, the methodology to determine final consumption was changed in order to integrate basic data from National Accounts.
- Since 2000, a more detailed breakdown of final consumption data is available due to a change in methodology.
- Since 2000, consumption in the non-ferrous metals sub-sector is included in iron and steel for reasons of confidentiality.
- Since 2000 consumption in not elsewhere specified (Industry) includes activity of companies reclassified to preserve the confidentiality.
- Prior to 2000, residential consumption includes consumption in commercial/public services and agriculture/forestry.

Biofuels and waste

**General notes**
- The Luxembourgian administration started including trade figure of wood chips in trade figure of solid biofuels from 2015 data. This creates breaks in time series between 2014 and 2015.
- Data on solid biofuels are available from 1992.

**Supply**
- There was a fire at the co-digestion plant Itzig in September 2018. The plant was not reopened until October 2019, causing a decrease in biogas production (specifically: other biogases from anaerobic fermentation).

**Transformation**
- In the end of 2018, there was a fire in one of the main biogas plants and it has been off for most of 2019. The most notable effect has been on biogas blending.
- In 2011, the blending of biogases with natural gas started.

Electricity and heat

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

- Most of the hydro production shown for Luxembourg is from the Vianden pumped storage plant and is exported directly to Germany.
- There were some repairs on the upper basin of the pumped storage site at Vianden in 2019 leading to a reduction in electricity production. The full storage capacity was not available during this period.
- In the 2017 edition, following plant reclassification, heat production by main activity plants was revised from 2011 onwards.
- Starting in 2005, data for electricity transmission and distribution losses were obtained from the network operator. Prior to that, they were estimated by the Luxembourgian administration.

Transformation

- The production of electricity from solid biofuels from 2013 corresponds to the opening of a new plant burning wood wastes.
- Data on electricity production from biogases are available from 1998 and heat production from 2010.
- In 2002, the increase in electricity production is due to a new natural gas combined cycle power plant.
- At the end of 1997, the iron and steel industry stopped production of electricity.
- Electricity data for natural gas autoproducer CHP plants are available starting in 1995, and for main activity CHP plants starting in 1996.
- Prior to 1990, net electricity production by autoproducers includes production from combustible fuel sources only.

Consumption

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

Poland

Source

Central Statistical Office, Warsaw.

Coal

General notes

- Other recovered gases which appear in the balances as output from blast furnaces also include off-gases from zinc and copper smelting, ceramics kilns and steel production, thus artificially increasing the overall efficiency of blast furnaces when calculated.
- The decrease in exports and consumption of coking coal, as well as the stock built in 2019 are consequence of a reduction of the external and internal demand of iron and steel, which was impacted, among other factors, by the carbon and electricity prices.
- Patent fuel trade data may include transit trade.
- Prior to 2016 data, other bituminous coal includes anthracite.

Transformation

- In 2019 the use of other bituminous coal for electricity generation decreased as consequence of high CO₂ prices and high mining costs, which made more competitive other generation technologies such as natural gas or renewables, as well as electricity imports.
- The decrease in the consumption of lignite in Main Activity Producer CHP Plants in 2019 is a result of the shutdown of a large power unit for renovation.
For the year 2015, there is production of gas works gas but no reporting of any input to that process. The LPG input was too small to be appeared (less than 0.5); until 2016, the reported numbers were rounded to the nearest whole number in the Joint Annual Questionnaires.

For the 2018 and 2019 editions, the Central Statistical Office has revised their methodology which accounts for sold heat produced from autoproducer heat plants using coking coal and other bituminous coal, resulting in lower, but more accurate data for 2007 onwards.

Consumption

Introduction of anti-smog resolution led to reduction of hard coal consumption in households in 2019.

Inputs of coke oven coke into blast furnaces and consumption in the iron and steel sector were estimated in 2019 so as to keep the efficiency of blast furnaces at 40%. Part of the large decrease in the iron and steel sector consumption can be explained by that estimation.

Consumption in agriculture/forestry for BKB, and own use in power stations for lignite are residual flows, so may contain statistical differences and other consumption not reported elsewhere. As a consequence, changes in these time series may not be wholly representative of the activities shown.

Prior to 2010, own use in coal mines included workers’ take home allowance, which should be included in residential consumption.

Oil

General notes

From 1997, production from other sources (natural gas) of other hydrocarbons corresponds to hydrogen used in refineries, also represented as the output of non-specified transformation in the balances format.

Supply

Output of petroleum coke is produced from a new refinery plant installed at the end of 2019.

Between 2016 and 2017, a break in series for stocks of refinery feedstocks results from a change in reporting methodology.

In 2018 new legislation introduced a biofuel blending obligation for liquid fuels. The effects of this policy can be seen throughout 2017, as companies prepared for the implementation of the new directive, and in 2018 once the directive came into force.

Transformation

In 2017 lower refinery activity is linked to maintenance activities at several refinery installations across the country.

Prior to 1998, inputs of gas/diesel oil and heavy fuel oil to autoproducer CHP in petroleum refineries have been included in the transformation.

Consumption

In 2016 regulatory changes affecting the customs and tax authorities meant that consumption of fuel in the informal economy decreased.

In 2015, a new flue-gas desulphurisation unit was installed. As this unit facilitates high sulphur fuel oil burning in place of natural gas, this explains the increase in fuel oil consumption in oil refineries.

Natural gas

Supply

Exports include all the natural gas sold by companies operating in Poland (these are mainly re-exports).

Natural gas reported in associated production contains some heavier hydrocarbons. This results in a high gross calorific value for production.

Transformation

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

In 2013 and 2014 some CHP plants were used as backup reserve plants, resulting in a decrease in consumption under main activity producers CHP plants.

In 2004 and 2005 small amounts of natural gas were used to start up main activity electricity plants.

In the 2017 data, local small-CHP & heat plants were reclassified from the commercial/public services to the transformation sector and the residential sub-sector.
Consumption

- Distribution losses may include some statistical differences.
- Non-specified energy includes gas used for heating and pumping operations in the distribution network.

Biofuels and waste

General notes

- Several breaks in the industrial waste time series are caused by difficulties in the classification of wastes.
- In the 2018 edition, solid biofuels were corrected for 2015 data.
- There is a break in time series between 2015 and 2016 for biogases due to reclassification from autoproducer to main activity plants.
- The increases in municipal wastes starting in 2016 are related to two new plants.
- Data on biodiesels are available from 2005; biogasoline data from 2003; and other liquid biofuels data from 2009.
- In 2008, a new questionnaire was launched which increased the coverage of renewable and waste data.

Supply

- Under current Polish law, only producers and importers of biodiesel are obliged to fulfil the National Indicative Target of share of biofuels in the total usage of transportation fuels. Since the regulation is currently not applied to retail distributors they, for economic reason, rather export the biodiesel than sell it domestically. This results in low domestic consumption and increase of exports in 2016.
- Production of other liquid biofuels increased in 2015 because new companies started to report their biofuels production to the Polish administration.

Transformation

- In 2017, heat production from autoproducer CHP and heat plants burning municipal wastes increased due to two new plants.
- Before 2000, industrial waste was used interchangeably with light fuel oil in some plants, which might result in breaks in the time series.

Consumption

- The decrease in the consumption of biodiesel in the road sector in 2017 is related to an unfavourable pricing scheme on the domestic market, causing consumers to choose diesel and producers to export or blend the biodiesel they produced.
- The consumption of solid biofuels in non-metallic minerals decreased in 2017 because modern clinker ovens have been replacing solid biofuels with municipal wastes.
- Increases in consumption of biodiesel in 2016 are related to a policy change in the middle of the year.
- Data for biogases refer only to the gas from fermentation of biomass.
- Until 1998, data for industrial waste include other recovered gases which have to be reported in Coal questionnaire, causing a break between 1997 and 1998.
- Between 1992 and 1993, due to data availability, there is a large increase in solid biofuels for residential, commercial/public services and agriculture/forestry.

Electricity and heat

General notes

- Prior to 2010, heat supply and consumption can include autoproducers unsold heat. Previous attempts to address such issue may have caused breaks for heat production and fuel in autoproducer heat plants (1993) and in autoproducer CHP plants, and for heat consumption in industry sub-sectors.

Supply

- Electricity and heat from chemical heat and other sources are available from 2011. Prior to that, these amounts could be included under different categories.
- Heat distribution losses are available from 2004. Prior to that they are included in consumption.
- Heat production from heat pumps is available from 2009.

Transformation

- For 2019, the increase in electricity output from industrial waste was in part due to the opening of a new waste-to-energy plant in late 2018.
In 2019, electricity output from solid biofuels increased following the introduction of a new state support scheme. In 2016, output declined following a reduction in state support for biomass co-firing.

Starting with 2017 edition and following, the Polish administration revised electricity production data from power plants run by combustible fuels, reclassifying those that were previously reported as main activity CHP as main activity electricity plants. These revisions mainly affected coal-fired power plants and created breaks in time series from 2004 onwards.

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.

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

### Coal

**General notes**

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

**Consumption**

- Between 1997 and 2001 gas works gas was gradually replaced by natural gas in the commercial/public service and residential sectors.
- The production of pig iron ceased in the first quarter of 2001, leading to decreases in supply and consumption of coking coal, coke oven coke, coke oven gas and blast furnace gas in 2001.

### Oil

**General notes**

- The increase in refinery throughput in 2015 is a result of increased refinery capacity linked to the expansion of the Sines refinery.
- A new hydrocracking unit started operations in Sines Refinery in April 2013. This explains the 2013 increase in refinery feedstock imports, as well as middle distillate production.

**Supply**

- Production from other sources (natural gas) of other hydrocarbons corresponds to hydrogen used in refineries, also represented as the output of non-specified transformation in the balances format.
- Scheduled refinery maintenance lasting two months in 2018 affected the production and exports of secondary oil products.

**Consumption**

- Due to an investment to increase capacity, petrochemical plant operations were stopped for almost five months, thereby decreasing the consumption of naphtha and LPG for non-energy use in 2018.
- Consumption of gas/diesel oil in industry and commercial/public services represents diesel use in mobile fleets.

### Portugal

Source

Direcção-Geral de Energia e Geologia, Lisbon.
Natural gas

Supply

- In February 1997, Portugal started to import natural gas.
- The surge in 2017 imports is attributed to the consumption of gas-fired power plants that filled in the gap of decreased hydro-generation due to a drought.

Transformation

- Since 2012, data reported for non-specified transformation represent natural gas used for hydrogen manufacture. Prior to this year, these quantities are reported under oil refineries.
- The 2002 decrease in natural gas used for gas works (transformation) is due to the closing of the Lisbon gas works plant in May 2001.

Biofuels and waste

General notes

- Charcoal data for 2018 (indigenous production and residential sector) are delayed. Revisions are expected in the future.
- Data for solid biofuels were revised in a previous publication by the National administration from 1990 to 2001, which may result in breaks in time series between 1989 and 1990.
- Data are available from 1994 for biogases, from 1999 for municipal waste and from 2003 for industrial waste.

Consumption

- The use of biogasoline for blending decreased in 2017 because it is no longer compulsory to use biofuels in gasoline.
- Data for solid biofuels were further revised based on a new survey on industry, resulting in breaks in sub-sectoral consumption for 2012.
- Between 2009 and 2010 a new survey on energy consumption in households creates a break in time series in the solid biofuels consumption in residential time series.

Electricity and heat

Supply

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

Transformation

- In the 2017 edition, the data for production of electricity by autoproducer hydro plants were revised between 1990 and 1999, according to a new national methodology.
- For 2016 data onwards, heat and electricity production from chemical sources have been reclassified as autoproducer CHP production from industrial waste, causing cessation of the heat and electricity generated from heat from chemical processes time series, and causing breaks in the industrial waste time series between 2015 and 2016.
- In 2007, some power plants that were previously reported as main activity CHP have been reclassified as autoproducer CHP.
- In 2007, the power station that burns industrial waste started to work as a CHP plant, whereas previously it was only producing electricity.
- New plants fuelled by solid biofuels and by municipal waste started in 1999.
- Prior to 1992, data for electricity production by autoproducers include production from combustible fuel sources only.
- Electricity production from other oil products refers to methanol.
- Data for production of electricity in main activity producer CHP plants and the associated fuel inputs are not available prior to 1980.

Consumption

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

Source
Statistical Office of the Republic of Slovenia, Ljubljana.

General notes
Breaks in the time series appear for inputs to and outputs from electricity generation between 2017 and 2018 due to a change in methodology. This is most notable for lignite-fired main activity producer CHP and electricity-only plants. Data for 2018 onwards are reported on a unit basis, whereas data for previous years are reported on a plant basis.

A new energy data collection system was implemented in January 2001, causing some breaks in time series between 1999 and 2000.

Data for Slovenia are available starting in 1990. Prior to that, they are included in Former Yugoslavia.

Coal
Transformation
- From 2018, there is a change in methodology for reporting CHP generation which reflects in new figures in only-electricity production. Revisions prior to 2018 are not expected.
- In 2015, one of the main activity electricity plants burning lignite ceased its operations.

Oil
Supply
- Between 2013 and 2014, a break in imports and exports time series for kerosene-type jet fuel and fuel oil appears due to improvements in reporting methodology. New trade corresponds to imports that are first stocked on Slovenian territory and later re-exported.

Consumption
- In the 2021 edition, there is a break between 2017 and 2018 for white spirit whereby consumption is reported for various industry sub-sectors due to a change in reporting methodology by the Slovenian administration.
- Time series for motor gasoline and gas/diesel consumption in road fluctuate as they are computed by the Slovenian administration as residual between the supply and the total consumption of all other categories.

Natural gas
Transformation
- In 2014, improvements in a main activity producer CHP plant resulted in a substantial reduction of natural gas consumption in this sector.

Consumption
- In 2011, the decrease in the chemical and petrochemical sector non-energy use consumption is due to minimal use of gas for production of methanol.
- There are inconsistencies in the time series for commercial/public services as this sub-sector is computed by the Slovenian administration as a residual.

Biofuels and waste
Consumption
- Increases in consumption of biodiesel starting from 2017 are the result of an amended energy policy, which went into effect in mid-2017.
- The break in time series between 2008 and 2009 for solid biofuels is due to revisions based on a new household survey which is to be carried out on an annual basis.
- Breaks in total final consumption for industrial waste prior to 2008 are a result of a sectoral reclassification.

Electricity and heat
Supply
- Electricity output from solar only includes on-site consumption from 2019 onwards.

Transformation
- In 2018, Slovenia began gradually changing the sources of data for main heat plants from questionnaires to administrative sources. This change has resulted in some variation in reported efficiencies, in particular, for natural gas.

Consumption
- Breaks occur between 2017 and 2018 for electricity consumption data (in particular, for Machinery and Construction) due to a change in
the sample frames and sample sizes used in surveys.

- Data on electricity consumption in Road are available from 2017.
- In 2017, the apparent increase in electricity consumption in Rail is due to improved data provided by a new survey launched by the Ministry of Infrastructure in 2018.
- Direct use of solar thermal and geothermal heat is available from 2009.
- Surveys for data on heat consumption are available from 2003 onwards for the residential, industry and energy sectors. Prior to 2003, the data have been estimated by the Slovenian administration.

### Sweden

#### Sources
Statistics Sweden, Örebro.

Swedish Energy Agency (Energimyndigheten), Eskilstuna.

### Coal

#### General notes
- **Peat products** data may be reported under the category of peat, particularly for imports.
- In the 2021 edition, there was a revision of the products included under gas works gas. As a result, the figures for the years 2011 to 2018 were put to zero. Previously this product included some mixture of LNG with air to form a lower calorie product.
- Autoproducer inputs to waste heat production that are sold are reported in the respective final consumption sectors and not in transformation.

### Supply
- **Other bituminous coal** production until 1992 is coal recovered during the quarrying of clay.

### Transformation
- The figures in the Transformation section for the products coke oven gas and blast furnace gas were estimated until 2018; from 2019 onwards the data is obtained from surveys.

### Oil

#### General notes
- In 2017 Statistics Sweden added more companies to their new data collection system; these have been progressively included in the reporting through 2018 reference year data.
- Swedish stock data include peacetime crisis stocks. Since these stocks may be held in crude oil instead of oil products, there may be occurrences of negative stock levels for products.
- Data are available from 2003 for refinery gas and from 2000 for additives and ethane.
- Beginning in 2002, Sweden has changed some of the conversion factors for some products. That explains the small breaks in time series between 2001 and 2002.

### Supply
- In 2019, outputs of several oil products decreased as a result of refinery shutdowns lasting two months.
- In 2018, due to a new data collection survey rolled out by Statistics Sweden which has a higher level of detail available, transfer of refinery gas, naphtha and fuel oil appear for the first time. Consequently, transfer of other products in 2018 dropped to zero.
- Quantities of receipts from other sources of other hydrocarbons correspond to natural gas used by refineries.

### Transformation
- In 2014, gas/diesel oil inputs to main activity CHP electricity plants are confidential and aggregated with fuel oil.
- In 2013 data, the drop in crude oil refinery intake is related with maintenance in August and September 2013 at the Swedish refineries.
- From 2011, the country’s gas works plants stopped using naphtha.

### Consumption
- Starting from 1995 data, Sweden has changed its standard classification of industry sub-sectors
- Between 1985 and 1986, there are breaks in consumption time series of fuel oil due to more detailed reporting.
In 1984 data, consumption of other kerosene in the road sector is discontinued due to product re-classification.

Natural gas

Supply

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


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

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.

Consumption

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 re-
sponsible for breaks in time series between 2010 and 2011.

- For biogases, the residential sector is used as a residual.

Electricity and heat

Supply

- In the 2021 edition, upward revisions were applied to heat production and consumption back to 1997, to incorporate new data on recovered flue gas heat. Production is reported under heat from other sources.

- For 2017 onwards, electricity inputs to and outputs from pumped hydro storage plants are based on a revised methodology. As a result, breaks occur between 2016 and 2017. Prior to 2017, electricity 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

- In Sweden, heat produced in heat pumps is sold to third parties (as district heat) and is therefore included in transformation.

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

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

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

- Prior to 1992, data on electricity production from biogases is included with solid biofuels.

- Heat produced for sale by autoproducer CHP plants is reported starting in 1992.

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

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

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

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

Consumption

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

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

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

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

Switzerland

Sources

Swiss Federal Office of Energy (SFOE), Ittigen.

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

General notes

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

Coal

General notes

- Stock changes figures are not available for any product for 2019p. This data will be published in the following edition of this publication.

- Calorific values for anthracite, other bituminous coal and coke oven coke are taken from a common default figure. Calorific values for
lignite are also default, but are based on dried lignite fines which have a higher calorific value.

Consumption

- From 1985, industrial consumption of gas works gas is reported in non-specified industry to prevent the disclosure of commercially confidential data.
- The allocation of consumption between certain coal types is estimated by the Swiss administration.

Natural gas

General notes

- Since the 2019 edition, the non-specified other flow is calculated as residual flow for natural gas. Prior to this, the statistical differences used to be absorbed by agriculture/forestry.

Transformation

- Since 2013 there are fluctuations in gas consumption of main activity producers CHP plants due to the fuel flexibility of a plant.
- In 1996, the increase of gas input to main activity CHP plants is due to more complete accounting for all producing entities.

Consumption

- Between 1977 and 1978, there are breaks in time series due to the introduction of a new survey by industry type.

Oil

General notes

- The statistical differences for gas/diesel oil are partly due to changes in consumer stocks.
- In 2004, petroleum coke production started due to the installation of a cracking unit in a refinery.
- As of 1993, the Swiss administration has reported figures for naphtha that are net of quantities used for blending into motor gasoline. For 1994, 1995, 1997, 1999, 2001 and 2002 this reporting has led to negative production numbers for naphtha. For these years, the IEA Secretariat has moved the data into transfers and reduced the production of motor gasoline by corresponding amounts.

Supply

- In 2019, outputs of several oil products decreased as a result of refinery shutdowns lasting two months.
- There is a break in stocks between 2017 and 2018 for refinery feedstocks as more detailed information of refinery activity is collected by the national administration.
- In 2015, low refinery throughput is due to maintenance in May and June and to an unplanned outage in October due to a leak in a heat exchanger at the Cressier refinery. The closure of the Collombey refinery from March 2015 also contributed. As a result, imports of many oil products increased in 2015.
- The Collombey refinery remained closed in 2016, resulting in decreased refinery throughput and increased imports in this year. Refinery output of petroleum coke stopped as this product was only produced at the Collombey refinery.
- Data for refinery losses at the remaining Cressier refinery are low and are under investigation.
- Since 2013 oil importers are obliged to compensate parts of the CO₂ emission that are produced by the transport fuels they sell. The biofuel components are exempt from this obligation, which together with tax exemptions on biofuels, partly explains the increase in biofuel blending since.

Transformation

- Gas/diesel oil non-specified transformation represents inputs to mobile and stationary power generators, of which the electricity output is unknown at this stage.
- In 2012, low refinery intake is due to the temporary shutdown of the refinery in Cressier in the first semester of 2012 and maintenance at Collombey refinery.
- In 1988, the reduction in refinery intake of refinery feedstocks in 1988 is partly due to a switch to crude oil and partly to a shutdown for maintenance of a refinery.

Consumption

- In the 2019 edition the Swiss administration revised data back to 1990 for road diesel consumption in rail and domestic navigation, and motor gasoline consumption in domestic navigation.
In 1994, the increase in consumption of gas/diesel oil is due to consumer stock-building prior to the introduction of a value-added excise tax on heating fuels as of 1 January 1995.

**Biofuels and waste**

**Supply**
- Due to favourable taxation in Switzerland, the imports of biodiesel and bioethanol intended to be blended with oil products increased significantly from 2016 to 2017.
- Due to a new program launched in September 2014 in which 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.
- For 2019, gross heat production from heat pumps ceased following a decline in 2018. Two such facilities existed in Switzerland, the larger of which closed in 2018, followed by the smaller in 2019.
- For 2016 and 2017, electricity output from nuclear sources declined due to shut downs at two of Switzerland’s five nuclear power plants (Beznau 1 and Leibstadt). For 2018, output increased due to higher availability at these two plants.
- Electricity used for pumped storage (pure hydro pumping plants) is included under used for pumped storage (mixed plants).
- In 2016, two new pumped hydroelectric plants went into operation.
- For 2015, the large decline in electricity and heat production from industrial waste is due to one large main activity CHP plant significantly reduces their activity. This plant eventually closed in 2016, further lowering electricity and heat generation for this fuel.
- For 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.

**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.
• The allocation of electricity production in main activity producer electricity only and CHP plants between 1967 and 1973, and in main activity producer CHP and autoproducer CHP plants in 1974 are Secretariat estimates.

• All hydro electricity production is reported under large scale hydro (> 10 MW) due to the fact that production data are not being collected by different size capacity categories.

Consumption

• Consumption in the transport equipment industry is included with machinery.

• Geothermal direct use is overstated as it refers to heat production by geothermal heat pumps, which include inputs from electricity and/or gas in the transformation process.

• The breakdown of final consumption of electricity in the industry sector from 2000 to 2001 was estimated by the Secretariat.

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

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 mid-year, and the previously converted unit had a full year of operation in 2015 rather than just the last few months of 2014.

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

Consumption

• Consumption shown for the commercial/public services includes consumption of some of non-specified other.

Oil

General notes

• There is a break in series between 2015 and 2016 due to a change in methodology and estimation process applied by the UK administration in the 2020 edition, which involves including data from trade body members and major suppliers.

• Breaks in time series occur for LPG between 2007 and 2008 due the inclusion of additional information from the petrochemical sector.

• For international marine bunkers and domestic navigation, a different bunkers methodology is applied from 2008, in line with UK’s National Atmospheric Emissions Inventory. From 2013 onwards, improved data are available for international marine bunkers. Deliveries to international marine bunkers may be underestimated in previous years.

• For consumption of oil products, the UK administration revised its methodology from 2008 to better track consumption of imported oil.
products and domestically refined oil products sold through third parties to final consumers.

- Breaks in time series appear in 2013 for **ethane**, **naphtha**, **white spirit**, **lubricants**, **bitumen**, **petroleum coke** and **other oil products**, as new information became available on the energy use of these products.

**Supply**

- In the 2021 edition, the UK administration revised the stock levels (national territory) of **motor gasoline** and **gas/diesel oil** from 2015 onwards, resulting in a stock break between 2014 and 2015.

- Refinery output of **ethane** decreased in 2019 due to the closure of the Mossmorran NGL plant.

- **Biodiesel** blending notably increased in 2019 per the requirement of the Renewable Transport Fuel Obligation.

- Indigenous production of **crude oil** and **natural gas liquids** increased in 2018 primarily due to multiple new projects coming online at the end of 2017.

- Refinery output of total oil products decreased in 2018 due to relatively high levels of maintenance throughout 2018.

- From 2008 data on **naphtha** and **motor gasoline** better reflects the blending of these products. Breaks in series may appear between 2007 and 2008.

- Between 2007 and 2008 breaks in time series appear for **NGL** as a result of the UK administration obtaining additional information on the destination of some upstream **NGL**. Previously classified as exports, these amounts now appear as transfers, mainly to **LPG**, then as consumption in the petrochemical sector.

- Between 2002 and 2004 products transferred include backflows and interproduct transfers. From 2005 onwards backflows are estimated by the UK administration.

- Condensates are reported in **NGL** from 1980 and in crude oil until 1979.

- **LPG** includes ethane until 1980.

- **Other hydrocarbons**, reported until 1994, correspond to bitumen production from coal.

**Consumption**

- Breaks in time series may occur in the consumption of **gas/diesel oil** between 2011 and 2012, following the UK’s administration improved access to customs trade data, in particular duty figures for demand in agriculture.

**Natural gas**

**General notes**

- In the 2020 edition, revisions were made to years 2017 and 2018 to align with the DUKES publications.

- Since 1992, **distribution losses** include metering differences and losses due to pipeline leakage.

**Supply**

- In the 2018 edition, UK administration revised the supply balance back to 2008 to update Norwegian imports from two terminals previously reported as **indigenous production**.

- In 2002, the increase in **imports** is due to increased supplies from the Norwegian sector of the North Sea through the Vesterled pipeline, which was commissioned in the 4th quarter of 2001.

- In 2017 data the decreased **closing stock level** is related to the cessation of storage operations in Rough, UK’s single largest storage facility.

**Transformation**

- The **natural gas** reported in **coke-oven (transformation)** is used to form synthetic **coke oven gas** rather than undergoing a coking process.

**Consumption**

- In the 2018 edition, **natural gas** consumption in the sectors of **industry**, **residential**, **commercial/public services**, was revised back to 2008 to include information from other data sources such as the Purchases Inquiry, EU ETS and ONS Index of Services and Production.

- In the 2019 edition, the UK administration proceeded to revisions back to 2015 based on improved data from the Purchases Inquiry annual survey of the Office of National Statistics (ONS).

- Before 2008, the commercial sector consumption is included in **non-specified other**, while that of public services is shown separately.

- Between 2007 and 2008 there are some breaks in time series in sectoral consumption due to a new methodology of data estimation.
Natural gas consumption includes substitute natural gas made at gas works and piped into the natural gas distribution system.

Non-specified industry represent to sales by independent gas suppliers unallocated by category.

Consumption by the mining and quarrying and the wood and wood products sectors is included in non-specified industry.

Non-specified energy includes gas used for heating and pumping operations in the distribution network.

Biofuels and waste

General notes

In the 2021 edition, revisions from 2015 onward in municipal wastes were reflect a reclassification from non-renewable to renewable based on the renewable portion of tires.

In the 2017 edition, the UK government revised the data time series for municipal waste and solid biofuels back to 2001. As a result, breaks in time series may occur between 2000 and 2001.

Transformation

From 2015, the UK administration started collecting data from the main-activity solar PV companies. Prior to this, all data were included under autoproducers.

The consumption of solid biofuels has increased in 2015, as the largest power station in the UK halfway through the year converted a further unit from coal to biomass, plus the previously converted unit had a full year of operation in 2015 rather than just the last few months of 2014.

Prior to 2013, due to data confidentiality reasons, one or two main-activity municipal waste plants had to be included within the autoproducer plant category. Since 2013, as there have been at least three main-activity companies, these plants have been reclassified from autoproducer plant to main activity electricity plant, with some CHP plants included under main electricity due to confidentiality reasons.

Consumption

In the 2021 edition, solar thermal reclassifications from residential to commercial and public services in 2016 – 2018 represent new data on heating for public swimming pools.

The UK administration undertook a survey of domestic wood consumption in 2015 and revised figures back to 2008. This resulted in breaks in time series for solid biofuels consumption in residential between 2007 and 2008.

In the 2020 edition, there are some unusual patterns in the industry sector for municipal wastes and solid biofuels, however revisions are expected in the following cycle.

In the 2018 edition, following a review of the consumption of biogases and municipal wastes for 2015 and 2016 data, data that were allocated to other sectors have been reallocated to the industry sectors. This has caused a break in time series between 2014 and 2015.

Electricity and heat

General notes

For the United Kingdom, it is necessary to combine figures for main activity producers and autoproducers in order to prevent the disclosure of information relating to less than three electricity generating companies, since this information is considered confidential. For this reason, data for main activity producer CHP plants have been included with autoproducer CHP plants from 1988. Prior to 1988, electricity output from CHP plants was included with autoproducer electricity plants.

The re-organisation and subsequent privatisation of the electricity supply industry in 1990 has resulted in some breaks in time series.

Supply

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

Large declines in electricity generation from coal-fired power since 2013 are due to concrete plans to phase out coal use for electricity generation entirely by 2025. Alternative generation has been supplied by increases from other sources, including biomass, natural gas, nuclear, solar and wind generation, and increases in imports through undersea HVDC interconnectors.

Electricity production data for solar PV are available from 1999.

The launch of a feed-in-tariff scheme in April 2010 resulted in a rapid increase of capacity and
corresponding electricity production growth from solar PV in the following years.
- In 1996, the break in electricity production from nuclear is due to a reclassification of plants from autoproducer to main activity producer plants.
- Data on electricity production from wind is available from 1989.

Transformation
- For 2019, the decline in output from other bituminous coal was due to plant closures (Fiddlers Ferry [unit 1], Cottam, and Aberthaw).
- For 2018 and 2019, the decrease in electricity output from nuclear was due to plant outages for maintenance.
- Electricity used for pumped storage (mixed plants) is included under used for pumped storage (pure hydro pumping plants) for confidentiality reasons.
- In 2007, outputs of electricity from petroleum coke are included in fuel oil.
- Prior to 2003, all outputs of electricity and heat from oil products are reported in the other oil products category.
- Heat production from autoproducers is available starting in 1999.
- Inputs and output from natural gas for main activity producer electricity production are included in autoproducer electricity for 1990 (for reasons of confidentiality).

Consumption
- For the 2019 edition, a change in methodology was applied for heat consumption figures from 2015 onwards. Due to new information regarding the purchasing and reselling of heat, consumption previously included under the Commercial and Public services sector was reallocated to the Residential sector.
- For 2017, the decrease in electricity consumption in mining and quarrying is due to omission of one company from dataset.
- Prior to 2010, consumption in mining and quarrying is included in the non-metallic minerals sector.
- Electricity consumption in coal mines includes consumption in patent fuel plants.
- Data for electricity consumption in transport was classified by sub-sector only starting from 2004 resulting in a break in time series between 2003 and 2004. Prior to 2004, non-specified transport includes consumption for traction by urban rails and road vehicles, and consumption for non-traction by railways and bus stations and airports. From 2004 onwards, road vehicles consumption is included under road transport. Prior to 2004, electricity consumption in rail refers to industrial rail only. From 2004 onwards it includes both industrial and urban rail.
- Consumption in the machinery sub-sector includes that of the transport equipment industry before 1996.
- Starting in 1990, small amounts of electricity used in heat pumps have been included in residential.
- From 1984 onwards, the electricity consumption in the non-specified industry sector includes that of the wood and wood products sub-sector (except 2010-2014, when estimates were supplied by the UK) and unallocated consumption. The unallocated consumption comes from data reported as ‘Other industries’ by companies and includes Standard Industrial Classification (SIC) codes 7, 22, 31, 32, 33.19, 36, 38.3.
- Electricity consumption in energy non-specified sub-sector is primarily made up of ‘gas and electricity supply’ and includes Standard Industrial Classification (SIC) codes 24.46 and 35. However, prior to 1990, consumption in gas works includes electricity use in the transmission/distribution of public supply gas.
- For autoproducers, due to data availability constraints, heat is assumed to be consumed within the same sector as it is generated.

United States

Source
US Energy Information Administration, Washington D.C.

General notes
Starting with 2017 data, inputs to and outputs from electricity and heat generation include Puerto Rico.
End-use energy consumption data for the United States present a break in time series with historical data due to a change in methodology in 2014. The break in time series occurs between 2011 and 2012 for oil; and between 2001 and 2002 for electricity and natural gas. The new methodology is based on the last
historical year of the most recent Annual Energy Outlook (AEO) publication. Changes occur primarily in reported end-use energy consumption in the industrial sector and its subsectors, including the non-manufacturing industries of mining, construction and agriculture. Historical revisions are pending. Due to other changes in reporting methodologies, there are numerous breaks in time series for the US data, particularly in 1992, 1999, 2001, 2002 and 2013. Care should be taken when evaluating consumption by sector since inputs of fuel to autoproducers are included in final consumption for some years. No data are available for most energy products in the construction and mining and quarrying industries.

Coal

General notes

- The statistical difference for anthracite is significant for some parts of the time series as some consumption falls below the reporting thresholds, such as residential usage.
- Since the Energy Information administration (EIA) and the US Department of Commerce do not collect separate data on patent fuel exports by country, total exports data of patent fuel are included in the exports of other bituminous coal.
- Coal tar as a by-product of coke ovens is not currently reported.
- In 2002, the United States reported “synfuel” production as patent fuel for the first time. Prior to 2002, the consumption of this fuel was reported with other bituminous coal. Production ceased in 2007 for economic reasons.
- Hard coal data prior to 1978 may include sub-bituminous coal.

Supply

- Other sources coal production represents coal production that does not have a Mine Health and Safety Administration (MSHA) identifier.
- Other bituminous coal exports could include some anthracite quantities. Anthracite is often blended with bituminous coal when exported.

Transformation

- Anthracite calorific values for Main Activity & Other Uses is mainly Anthracite waste coal. As such heat content is much lower than expected for this product.

Coking coal calorific values for coke ovens and blast furnaces are reported by most data providers on an “dry heat content” basis rather than on an “as is” or “as received” basis. As such, they are on the higher end of the range expected for this product.

Oil

General notes

- In the 2018 edition, the US administration revised data back to 2011 for several products owing to the introduction of a number of methodological changes. This results in a number of breaks in the time series between 2010 and 2011, particularly in the consumption data.
- From 2011 onwards, olefins are reported under other oil products instead of LPG.
- Breaks in time series due to methodology improvements and newly available information to the US administration also appear in historical data: in 1990 for fuel oil (new methodology for marine bunkers); in 1992 for LPG/NGL (specific densities); in 1993 for oxygenates (new collection system to accommodate the revised Clean Air Act); in 1994 for motor gasoline (new model from the US Department of Transportation); in 1999-2000 for industry consumption (new available data from the 2002 MECS survey); in 2001 for fuel oil (changes in methodology for classifying imports of unfinished oils) and in 2011 for refinery gas (new density).

Supply

- In the 2021 edition, receipts from other sources and total exports of additives/oxygenates have been estimated by the IEA Secretariat for 2019 based on information in the IEA Monthly Annual Oil Statistics.
- In the 2021 edition, the refinery gross output of motor gasoline has been estimated by the IEA Secretariat for 2019 based on information in the IEA Monthly Annual Oil Statistics.
- In the 2021 edition, deliveries of gas/diesel oil for international marine bunkers have been estimated by the IEA Secretariat for 2019 based on information provided by the EIA.
- Deliveries to international marine bunkers of gas/diesel oil have been estimated by the IEA Secretariat for 2016 and 2017 based on information provided by the EIA.
• In the 2018 edition, the breakdown of exports by destination of low sulphur fuel oil and high sulphur fuel oil is not available. The time series was revised back to 2011.
• Completion of the Utopia pipeline from Ohio to Ontario has facilitated more ethane exports to Canada in 2018.
• High statistical differences for crude oil represent “unaccounted for crude oil”, the difference between the supply and disposition of crude oil.
• From 2013, the US administration reports exports of refinery feedstocks, some of which were previously reported under white spirit and SBP.
• Stocks changes for gas/diesel oil, fuel oil and petroleum coke were estimated by the IEA Secretariat from 1996 onwards to include stock changes at utilities.

Transformation
• From 2002 onwards, the IEA Secretariat has estimated the amounts of refinery gas used for auto-producer electricity production.

Consumption
• In the 2021 edition, consumption of motor gasoline for road transport and of gas/diesel oil for rail transport have been estimated by the IEA Secretariat for 2019 based on information provided by the EIA.
• In the 2021 edition, non-energy use of gas/diesel oil in the chemical (including petrochemical) sector has been estimated by the IEA Secretariat for 2019 based on information provided by the EIA.
• In the 2021 edition, consumption of petroleum coke in industry – not elsewhere specified has been estimated by the IEA Secretariat for 2019 based on information provided by the EIA.
• In 2018 demand for petrochemical feedstocks derived from oil products increased following new ethylene production capacity coming online and the ramp up in polyethylene capacity. This trend is expected to continue through 2019 as further ethylene capacity comes online.
• Between 2010 and 2011, end-use energy consumption data for the United States present a break in time series due to a change in methodology. For the period 2011-2016, quantities of non-energy use of LPG in chemical and petrochemical, and of other oil products in non-specified industry have been estimated by the IEA Secretariat.
• From 2013 onwards, road use lubricants are reported under non energy consumption in transport equipment, machinery, and wood and wood products. Previously, such quantities were reported under non-specified industry.
• From 1995 onwards, LPG inputs to gas works are included in industry.

Natural gas

General notes
• Puerto Rico is currently not included in US data for natural gas with the exception of gas consumed for electricity generation. LNG imports into Puerto Rico are reported in the Other non-OECD Americas regional aggregate.

Supply
• In the 2017 edition of this publication, the indigenous production data for 2014 was revised by the US administration creating a break in the time series between 2013 and 2014 due to a change in the methodology. In addition, this increased the statistical difference that remained high in 2015 and 2016.
• The exports have been increasing since 2015, due to new liquefaction capacity (i.e. Sabine Pass) coming online at the end of that year.

Transformation
• Since 2012, data reported under non-specified transformation represent natural gas used for hydrogen manufacture. Prior to 2012, these quantities are reported under the chemical and petrochemical sector.
• Between 1999 and 2000, there are some breaks in time series for the transformation subsectors due to a new data reporting method.
• Between 1990 and 2002, the amounts of gas works gas that are blended with natural gas have been estimated on the basis of the output efficiency of the process.
• Since 1989, consumption by autoproducer CHP plants is available, while consumption by autoproducer electricity and main activity producer CHP plants is available since 1991. Prior to these years, these consumptions are included with industry and commerce/public services.
Consumption

- In the 2019 edition, revisions were made to the industry sector from 2015 onwards, by reallocating natural gas consumption to the chemical and petrochemical sub-sector from other industrial sub-sectors.
- Due to revisions made to the iron and steel model, there is a break in the time series between 2014 and 2015 for the consumption in blast furnaces (energy).
- Until 2001, agriculture/forestry consumption is included under industry.
- From 1995 to 2001, the detailed breakdown of industry consumption is estimated by the Energy Information administration using the Manufacturing Energy Consumption Survey (MECS), which is conducted quadrennially.
- Prior to 1995 a detailed breakdown of industry consumption is not available (between 1990 and 1994, chemical consumption is estimated by the American administration).
- In 1991 data on natural gas use in the road sector were collected for the first time, and are not available for previous years.
- Non-specified energy industry own use represents natural gas consumed for the production of ethanol.
- Consumption in fisheries is included under industry.

Biofuels and waste

General notes

- The EIA assumes all industrial waste is non-renewable.
- Due to the change in reporting methodology for liquid biofuels, breaks in time series occur between 2009 and 2010. This is especially noticeable in the biodiesel time series.

Supply

- Data for indigenous production and domestic supply of industrial waste have been estimated by the IEA Secretariat for 2019p.
- Data for production of industrial waste have been decreasing since May 2014 due to reclassification, resulting in a break in series between 2013 and 2014.
- Indigenous production of biodiesel is estimated in 2010 based on the EIA’s Monthly Energy Report.

Transformation

- The EIA collects generation and consumption data from all plants 1 MW or more in capacity.

Consumption

- Due to an improved estimation, there are some breaks in time series of the industry sector and other sectors between 2009 and 2010: for industry, geothermal, biogases and industrial waste (paper, pulp and printing); for other sectors, geothermal and solar thermal.

Electricity and heat

General notes

- Geothermal supply and inputs to transformation data are estimated by the IEA Secretariat starting in 2009 because of efficiency discrepancies.
- Between 2001 and 2002, there are breaks in time series concerning the total production of electricity and heat in the United States. Comprehensive data on electricity and heat production and consumption in main activity producer electricity, CHP and heat plants and autoproducer electricity and CHP plants are not available for all years.

Supply

- There is a break in series for geothermal and solar thermal direct use data between 2017 and 2018 as a new methodology for reporting these data was adopted with 2018 data. There is an additional break in series between 2018 and 2019 data for geothermal direct use, as the methodology has reverted to the previous one.
- The IEA Secretariat estimated US solar PV electricity generation from autoproducers starting in 1999 by multiplying the dispersed and distributed PV capacity estimated by the US administration by an average capacity factor of 12%. The capacity factor was based on a report published in 2007 by the IEA Photovoltaic Power Systems Programme, Cost and Performance Trends in Grid-Connected Photovoltaic Systems and Case Studies. The corresponding consumption of electricity has been included under non-specified other.
• Data for electricity inputs to and outputs from pumped storage hydro plants became available starting in 1987.
• Discrepancies occur between respective reported figures for electricity trade between the US and Mexico from 2013 onwards, and between the US and Canada from 2016 onwards. This is in part due to a change in data source for US electricity trade figures, which creates a break in series between 2015 and 2016.

Transformation

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

- Prior to 1991 some of the fuel inputs to electricity and heat production reported for autoproducer plants are reported as final consumption in the particular economic sector in which the autoproducer is operating.
- Prior to 1989, there are no generation data available from autoproducers.
- Sub-bituminous coal inputs for electricity and heat production are included in hard coal before 1983.

Consumption

- Consumption breakdown data for electricity are modelled based on data obtained from the Annual Energy Outlook and conversion factors. These data are based on fiscal values rather than physical tonnage, so if commodity prices increase or decrease between AEO versions and the conversion factors are not updated, derived changes in consumption may appear that are not supported by physical changes in production, or actual changes in consumption. For example in 2016, production of steel in electric arc furnaces increased by 6%, however consumption of electricity in the iron and steel industry was reported as declining by 17%. In addition, as the AEO models are revised annually, but the historical data are not necessarily revised, regular breaks in-series can occur.
- For the 2019 edition, the breakdown of final electricity consumption for 2017 was based on the results of the Annual Energy Outlook (AEO) of 2018. The model used in the 2018 edition of the Outlook was updated to incorporate the results of the 2014 Manufacturing Energy Consumption Survey (MECS). The MECS values were last updated in 2010, and in the intervening period, several industries had changed significantly. For industry sub-sectors where disaggregated AEO2018 values are unavailable e.g. non-ferrous metals, textiles, and non-metallic minerals, consumption was extrapolated from the MECS 2014 values at the same rate as shipments in that industry. Breaks in time series occur across several sectors between 2016 and 2017.
- Similarly, the breakdown of final electricity consumption for 2015 was based on the results of the Annual Energy Outlook (AEO) of 2016. Breaks in time series appear in the mining and agricultural electricity consumption sectors as a result of introduction of individual industry benchmarking for 2015 results. Changes in iron and steel, and pulp and paper data from 2014 to 2015 are the result of fundamental revisions of the iron and steel and pulp and paper models between AEO2014 and AEO2016 as well as the use of individual industry benchmarking for AEO2016. These changes are a few notable examples of series changes, and any series can change between AEO releases because of data updates and methodology changes.
- Electricity consumption in road includes all estimated consumption by electric vehicles (both 100% and plug-in hybrids).
- Prior to 1991, total consumption of heat sold referred to consumption in commercial/public services.
- No data are available for heat sold that is consumed in the residential and agriculture/forestry sectors for any year.
- Data for direct use of solar thermal heat in residential are available from 1999.
- Since 1995, heat consumption data by sector are no longer collected, and have been estimated by the Secretariat, resulting in breaks in time series between 1994 and 1995, and 1999 and 2000.
- Data for consumption of heat sold in industry are available from 1991 and in energy industry own use from 1992.
NON-OECD COUNTRIES

General notes

Before 2016, the IEA Secretariat published separately “Energy balances of non-OECD countries” and “Energy balances of OECD countries”. The two were combined into “World energy balances” in 2016.

When making references to “this publication”, it includes “Energy balances for non OECD countries” produced until 2016.

In the references below, both the statistical year (2019) 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 2019.

Data may not include all informal and/or illegal trade, production or consumption of energy products, although the IEA Secretariat makes efforts to estimate these where reliable information is available.

General references

- Annual Statistical Report, Organization of Arab Petroleum Exporting Countries (OAPEC), Kuwait, various editions up to 2019.
- Asia Pacific Economic Cooperation annual energy questionnaires, Asia Pacific Energy Research Centre (APERC), Tokyo.
- Arab Oil and Gas Directory, Arab Petroleum Research Centre, Paris, various editions up to 2018.
- Asia Pacific Database, FACTS Global Energy, Singapore, various editions up to 2019.
- Centroamérica: Estadísticas de Hidrocarburos, Comisión Económica para América y el Caribe (CEPAL), United Nations, Mexico, various editions up to 2019.
- CIS and East European Energy Databook, Eastern Bloc Research Ltd, Tolsta Chaolais, various editions up to 2014.


• Joint IEA/Eurostat/UNECE annual energy questionnaires.


• **Middle East Economic Survey (MEES)**, Nicosia, various issues to June 1999.

• **Middle East Petroleum Databook**, FACTS Global Energy Group, Singapore, various editions up to 2018.

• **Natural Gas in the World**, Cedigaz, Paris, various editions up to 2019.

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


• **PIW’s Global Oil Stocks & Balances**, New York, various issues to June 1995.


• **SIE-Afrique (Systèmes d’Information Énergétique – Afrique)**, projet promu par ECONOTEC et Institut de l’Energie et de l’Environnement de la Francophonie (IEPF), organiste subsidiaire de l’Organisation Internationale de la Francophonie (OIF) up to 2009.


• **Statistical Bulletin, Arab Union of Producers, Transporters and Distributors of Electricity (AUPTDE)**, Amman, various editions up to 2020.


• **Statistiques économiques**, Banque des Etats de l’Afrique Centrale (BEAC), online database 2011.


• **Statistical Yearbook, The Interstate Statistical Committee of the Commonwealth of Independent States**, Moscow, various editions up to 2011.

• **Statistical Yearbook of the Member States of the CMEA**, Council of Mutual Economic Assistance (CMEA), Moscow, 1985 and 1990.

• **The LNG Industry**, International Group of Liquefied Natural Gas Importers (GIIGNL), Neuilly sur Seine, various editions up to 2019.


• **World Development Indicators**, The World Bank, Washington, various editions up to 2019.

**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.

- 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 Senegal, Benin, Democratic Republic of the Congo, Ethiopia, Ghana, Kenya, Nigeria, Rwanda, Uganda and Zambia.

**Argentina**

**General notes**

Data for Argentina are available starting in 1971.

In the 2021 edition, new use of customs information led to revisions of coal imports between 2002 and 2018.

In the 2020 edition, Argentina’s 1971-2017 time series were revised across all products after communication of revised historical balances from Secretaría de Energía. Most of the revisions are based on those revised energy balances; others are based on revisions from the IEA Secretariat after analysis of available historical balance series. In detail:

- Coke oven coke, coke oven gas and blast furnace gas data are estimated by the IEA Secretariat from 2006 onwards.
- Petroleum coke demand is estimated by the IEA Secretariat from 2006 onwards, and trade is sourced from Instituto Nacional de Estadística y Censos de la República from 2006 onwards.
- Data on electricity demand by industrial sub-sector is available since 2015. However, it reflects fixed shares of demand by sub-sector and does not reflect variation of demand trends between sub-sectors over time. Electricity generation by fossil source is estimated by the IEA Secretariat based on information of fuel inputs and generation by technology.
- Biogas data includes biogases from thermal processes in the paper industry up to 2013, and electricity generation data reported by CAMMESA from 2012. Refinery feedstocks data is available from 1999.
- Additives data contains MTBE from 1994 and other octane improvers from 2010 onwards. A structural break may exist between 2009 and 2010. Natural gas data contains trade of wet gas and own use of wet gas in oil and gas extraction. This can lead to statistical differences in the time series.

The Secretaría de Energía is developing its statistical system to collect further data on final consumption data and its disaggregation by activity. This could lead to data revisions or breaks in time series in future editions.

Since 2010 a different methodology was adopted by Argentina for reporting refinery flows leading to more detailed information (e.g. reprocessing of some oil products). This may result in breaks in time series between 2009 and 2010. Breaks in time series may also exist between 1993 and 1994 due to the start of the data series coverage of such refinery flows.

**Sources**

**Sources up to 2019:**

- Direct communication with the Ministry of Economy, Secretaría de Energía, Buenos Aires.
- *Informe del sector eléctrico*, Ministerio de Planificación Federal, Inversión Pública y Servicios,
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 2021 edition, close cooperation with the Ministry of Mines and Energy also led to a series of revisions affecting oil and gas data, enhancing harmonization of IEA data with national energy balances. The quantities of refinery input and output now reflect those reported by the Ministry of Mines and Energy more accurately. Wet gas losses in gas separation plants are now excluded.
from NGL production, leading to revisions from 2011. Production of LPG and motor gasoline was also revised to exclude the quantities resulting from naphtha processing by the petrochemical industry, which are now included in transfers. The calorific values of natural gas, other non-specified oil products and natural gas liquids have also been revised. As a result of these changes, production and transfers have been revised for LPG, motor gasoline and other non-specified oil products since 1971. Refinery feedstocks have also been revised from 1971, with significantly lower levels of refinery input.

The national energy balance of Brazil reports quantities of “Other non-renewable” energy consumed by the chemical, cement, iron and steel, and other sectors for both final consumption and autoproducer CHP generation. This combines a series of energy sources, such as tyre scrape, clay, blast furnace dust, tail gas, residual gases, sulphur gases and other residues. Starting with the 2021 edition, these products and their corresponding electricity generation are allocated to industrial waste, except for the power inputs of the chemical sector, which are allocated to heat from chemical sources. This leads to a structural break in 2017, as generation from such energy sources in the iron and steel was not separated from blast furnace gases before 2017.

In the 2021 edition, biogases from thermal processes include the amount of blast furnace gases from charcoal, and the corresponding electricity generated from those gases, from 2012 onwards.

In the 2020 edition, new information became available, leading to revisions to 2016, 2017 and 2018 data in coal, gas oil and electricity. Data on biogas in transformation processes has been revised since 2008, oil product densities since 2014, and biodiesel and diesel data since 2011. Transfers of fuel oil and lubricants have been revised since 2012.

In the 2015 edition, new information became available which explains the types of product transfers within Brazilian refineries. The IEA attempted to reflect these transfers as accurately as possible.

Brazil produces a large share of its pig iron in blast furnaces that are fuelled and fed with charcoal. The blast furnace gases produced when charcoal is used as a reagent in the blast furnaces are renewable products and they have been reported in this publication under the product “Biogases from thermal processes”. Additionally, only the part of these gases consumed for power generation (i.e. energy purposes) has been accounted for in the transformation sector. The remaining charcoal consumed in or used to heat the blast furnaces is reported in final consumption under the iron and steel industry with no distinction between transformation and final consumption.

Prior to the year 2000 blast furnace gases data availability is limited to the input to auto producer electricity plants. Therefore, from 1971 to 1999, the other flows (e.g. production, consumption etc.) are IEA Secretariat estimates.

The Itaipu hydroelectric plant, operating since 1984 and located on the Paraná River (which forms the border of Brazil and Paraguay) was formed as a joint venture between Eletrobrás and the Paraguayan government. Production is shared equally between Brazil and Paraguay.

Sources

Sources 1971 to 2019:

- Direct communication with the Ministério de Minas e Energia, Brasília.

Bulgaria

General notes

Data for Bulgaria are available starting in 1971.

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. Breaks in the time series may occur between
2017 and 2018. The National Statistical Institute is
currently reviewing their methodology for this
reporting.

Non-specified transformation of natural gas to other
hydrocarbons corresponds to hydrogen used in
refineries.

Bulgaria has re-classified black liquor from industrial
waste to solid biofuels and the renewable portion of
tyres from industrial waste (non-renewable) to solid
biofuels (industrial waste – renewable part) from
2008. Breaks in time series may occur between 2007
and 2008.

A break in the time series for natural gas stock
changes may occur between 2003 and 2004 as
cushion gas is excluded from 2004 onwards.

Sources

Sources 1990 to 2019:

- Direct communication with the National Statistical
  Institute, Sofia.
- Joint IEA/Eurostat/UNECE annual energy
  questionnaires.
- Energy Balances, National Statistical Institute,

Sources up to 1990:

- Energy Development of Bulgaria, Government of
- Energy in Bulgaria, Government of Bulgaria,
  Sofia, 1980 to 1983.
- General Statistics in the Republic of Bulgaria

Sources for biofuels and waste:

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

- The United Nations Energy Statistics Database,

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, 2019 data from the National
Bureau of Statistics (NBS) of the People’s Republic
of China was not available before publication. It has
therefore been estimated by the IEA Secretariat on the
basis of available secondary sources.

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

Coal

NBS and IEA collaborate to provide additional detail
on energy production, transformation and
consumption of all five different types of coal
(e.g. anthracite, coking coal, other bituminous, sub-
bituminous and lignite). At the moment NBS only
provides quantities of raw coal and washed coal (split
between cleaned coal and other washed coal) in their
energy balances and the IEA Secretariat has attributed
these quantities to coking coal and other bituminous
coal. It is expected that the continuing work to
provide disaggregated data on the five different coals
will result in greater detail in future editions.

In the 2018 edition, NBS changed the definition of
cleaned coal and other washed coal. Only the coal
used for coking is called cleaned coal. This might
result in breaks in time series in coking coal between
2015 and 2016. As this change of methodology
resulted in uncertainty on the use of cleaned coal, the IEA Secretariat estimated the use of coking coal in transformation and final consumption sectors.

In the 2018 edition, based on new information, coal consumption in rail was revised for the whole time series to reflect the fact that coal is used for other usages than transport in the rail sector. The IEA Secretariat has allocated part of the coal reported under rail to other non-specified sectors for the period 1990-2003. For the period 2004-2016 the IEA Secretariat allocated the total amount of coal reported under rail to other non-specified sectors.

In the 2018 edition, based on new information, coal inputs to main activity heat plants and part of coal inputs to main activity electricity plants were allocated to main activity CHP plants for the period 2005-2016.

Net calorific values (NCV) for coal inputs to power generation from 2000 are estimated by applying assumptions used by China on the average thermal efficiency of coal-fired power stations in these years. NCVs are also estimated for bituminous coal production from 2000 as well as for inputs to main activity CHP plants from 2008.

Since 2000, imports and exports of cleaned coal are no longer reported in the national energy balance of China. The IEA Secretariat has used secondary sources of information to report this coking coal trade and corresponding quantities have been removed from bituminous coal trade. Consumption of this coking coal is assumed to be in coke ovens.

The IEA data of coal stocks for the years 1985 and 1990 as well as coal production for the years 1997-1999 are estimates and do not represent official data released by the Chinese government. Those estimates were based on the assumption that coal consumption statistics are more reliable than coal production statistics and that the production-consumption relationship should maintain a balance over time. In recent years, China has reported large increases in stocks for different types of coal. These stock increases are seen as consistent with trends in economic growth and development in China; however, information is currently lacking on the scale of the infrastructure available for this magnitude of stock increases.

Data for coal trade in this publication may not match data from secondary sources of information.

**Oil**

Starting with 2010 data, NBS increased the level of detail of the national energy balance regarding oil products and coal gases. Breaks in time series may occur between 2009 and 2010.

In 2012, new information became available on how NBS accounts for international aviation and marine bunkers in the China’s national energy balance. Previously international flights by Chinese airlines and ships had been excluded. A revised methodology was implemented that includes fuel use for international airplanes and ships, regardless of whether they are foreign- or China-owned.

Coal to liquids output was estimated based on projected production slate of operational coal-to-liquid plants.

In recent years, China has reported large increases in stocks for crude oil and oil products. These stock increases are seen as consistent with trends in economic growth and development in China; however, information is currently lacking on the scale of the infrastructure available for this magnitude of stock increases.

**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.
waste in the IEA energy balances. This quantity of industrial waste is not likely to represent the only combustion of industrial waste in China; however, information is not available to provide more complete data on this activity.

Time series for liquid biofuels and biogases are based on secondary sources of information and IEA Secretariat estimates. None of these time series are reported in the national energy balance of China.

Electricity and heat

In the 2018 edition, based on new information, heat production from main activity heat plants using coal and natural gas and part of electricity production from main activity electricity plants using coal and natural gas were attributed to main activity CHP plants from 2005 onwards.

Estimates on the electricity consumption in road transportation are included, starting with 2001 data.

Electricity production from pumped storage hydro is reported from 2010 onwards.

Time series for wind (prior to 2010), geothermal, solar photovoltaic and solar thermal generation are based on secondary sources of information and IEA Secretariat estimates. None of these time series are reported in the national energy balance of China.

Sources

Sources for 2019:
- IEA Secretariat estimates.

Sources 1990 to 2018:
- Direct communication with the China National Bureau of Statistics (NBS), Beijing.
- Direct communication with the China National Renewable Energy Centre (CNREC), National Energy Administration (NEA), Beijing.
- Direct communication with the Institute of Built Environment of Tsinghua University, Beijing.
- IEA Secretariat estimates.

Sources up to 1990:
General notes

Data for Costa Rica are available starting in 1971.

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.

Sources

Sources up to 2019:

- Direct communication with the Ministerio del Ambiente y Energía, San José.
- Balance Energético Nacional, Secretaría Planificación Subsector Energía (SEPSE), San José, various editions up to 2019.
- IEA Secretariat estimates.

Croatia

General notes

Data for Croatia are available starting in 1990. Prior to that, they are included in Former Yugoslavia.

Non-specified transformation of natural gas reported from 2007 refers to natural gas used by refineries for hydrogen production.

Breaks in time series may appear between 2007 and 2008 as transit data of electricity trade are not available for years prior to 2008.

The 2021 publication includes revisions to oil products consumption and to electricity and heat data across the whole time series based on new information available.

Sources

Sources 1990 to 2019:

- Direct communication with the Energy Institute “Hrvoje Požar”, Zagreb.
- Direct communication with the Central Bureau of Statistics, Zagreb.
- Joint IEA/Eurostat/UNECE annual energy questionnaires.
- IEA Secretariat estimates.

Cyprus

General notes

Note by Turkey:

The information in this document with reference to “Cyprus” relates to the southern part of the Island. There is no single authority representing both Turkish and Greek Cypriot people on the Island. Turkey recognizes the Turkish Republic of Northern Cyprus (TRNC). Until a lasting and equitable solution is found within the context of the United Nations, Turkey shall preserve its position concerning the “Cyprus issue”.

Note by all the European Union member states of the OECD and the European Union:

The Republic of Cyprus is recognized by all members of the United Nations with the exception of Turkey. The information in this document relates to the area
under the effective control of the government of the Republic of Cyprus.

Data for Cyprus are available starting in 1971. In the 2021 edition, net calorific values reported by Cyprus were used to convert physical data to energy units. In previous years, IEA standard net calorific values were used. As a result, the time series of liquefied petroleum gases, kerosene type jet fuel excluding biofuels, other kerosene, gas/diesel oil excluding biofuels, fuel oil, lubricants, bitumen, and petroleum coke were revised from 1990-2018. Breaks in the time series may occur between 1989 and 1990 for these products.

In the 2020 edition, the time series of primary solid biofuels were revised from 2009-2010 based on newly available information. Breaks in the time series may occur between 2008 and 2009 for these products.

Sources

Sources 1994 to 2019:
- Direct communication with the statistical service of Cyprus, Nicosia.
- Joint IEA/Eurostat/UNECE annual energy questionnaires.

Sources up to 1993:

Sources for biofuels and waste:
- Joint IEA/Eurostat/UNECE annual energy questionnaires on renewables.
- IEA Secretariat estimates.

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 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 2019:
- Direct communication with the Instituto de Investigación Geológico y Energético, Quito.
- Informe Estadístico, Informe Cifras Petroleras, Petroecuador, Empresa Estatal Petróleos del Ecuador, Quito, various editions up to 2019.
- IEA Secretariat estimates.

Sources up to 1999:
- Ministerio de Energía y Minas.
- Informe Estadístico, Informe Cifras Petroleras, Petroecuador, Empresa Estatal Petróleos del Ecuador, Quito, various editions up to 2018.
- Estadística del Sector Eléctrico Ecuatoriano, Agencia de Regulación y Control de Electricidad Arconel, Quito.
- Cuentas Nacionales, Banco Central del Ecuador, Quito, various editions from 1982 to 1987.

### 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 2001 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 2019:**

- **Balances Energéticos**, Consejo Nacional de Energía (CNE), San Salvador, various editions from 2007 to 2019.
- Direct communication with the Consejo Nacional de Energía, San Salvador.
- IEA Secretariat estimates.

**Sources for biofuels and waste:**

- **Balances Energéticos**, Consejo Nacional de Energía (CNE), San Salvador, various editions from 2007 to 2019.
- IEA Secretariat estimates.

### Guyana

**General notes**

Data for Guyana are available starting in 1971.

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.

**Sources**

**Sources up to 2019:**

- **Energy-Economic Information System (SIEE)**, Latin American Energy Organization (OLADE),
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 2019 correspond to 1 April 2019 – 31 March 2020. This convention is different from the one used by Government of India, whereby 2019 data would refer to fiscal year 1 April 2018 – 31 March 2019.

Coal

In the 2021 edition several transformation and consumption flows are based on growth of total energy supply for a given product, as official data are not yet available.

In the 2015 edition, significant revisions of the net calorific values of the different types of coal were made for the whole time series, based on official data as well as IEA and other experts’ estimates. As a result, there have been significant changes for the coal data when presented in energy units, as well as in the calculated efficiency of coal fired power generation. Data on the production and consumption of secondary coal products may have also been revised as a result.

The net calorific values of coking coal, sub-bituminous coal and other bituminous coal, were revised again in the 2018 edition to take into account more detailed information on imports and IEA Secretariat experts estimates.

From 2008, due to a notable discrepancy between official coal imports from India and coal exports to India as reported by trade partners, imports of coking coal and non-coking coal are estimated by the IEA Secretariat, based on trade partners’ data. The breakdown of non-coking coal imports between bituminous coal and sub-bituminous coal is estimated from 2008. This could lead to breaks in time series between 2007 and 2008.

Coking coal figures for India do not align with IEA definitions as they include production of non-metallurgical coking coal reported by India.

Due to data limitations, IEA Secretariat estimates are used for some products and flows, including supply and demand of coke oven gas and blast furnace gas. Coke oven coke production is estimated from 2006 based on growth of blast furnace iron production, as official production data do not include production from small private producers.

Oil

In the 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 addition, the import of products such as diesel, fuel oil, kerosene and bitumen is larger than previous years due to a change in the scope for accounting these products.

In the 2020 edition, input to autoproducers of electricity were revised from 2008 onwards based on data on their power generation reported by the Central Electricity Authority. In parallel, several final consumption flows were revised to incorporate sales from retailers.

In the 2018 edition, petroleum coke consumption by the non-metallic mineral industries was revised based on information on cement production estimated by the IEA Secretariat based on United States Geological Survey Mineral Industry Report on India. This may lead to breaks in time series as well as differences with previous editions.

In the 2014 edition, information on stock changes of crude oil and oil products, available from the JODI database from April 2011, was added. Breaks in time series may appear in stock changes between 2010 and 2011.

In the 2014 edition, refinery intake was split between crude oil and refinery feedstocks from 1999 based on data available by the Ministry of Petroleum and Natural Gas. The refinery feedstocks reported by the IEA Secretariat correspond to the quantities officially reported as “other inputs” to Reliance Refineries. They do not include additives and refinery feedstocks to other Indian refineries. These missing inputs could reach up to 2.5 million tonnes.

Data for diesel consumption from 2008 are partially based on an official survey on the end use of diesel retail sales. The IEA Secretariat classifies the diesel used in mobile phone towers and non-industry power
generators as input to autoproducer electricity generation. A corresponding electricity output is estimated.

No NGL production is officially reported by India. The NGL production estimated by the IEA Secretariat corresponds to the production of oil products from gas separation plants, known in India as “fractionators”. In the IEA methodology, the output of oil products from gas separation plants comes from an input of NGL and the separation process is shown in the transfer row. Prior to 2005-2006, the split of fractionator output between petroleum products is estimated by the IEA Secretariat.

No breakdown of refinery fuel by products is currently officially available. Refinery gas production is estimated based on expected refinery output for the years where using official data would lead to refinery gains. Due to notable breaks in official data for fuel oil, consumption of fuel oil in international marine bunkers is estimated between 1990 and 2002 based on industry sources and from 2003 onwards based on Ministry of Shipping cargo data; final consumption of fuel oil is estimated from 2004 based on 2003 data and official trends from Ministry of Petroleum and Natural Gas.

**Natural gas**

In the 2020 edition, inputs to main activity producers of electricity were revised from 2010 onwards, based on data reported by the Ministry of Petroleum and Natural Gas. Before 2010 inputs to main activity power plants are estimated by the IEA Secretariat.

In the 2020 edition, use of natural gas in oil refineries was added from 2008 onwards based on data reported by the Ministry of Petroleum and Natural Gas. Before 2008 there is no data reported for this flow.

In the 2020 edition, total final consumption of natural gas was revised from the start of the time series based on data reported by the Ministry of Petroleum and Natural Gas.

Natural gas imports for India from 2008 onwards are based on Indian Customs data, in order to include all LNG importers.

No data are officially available on the sectoral consumption of re-gasified LNG and city gas. The breakdown is estimated by the IEA Secretariat.

**Biofuels and waste**

Due to data limitations, use of biogas produced in family biogas plants for cooking is currently not estimated by the IEA Secretariat. Data for liquid biofuels production are based on United States Department of Agriculture estimates for the calendar year.

Bagasse input to power generation and co-generation is reported altogether as input to autoproducer electricity plants. Up to 2015 data, it only includes bagasse used to produce power as a surplus sold to the grid. From 2016 onwards, capacity data reported by MNRE include non surplus capacity; the input of bagasse estimated by the IEA Secretariat therefore includes not only what generates electricity sold to the grid but the total input of bagasse. Breaks in time series occur between 2015 and 2016.

In the 2018 edition, data on the 2001-2016 residential consumption of wood, charcoal and other vegetal matters and residues were revised using data from the World Health Organisation on reliance on biomass for cooking. Breaks in time series may appear between 2000 and 2001.

In the 2015 edition, estimates of the production and consumption of charcoal have been added for the whole time series, as well as the respective inputs of fuelwood to charcoal production plants.

**Electricity and heat**

In the 2021 edition solar thermal is estimated based on the growth rate of solar collector. In addition final figures for electricity export are not yet available and are estimated as well.

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. 2018 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

INTERNATIONAL ENERGY AGENCY
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.

Sources

Sources 1992 to 2020:

- Direct communication with the Central Statistical Office, Ministry of Statistics and Programme Implementation, Government of India, New Delhi.

Coal

- Direct communication with the Coal Controller’s Organization, Ministry of Coal, Government of India, Kolkata.
- Coal Directory of India, Coal Controller's Organization, Ministry of Coal, Kolkata, various editions up to 2019 (2017-2018 data).

Oil and natural gas

- Direct communication with the Economic Division and Petroleum Planning and Analysis Cell, Ministry of Petroleum and Natural Gas, Government of India, New Delhi.
- Indian Petroleum and Natural Gas Statistics, Ministry of Petroleum and Natural Gas, New Delhi, various editions from 2000-01 to 2018-19.
- Petroleum and Natural Gas data, website of Petroleum Planning and Analysis Cell, Ministry of Petroleum and Natural Gas, New Delhi, http://ppac.org.in/content/3_1_Petroleum.aspx, last accessed in January 2021.
- All India Study on Sectoral Demand of Diesel and Petrol, Petroleum Planning and Analysis Cell, Ministry of Petroleum and Gas, New Delhi, January 2014.
- Commodity-wise traffic handled at major ports 2002-03 to 2019-20 (p), website of the Ministry of Shipping, New Delhi, shipping.nic.in, last accessed in December 2020.
- JODI Oil World database, Joint Organisations Data Initiative (JODI), Riyadh, last accessed in December 2020: https://www.jodidata.org/oil/.
Biofuels and waste

- Direct communication with the Ministry of New and Renewable Energy, Government of India, New Delhi.
- India – Biofuels Annual, Global Agriculture Information Network (GAIN) Report, USDA Foreign Agriculture Service, New Delhi, several editions from 2014 to 2020p.
- IEA Secretariat estimates, based on a per capita average consumption from various surveys and direct communication with the former Ministry of Non-conventional Energy Sources.

Electricity and heat

- Direct communication with the Central Electricity Authority, Ministry of Power, Government of India, New Delhi.
- Monthly Generation Review, Central Electricity Authority, Ministry of Power, New Delhi, several monthly reports up to November 2020.
- Direct communication with the Ministry of New and Renewable Energy, Government of India, New Delhi.
- Annual report, various editions up to 2020, Ministry of New and Renewable Energy,

Sources up to 1991:

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 2021 edition, new information on the use of biodiesel was available. This allowed the Secretariat to estimate the part blended with diesel and allocate it to biodiesel for 2019. In the time series up to 2018 included, some biodiesel consumption data could still be included under gas/diesel. This leads to breaks in time series between 2018 and 2019.

In the 2021 edition, the ministry of Energy and Mineral Resources was able to retrieve information to split the electricity generation from biofuels and waste into the different sources. This leads to breaks in time series between 2018 and 2019.

In the 2020 edition, new information on coal sales has led to revisions of the coal consumption in industry, as well as to coal production, for both other bituminous coal and sub-bituminous coal. This leads to breaks in time series between 1999 and 2000 as well as 2010 and 2011.

In the 2020 edition, the IEA Secretariat integrated new information on the classification of power plants for the year 2018. This might lead to breaks in time series between 2017 and 2018.

Further, the Ministry of Energy and Mineral Resources has, for 2018 data and for the first time, provided the Secretariat with estimates for Indonesia’s off-grid electricity production. This information has been added to the 2018 electricity data and leads to breaks in time series, foremost but not exclusively for solid biofuels data.

In the 2019 edition, the IEA Secretariat came across new information regarding the use of coal in Indonesia’s industry sector. First estimates of this use may lead to breaks in time series between 2015 and 2016, as well as between 2016 and 2017.

In the 2018 edition, the Ministry of Energy and Mineral Resources allocated power generation from solid biofuels and waste to waste power plants according to new information received from PLN. This leads to a break in time series between 2016 and 2017.

The data on electricity generation from other vegetal materials and residues includes some electricity generation from waste until the year 2016.

In the 2015 edition, data reported for coal consumption in pulp and paper industry might also include coal consumed in the textile and fertilizers sectors. This may create breaks in time series.

Electricity consumption for the agricultural sector is estimated by the IEA Secretariat from 2000 onwards. This may lead to breaks in time series between 1999 and 2000.

Sources

Sources 2008 to 2019:

- Direct communication with the Data Centre and Information Technology (PUSDATIN), Ministry of Energy and Mineral Resources, Jakarta.
• Statistik, Minyak & Gas Bumi, Directorate General of Oil and Gas, Ministry of Energy and Mineral Resources (ESDM), Jakarta, various editions up to 2020.
• PLN Statistics, PT.PLN (Persero), Jakarta, various editions up to 2020.
• Irrigation management to increase agriculture production. Ministry of Agriculture Republic of Indonesia, Jakarta, 2012.
• Direct communication with PT PLN (Persero), Jakarta.
• Direct communication with the Indonesia Coal Mining Association, Jakarta.
• IEA Secretariat estimates.

Sources 1992 to 2007:
• Oil and Gas Statistics of Indonesia, Directorate General Oil and Gas, Jakarta, various editions 1981 to 2007.
• Asia Pacific Economic Cooperation annual energy questionnaires, Asia Pacific Energy Research Centre (APERC), Tokyo.
• Direct communication with the Indonesian Institute for Energy Economics, Jakarta, 2004 and 2005.
• Direct communication with the ASEAN Centre for Energy, Jakarta, 2005.

Sources up to 1991:

Sources for Biofuels and waste:
• GAIN Report - Indonesia biofuels Annual, United States Department of Agriculture, Washington DC, various editions up to 2019.
• Direct communication with Indonesian Biofuel Producer Association (APROBI), Jakarta.
• IEA Secretariat estimates.

Malta

General notes
Data for Malta are available starting in 1971.

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 2019:

- Direct communication with the Central Office of Statistics, Valletta.
- Joint IEA/Eurostat/UNECE annual energy questionnaire on gas, 2019.
- IEA Secretariat estimates.

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 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 auto producer 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 2019:

- Joint IEA/Eurostat/UNECE annual energy questionnaires.

Sources 1992 to 2014:

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

Sources up to 1991:


**Sources for biofuels and waste:**
• Direct communication with Ministère de l’Energie et des Mines, Direction des Mines, Rabat.
• IEA Secretariat estimates.

**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 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.

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.

**Sources**

**Sources up to 2019:**
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 develop its statistical system and additional data and sectoral disaggregation is likely to be available in the future and taken into account in future editions. At present, there is no available information on the capacity and generation of solar and wind power.

In the 2019 edition, wood data was revised for 2016 due to a revision of the wood density used by the source. This led to a break in time series between 2015 and 2016.

In the 2019 edition, new information became available on the split between international and domestic use of jet kerosene from 2005 onwards. The consequent data revision may lead in break in time series between 2004 and 2005.

In 2015, Paraguay surveyed the charcoal production plants. The results allowed to correct the efficiency of the process down to 49%. This change is implemented in the data from 2015 onwards and leads to a break in the time series of wood input to charcoal production plants.

From 2006 onwards, there has been no output of oil products, due to refinery closure.

Sources

Sources up to 2019:

- Direct communication with Ministerio de Obras Públicas y Comunicaciones, San Lorenzo.

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 2021 edition, refinery input and output figures for 2019 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 2018 refinery input and output became available, leading to revisions of the numbers published in the 2020 edition.
In the 2021 edition, the 2008-2019 exports data for aviation gasoline were revised as new information became available.

The IEA Secretariat, the Energy Market Authority (EMA) and the National Climate Change Secretariat (NCCS) have worked closely together on improving data quality for Singapore. Therefore, breaks in time series between 2008 and 2009 and differences in trends when compared to previous publications may occur for some products.

From 2009, Singapore publishes splits of refinery output between light, middle and heavy distillates and residuum only. Further breakdown between products is estimated by the IEA Secretariat. Singapore aggregates petrochemical and refinery consumption. The split between refining and petrochemical consumption is estimated by the IEA Secretariat.

Refinery input is broken down between crude oil and feedstocks. Splits of feedstock by product are not provided by Singapore. By default, IEA estimates that feedstocks come from naphtha as a result of residual calculation plus gas/diesel and fuel oil in equal proportions.

Other data remain aggregated due to lack of data availability. Electricity consumption in the industry sector from 2005 includes electricity consumption by refineries. Electricity consumption in transport includes all electricity consumption at airport terminals. Municipal waste production and consumption may include biogas.

Refinery gas production and consumption may include syngas produced by the petrochemical sector.

Due to Singapore’s large trade volume in comparison to its final consumption, slight misalignment of trade figures can have a significant impact on the energy balance of Singapore. The IEA Secretariat has adjusted total imports of gas/diesel from 2009 onwards to match demand.

A coal-fired power plant started operations in 2013. This might lead to breaks in time series between 2012 and 2013.

Sources

**Sources 1992 to 2019:**

- Direct communication with the Energy Market Authority, Singapore.
- Direct communication with Enterprise Singapore, Singapore.
- Direct communication with the National Climate Change Secretariat (NCCS), Singapore, from 2013.
- Direct communication with the Solar Energy Research Institute of Singapore, from 2011.
- ASEAN-EC Energy Management and Research Training Centre (AEMTRC), Brussels, 1996.
- Direct submissions from oil industry sources up to 1996.
- IEA Secretariat estimates.

**Sources up to 1991:**


• **ASEAN Oil Movements and Factors Affecting Intra-ASEAN Oil Trade,** Institute of Southeast Asian Studies, Singapore, 1988.


**Sources for biofuels and waste:**

• **Singapore Energy Statistics,** Energy Market Authority, Singapore, various editions up to 2020.


• IEA Secretariat estimates.

### South Africa

#### General notes

Data for South Africa are available starting in 1971. South Africa became an IEA Association country in November 2018.

#### Coal

Outputs from gas-to-liquids and coal-to-liquids plants are presented in the “Transfers” flow.

Coking coal, coke oven coke, coke oven gas and blast furnace gas production and consumption are estimated using reported crude steel production figures.

For the 2019 edition, the estimation methodology was changed for gas work gas, which may lead to break in time series between 2009 and 2010. The IEA Secretariat uses the industrial activity data reported by the World Steel Association to estimate the consumption of the industry sector.

In the 2017 edition, new information became available which allowed the separation of non-energy use of coal in Coal to Liquids (CTL) plants from the coal used for energy purposes in these same plants. Non-energy conversion efficiencies for CTL plants in South Africa are assumed to be 60% in physical units. Due to specific calorific values used for this specific process, the efficiency is 73% in our energy balance format. This methodology may lead to breaks in time series between 2010 and 2011 for these products and flows.

In the 2013 edition, breaks in time series may occur for anthracite and coking coal between 2009 and 2010 as new information became available. Prior to 2010, coking coal data may include anthracite.

#### Oil

In the 2021 edition, the 2016-2019 inputs to refineries and outputs of refined oil products for were revised to avoid refinery gains in energy terms. This may result in high statistical difference for crude oil data.

In the 2019 edition, new information became available that led to changes in the split of kerosene type jet fuel consumption in domestic aviation and international bunker. Breaks in time series may occur between 2008 and 2009.

New information became available in 2015 on refinery output of lubricants. Data have been revised from 1998. This may lead to breaks in time series between 1997 and 1998. Reported quantities of synthetic fuels output may not include quantities from PetroSA.

#### Natural gas

In the 2014 edition, new information became available on consumption of natural gas in industrial sectors. Breaks in time series may occur between 2009 and 2010.

#### Biofuels and waste:

In the 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 consumption of fuels.

In the 2019 edition, bagasse consumption in CHP plants was reported for the first time by the Department of Energy. Data may include coal co-burnt with bagasse.

In the 2019 edition, new information on number of people without access to electricity became available. Breaks in time series may between 1999 and 2000 occur for fuelwood and charcoal.
Sources

Sources 2010 to 2019:

- Direct communication with the Department of Energy, Pretoria, South Africa.
- Annual Reports, South Africa Petroleum Industry Association (SAPIA), Sandton, up to 2020 edition.
- Integrated Annual Reports, Electricity Supply Commission (ESKOM), Sandton, up to 2020 edition.
- Analyst Book, SASOL Limited Group, Johannesburg, various editions up to 2019.
- Integrated Annual Reports, PetroSA, Parow, various editions up to 2019.
- IEA Secretariat estimates.

Sources 1992 to 2009:

- Electricity generated and available for distribution, Statistics South Africa, Pretoria, various editions up to 2009.
- Direct communication with the Energy Research Institute, University of Cape Town.

Sources up to 1991:


Sources for biofuels and waste:

- Direct communication with the Department of Energy, Pretoria, South Africa.
- IEA Secretariat estimates.

Thailand

General notes

Data for Thailand are available starting in 1971.
Thailand joined the IEA as an Association country in November 2015.

Data for lubricants, refinery gas and non-specified oil products are not published by the Ministry of Energy and are estimated by the IEA Secretariat. Up to 2012 data, IEA Secretariat also estimated naphtha.

Data for production, own use and non-energy use of natural gas may include propane, butane and ethane produced in gas separation plants.

Stock changes may include statistical difference for certain products.

In the 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 for 2018 and 2019, motor gasoline for 2019 and gas/diesel oil for 2018 were estimated by the IEA Secretariat to avoid refinery gains.

In the 2021 edition in an effort to report the consumption of aviation fuels more accurately across the time series, the IEA Secretariat estimated the split between international and domestic aviation consumption prior to 2006.

In the 2020 edition, motor gasoline, other kerosene and fuel oil total final consumption as well as gas/diesel oil used in transformation processes was 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.

Sources

Sources 2012 to 2019:

- Direct communication with the Ministry of Energy, Thailand, Bangkok.
- Thailand Energy Balance Table, Ministry of Energy, Department of Alternative Energy Development and Efficiency, Bangkok, various editions up to 2019.
- Thailand’s Overall Petroleum Supply & Utilization, Petroleum Institute of Thailand, Bangkok, various editions up to 2019.
- Annual Report, Electricity Generation Authority of Thailand, Nonthaburi, various editions up to 2019.
- Presentation of Air Transport statistical results, International Civil Aviation Organization (ICAO), United Nations, New York, various editions up to 2019.
- IEA Secretariat estimates.

Sources 2002 to 2012:

- Direct communication with the Petroleum Institute of Thailand, Bangkok, 2008 to 2012.
- Thailand Energy Situation, Ministry of Energy, Department of Alternative Energy Development
Uruguay

General notes

Data for Uruguay are available starting in 1971.

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.

Sources

Sources up to 2019:

• Direct communication with Dirección Nacional de Energía, Ministerio de Industria, Energía y Minería, Montevideo.

Sources up to 2001:


Sources for biofuels and waste:

• Thailand Energy Statistics, Ministry of Energy, Department of Alternative Energy Development and Efficiency, Bangkok, various editions up to 2018.

• Thailand Energy Balance Table, Ministry of Energy, Department of Alternative Energy Development and Efficiency, Bangkok, various editions up to 2018.


• IEA Secretariat estimates.

• IEA Secretariat estimates.
7. METHODOLOGICAL NOTES

This publication is based on the data in physical units of the IEA World Energy Statistics publication, which follow the definitions of the United Nations International Recommendations for Energy Statistics (IRES) and on the IEA energy balance methodology, briefly summarised below.

Energy balance: key concepts

Energy data are generally collected independently across different commodities. Energy statistics are the simplest format to present all the data together, assembling the individual balances of all products, each expressed in its own physical unit (e.g. TJ for natural gas, kt for coal, etc). These are called commodity balances.

However, energy products can be converted into one another through a number of transformation processes. Therefore, it is very useful to also develop one comprehensive national energy balance, to understand how products are transformed into one another, and to highlight the various relationships among them.

By presenting all the data in a common energy unit, the energy balance allows users to see the total amount of energy used and the relative contribution of each different source, for the whole economy and for each individual consumption sector; to compute the different fuel transformation efficiencies; to develop various aggregated indicators (for example consumption per capita or per unit of GDP) and to estimate CO₂ emissions from fuel combustion.

The energy balance is a natural starting point to study the evolution of the domestic energy market, forecast energy demand, monitor impacts of energy policies and assess potential areas for action. The statistician also uses the energy balance as a high-level check on the data accuracy, as large statistical differences in energy units, apparent energy gains or large losses in transformation processes, or large unexplained variations in shares or in high-level indicators may all indicate underlying data problems.

The energy balance takes the form of a matrix, where columns present all the different energy sources (“products”) categories and rows represent all the different “flows”, grouped in three main blocks: energy supply, transformation/energy use and final consumption.

To develop an energy balance from the set of commodity balances, the two main steps are: i) all the data are converted to a common energy unit – also allowing to compute a “total” product; and ii) some re-formatting is performed to avoid double counting when summing all products together. For example, for secondary products (e.g. motor gasoline) the production appears in the production row in commodity balances, but is reported as an output of the relevant transformation (e.g. oil refineries) in an energy balance, where the production row only refers to production of primary products (e.g. crude oil).

The methodological assumptions underlying energy balances, discussed in the next section, are particularly important to understand differences across balances derived by different national and international organisations starting from the same energy commodity data.
IEA energy balances methodology

The unit adopted by the IEA is the tonne of oil equivalent (toe), defined as 10^7 kilocalories (41.868 gigajoules). This quantity of energy is, within a few per cent, equal to the net heat content of 1 tonne of crude oil. Conversion of the IEA energy balances to other energy units would be straightforward.

The main methodological choices underlying energy balances that can differentiate the final balances layout across organisations are: i) “net” versus “gross” energy content; ii) calorific values; and iii) primary energy conventions.

Net versus gross energy content

The IEA energy balances are based on a “net” energy content, which excludes the energy lost to produce water vapour during combustion. All the elements of the energy balance are expressed on the same net basis to ensure comparability. Even elements (e.g. natural gas) that in commodity balances may be already in energy units but on a different basis (e.g. “gross”) are converted (e.g. from “gross” to “net”).

The difference between the "net" and the "gross" calorific value for each fuel is the latent heat of vaporisation of the water produced during combustion of the fuel. For coal and oil, the net calorific value is about 5% less than gross, for most forms of natural and manufactured gas the difference is 9-10%, while for electricity and heat there is no difference as they are not combusted.

Calorific values

Generally, the IEA adopts country-specific, time-varying, and for some products flow-dependent, net calorific values supplied by national administrations for most products; and regional default values (in conjunction with Eurostat for the European countries) for the oil products. More detailed explanations on the IEA conversion to energy units for the different energy sources are given in Section 2, Units and conversions.

Primary energy conventions

A very important methodological choice is the definition of the “primary energy equivalent” for the electricity and heat produced from non-combustible sources, such as nuclear, geothermal, solar, hydro, wind. The information collected is generally the amount of electricity and heat produced, represented in the balance as an output of transformation. Conventions are needed to compute the most appropriate corresponding primary energy, input to the transformation, both in form and in amount.

The principle adopted by the IEA is that the primary energy form is the first energy form downstream in the production process for which multiple energy uses are practical. For example, the first energy form that can be used as energy in the case of nuclear is the nuclear heat of the reactor, most of which is then transformed into electricity. The application of this principle leads to the choice of the following primary energy forms:

- **Electricity** for primary electricity (hydro, wind, tide/wave/ocean and solar photovoltaic).
- **Heat** for heat and secondary electricity (nuclear, geothermal and solar thermal).

Once the primary energy form is identified for all electricity and heat generated from non-combustible sources, the IEA adopts the physical energy content method to compute the corresponding primary energy equivalent amounts: the primary energy equivalent is simply the physical energy content of the corresponding primary energy form.

For primary electricity, such as hydro and solar PV, as electricity is identified as the primary energy form, the primary energy equivalent is simply the gross electricity generated in the plant.

For nuclear electricity, the primary energy equivalent is the quantity of heat generated in the reactors. In the absence of country-specific information, the IEA estimates the primary energy equivalent from the electricity generated by assuming an efficiency of 33%, derived as the average efficiency of nuclear power plants across Europe. Note that the principle of using the heat from nuclear reactors as the primary energy form for the energy statistics has an important effect on any indicators of energy supply dependence. Under the present convention, the primary nuclear heat appears as an indigenous resource. However, the majority of countries using nuclear power import their nuclear fuel, and if this fact could be taken into account, it would lead to an increase in the supply dependence on other countries.

For geothermal electricity, the primary energy equivalent is the quantity of heat and a similar back-calculation is used where the quantities of steam supplied to the plant are not measured, assuming a thermal efficiency of 10%. This figure is only approximate and reflects the fact that the steam from
geothermal sources is generally of low quality. If data for the steam input to geothermal power plants are available, they are used directly as primary energy equivalent.

Similarly, for solar thermal plants the heat supply is back-calculated assuming a 33% efficiency of conversion of heat into electricity, reflecting relatively low working temperatures, although central receiver systems can reach higher temperatures and therefore higher efficiencies.

In summary, for geothermal and solar thermal, if no country-specific information is reported, the primary energy equivalent is calculated using the following efficiencies:

- 10% for geothermal electricity;
- 50% for geothermal heat;
- 33% for solar thermal electricity;
- 100% for solar thermal heat.

An alternative to the physical energy content method is the partial substitution method, used in the past by the IEA. In this case, the primary energy equivalent of the electricity generated from non-combustible sources is computed as the hypothetical amount of energy necessary to generate the same amount of electricity in thermal power plants, assuming an average generation efficiency. The method was abandoned by the IEA and other organisations because it had little meaning for countries with significant hydro electricity generation, and because the actual substitution values were hard to establish, as they depended on the efficiency of the marginal electricity production. It also had unreal effects on the energy balance, as transformation losses appeared without a physical basis.

Since the two methods differ significantly in the treatment of solar, hydro, etc., the share of renewables in total energy supply varies depending on the method. To interpret shares of various energy sources in total supply, it is important to understand the conventions used to calculate the primary energy supply.
8. NOTES ON DATA QUALITY

Methodology

For OECD Member countries, the data shown in this publication are derived based on information provided in the five annual OECD questionnaires: “Oil”, “Natural Gas”, “Solid Fossil Fuels and Manufactured Gases”, “Renewables” 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 on national energy 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 on Energy Statistics, 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 most of these differences and, where possible, adjusted the data to meet international definitions.

Recognised anomalies 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 anomalies by country.

Estimation

In addition to adjustments addressing differences in definitions, estimations 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 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.

4. See link to the annual questionnaires:
   www.iea.org/statistics/resources/questionnaires/annual/

6. 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.
More in general, 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 data may be based on out-of-date surveys. Therefore, sectoral disaggregation of consumption should generally be interpreted with caution.

In transition economies (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 market economies. 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 under-reporting of imports and exports for fiscal reasons.

### Specific issues by fuel

#### Coal

Data on sectoral coal consumption are usually reported in metric tonnes. Net calorific values of different coal types used in different end use sectors are not always available. In the absence of specific information, the IEA secretariat estimates end use net calorific values based on the available net calorific values for production, imports and exports.

#### Oil

The IEA secretariat collects comprehensive statistics for oil supply and use, including oil for own use of refineries, oil delivered to international bunkers, and oil used as petrochemical feedstock. National statistics often do not report all these amounts.

Reported production of refined products may refer to net rather than gross refinery output; consumption of oil products may be limited to sales to domestic markets and may not include deliveries to international shipping or aircraft. Oil consumed as petrochemical feedstock in integrated refinery/petrochemical complexes is often not included in available official statistics.

Where possible, the IEA secretariat has estimated those unreported data, in consultation with the oil industry. In the absence of any other indication, refinery fuel use is estimated to be a percentage (e.g. 5%) of refinery throughput, and where possible, split between refinery gas and fuel oil. For a description of some adjustments made to the sectoral consumption of oil products, see the above section ‘Classification of fuel uses’.

#### Natural gas

Natural gas should be comprised mainly of methane; other gases, such as ethane and heavier hydrocarbons, should be reported under the heading of ‘oil’. The IEA defines natural gas production as the marketable production, i.e. net of field losses, flaring, venting and re-injection.

However, the lack of adequate definitions makes it difficult or impossible to identify all quantities of gas at all different stages of its separation into dry gas (methane) and heavier fractions. National data for natural gas do not always explicitly show separate quantities for field losses, flaring, venting and re-injection.
Natural gas supply and demand statistics are normally reported in volumetric units and it is difficult to obtain accurate data on the calorific value. In the absence of specific information, the IEA generally applies an average gross calorific value of 38 TJ/million m³.

Reliable consumption data for natural gas at a disaggregated level are often difficult to find. This is especially true for some of the largest natural gas consuming countries in the Middle East. Therefore, industrial use of natural gas for these countries is frequently missing from the data published here.

Electricity

The IEA classification shows ‘main activity producers’ separately from ‘autoproducers’ of electricity and heat. An autoproducer of electricity is an establishment which, in addition to its main activities, generates electricity wholly or partly for its own use. For non-OECD countries, data on autoproducers are not always reported. In such cases, the quantities of fuels used as input to electricity are included under the appropriate end-use sector.

When statistics of production of electricity from biofuels and waste are available, they are included in total electricity production. However, these data are not comprehensive; for example, much of the electricity generated from waste biomass in sugar refining facilities remains unreported.

When unreported, inputs of fuels for electricity generation are estimated using information on electricity output, fuel efficiency and type of generation capacity.

Heat

For heat, transition economies (countries of non-OECD Europe and Eurasia) and China used to adopt a different methodology from that adopted in market economies. They allocated the transformation of primary fuels (coal, oil and gas) by industry into heat for consumption on site to the transformation activity ‘heat production’, not to industrial consumption, as in the IEA methodology. The transformation output of Heat was then allocated to the various end use sectors. The losses occurring in the transformation of fuels into heat in industry were not included in final consumption of industry.

Although a number of countries have recently switched to the practice of international organisations, this important issue reduces the possibility of cross-country comparisons for sectoral end use consumption between transition economies and market economies.

Biofuels and waste

The IEA publishes data on production, domestic supply and consumption of biofuels and waste for all countries and all regions.

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 historical series were incomplete or unavailable, they were estimated using a methodology consistent with the projection framework of the IEA’s 1998 edition of World Energy Outlook (September 1998). First, nation-wide domestic supply per capita of biofuels and wastes was compiled or estimated for 1995. Then, per capita supply for the years 1971 to 1994 was estimated using a log/log equation with either GDP per capita or percentage of urban population as exogenous variables, depending on the region. Finally, supply of total biofuels and waste after 1996 was estimated assuming a growth rate either constant, equal to the population growth rate, or based on the 1971-1994 trend.

Those estimated time series should be treated very cautiously. The chart below provides a broad indication of the estimation methodology and of the data quality by region.

<table>
<thead>
<tr>
<th>Region</th>
<th>Main source of data</th>
<th>Data quality</th>
<th>Exogenous variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Africa</td>
<td>FAO database and A/DB</td>
<td>Low</td>
<td>population growth rate</td>
</tr>
<tr>
<td>Non-OECD Americas</td>
<td>national and OLADE</td>
<td>High</td>
<td>None</td>
</tr>
<tr>
<td>Asia</td>
<td>surveys</td>
<td>high to low</td>
<td>population growth rate</td>
</tr>
<tr>
<td>Non-OECD Europe and Eurasia</td>
<td>questionnaires and FAO</td>
<td>high to medium</td>
<td>None</td>
</tr>
<tr>
<td>Middle East</td>
<td>FAO</td>
<td>medium to low</td>
<td>None</td>
</tr>
</tbody>
</table>

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.

7. For autoproducer plants, the international methodology restricts the inclusion of heat in transformation processes to that sold to third parties.
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.
9. UNITS AND CONVERSIONS

### General conversion factors for energy

<table>
<thead>
<tr>
<th>From</th>
<th>TJ</th>
<th>Gcal</th>
<th>Mtoe</th>
<th>MBtu</th>
<th>GWh</th>
</tr>
</thead>
<tbody>
<tr>
<td>terajoule (TJ)</td>
<td>1</td>
<td>2.388x10(^2)</td>
<td>2.388x10(^3)</td>
<td>9.478x10(^7)</td>
<td>2.778x10(^\text{-}1)</td>
</tr>
<tr>
<td>gigacalorie (Gcal)</td>
<td>4.187x10(^\text{-}3)</td>
<td>1</td>
<td>1.000x10(^\text{-}7)</td>
<td>3.968x10(^7)</td>
<td>1.163x10(^\text{-}3)</td>
</tr>
<tr>
<td>million tonnes of oil equivalent (Mtoe)</td>
<td>4.187x10(^\text{6})</td>
<td>1.000x10(^7)</td>
<td>1</td>
<td>3.968x10(^7)</td>
<td>1.163x10(^\text{4})</td>
</tr>
<tr>
<td>million British thermal units (MBtu)</td>
<td>1.055x10(^\text{-}3)</td>
<td>2.520x10(^\text{-}1)</td>
<td>2.520x10(^\text{-}8)</td>
<td>1</td>
<td>2.931x10(^\text{4})</td>
</tr>
<tr>
<td>gigawatt hour (GWh)</td>
<td>3.600</td>
<td>8.598x10(^2)</td>
<td>8.598x10(^3)</td>
<td>3.412x10(^7)</td>
<td>1</td>
</tr>
</tbody>
</table>

### Conversion factors for mass

<table>
<thead>
<tr>
<th>From</th>
<th>kg</th>
<th>t</th>
<th>lt</th>
<th>st</th>
<th>Lb</th>
</tr>
</thead>
<tbody>
<tr>
<td>kilogramme (kg)</td>
<td>1</td>
<td>1.000x10(^\text{-}3)</td>
<td>9.842x10(^4)</td>
<td>1.102x10(^\text{-}3)</td>
<td>2.205</td>
</tr>
<tr>
<td>tonne (t)</td>
<td>1.000x10(^\text{7})</td>
<td>1</td>
<td>9.842x10(^-1)</td>
<td>1.102</td>
<td>2.205x10(^\text{3})</td>
</tr>
<tr>
<td>long ton (lt)</td>
<td>1.016x10(^\text{7})</td>
<td>1.016</td>
<td>1</td>
<td>1.120</td>
<td>2.240x10(^\text{3})</td>
</tr>
<tr>
<td>short ton (st)</td>
<td>9.072x10(^\text{-}3)</td>
<td>9.072x10(^\text{-}1)</td>
<td>8.929x10(^\text{-}1)</td>
<td>1</td>
<td>2.000x10(^\text{3})</td>
</tr>
<tr>
<td>pound (lb)</td>
<td>4.536x10(^\text{-}5)</td>
<td>4.536x10(^4)</td>
<td>4.464x10(^\text{-}1)</td>
<td>5.000x10(^\text{-}4)</td>
<td>1</td>
</tr>
</tbody>
</table>

### Conversion factors for volume

<table>
<thead>
<tr>
<th>From</th>
<th>gal U.S.</th>
<th>gal U.K.</th>
<th>bbl</th>
<th>ft(^3)</th>
<th>l</th>
<th>m(^3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S. gallon (gal U.S.)</td>
<td>1</td>
<td>8.327x10(^\text{-}1)</td>
<td>2.381x10(^\text{-}2)</td>
<td>1.337x10(^\text{-}1)</td>
<td>3.785</td>
<td>3.785x10(^\text{-}3)</td>
</tr>
<tr>
<td>U.K. gallon (gal U.K.)</td>
<td>1.201</td>
<td>1</td>
<td>2.859x10(^\text{-}2)</td>
<td>1.605x10(^\text{-}1)</td>
<td>4.546</td>
<td>4.546x10(^\text{-}3)</td>
</tr>
<tr>
<td>barrel (bbl)</td>
<td>4.200x10(^\text{-}1)</td>
<td>3.497x10(^\text{-}1)</td>
<td>1</td>
<td>5.615</td>
<td>1.590x10(^\text{-}1)</td>
<td>1.590x10(^\text{-}1)</td>
</tr>
<tr>
<td>cubic foot (ft(^3))</td>
<td>7.481</td>
<td>6.229</td>
<td>1.781x10(^\text{-}1)</td>
<td>1</td>
<td>2.832x10(^\text{-}1)</td>
<td>2.832x10(^\text{-}2)</td>
</tr>
<tr>
<td>litre (l)</td>
<td>2.642x10(^\text{-}1)</td>
<td>2.200x10(^\text{-}1)</td>
<td>6.290x10(^\text{-}2)</td>
<td>3.531x10(^\text{-}1)</td>
<td>1</td>
<td>1.000x10(^\text{-}3)</td>
</tr>
<tr>
<td>cubic metre (m(^3))</td>
<td>2.642x10(^\text{-}3)</td>
<td>2.200x10(^\text{-}3)</td>
<td>6.290</td>
<td>3.531x10(^\text{-}3)</td>
<td>1</td>
<td>1.000x10(^\text{-}6)</td>
</tr>
</tbody>
</table>
Decimal prefixes

<table>
<thead>
<tr>
<th>Prefix</th>
<th>Symbol</th>
<th>10^1</th>
<th>10^2</th>
<th>10^3</th>
<th>10^4</th>
<th>10^5</th>
<th>10^6</th>
<th>10^7</th>
<th>10^8</th>
<th>10^9</th>
<th>10^10</th>
<th>10^11</th>
<th>10^12</th>
<th>10^13</th>
<th>10^14</th>
<th>10^15</th>
<th>10^16</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>deca (da)</td>
<td>hecto (h)</td>
<td>kilo (k)</td>
<td>mega (M)</td>
<td>giga (G)</td>
<td>tera (T)</td>
<td>peta (P)</td>
<td>exa (E)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>10^1</td>
<td>10^2</td>
<td>10^3</td>
<td>10^4</td>
<td>10^5</td>
<td>10^6</td>
<td>10^7</td>
<td>10^8</td>
<td>10^9</td>
<td>10^10</td>
<td>10^11</td>
<td>10^12</td>
<td>10^13</td>
<td>10^14</td>
<td>10^15</td>
<td>10^16</td>
</tr>
<tr>
<td></td>
<td></td>
<td>deci (d)</td>
<td>centi (c)</td>
<td>milli (m)</td>
<td>micro (µ)</td>
<td>nano (n)</td>
<td>pico (p)</td>
<td>femto (f)</td>
<td>atto (a)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Energy content

Coal

Coal has separate net calorific values for production, imports, exports, inputs to electricity/heat generation and coal used in coke ovens, blast furnaces and industry.

For electricity/heat generation, coal inputs to each type of plant (i.e. main activity electricity plant, autoproducer electricity plant, main activity CHP plant, autoproducer CHP plant, main activity heat plant, autoproducer heat plant) are converted to energy units using average factors calculated from the Annual Electricity Questionnaire. All other flows are converted using an average net calorific value.

Crude oil

Country-specific net calorific values (NCV) for production, imports and exports by country are used to calculate the balances. The average value is used to convert all the other flows to heat values.

Gases

World Energy Statistics expresses the following gases in terajoules, using their gross calorific value.

Gas data provided in joules should be converted as follows: Data in TJ / 41 868 = Data in Mtoe.

To calculate the net heat content of a gas from its gross heat content, multiply the gross heat content by the appropriate following factor.

### Biofuels and waste

The heat content of primary solid biofuels, biogases, municipal waste and industrial waste, expressed in terajoules on a net calorific value basis, is presented in World Energy Statistics. The Secretariat does not receive information on volumes and other characteristics of these fuels.

Data in TJ / 41 868 = Data in Mtoe. Data for charcoal are converted from tonnes using the average net calorific values given in the electronic tables.

Unless country-specific information has been provided, data for biogasoline are converted from tonnes using 26 800 kJ/kg. Biodiesels and other liquid biofuels are assumed to have a net calorific value of 36 700 kJ/kg unless otherwise specified.

Oil products

For oil products, the IEA applies regional net calorific values (in conjunction with Eurostat for the European countries), except for the individual countries listed in the table at the end of this section.

Electricity

Figures for electricity production, trade, and final consumption are calculated using the energy content of the electricity. Electricity is converted as follows: Data in TWh x 0.086 = data in Mtoe.

Hydro-electricity production (excluding pumped storage) and electricity produced by other non-thermal means (wind, tide/wave/ocean, solar PV, etc.) are accounted for similarly. Gross electricity generation in TWh x 0.086 = primary energy equivalent in Mtoe.

The primary energy equivalent of nuclear electricity is calculated from the gross generation by assuming a 33% conversion efficiency. The calculation to be carried out is the following: gross electricity generation in TWh x 0.086 / 0.33 = primary energy equivalent in Mtoe.

In the case of electricity produced from geothermal heat, if the actual geothermal efficiency is not known, then the primary equivalent is calculated assuming an efficiency of 10%. The calculation to be carried out is

<table>
<thead>
<tr>
<th>Gas</th>
<th>Ratio NCV to GCV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural gas</td>
<td>0.9</td>
</tr>
<tr>
<td>Gas works gas</td>
<td>0.9</td>
</tr>
<tr>
<td>Coke oven gas</td>
<td>0.9</td>
</tr>
<tr>
<td>Blast furnace gas</td>
<td>1.0</td>
</tr>
<tr>
<td>Other recovered gases</td>
<td>1.0</td>
</tr>
</tbody>
</table>
the following: gross electricity generation in TWh x 0.086 / 0.10 = primary energy equivalent in Mtoe.

For electricity produced from solar thermal heat, the primary equivalent is calculated assuming an efficiency of 33% unless the actual efficiency is known. The calculation to be carried out is the following: gross electricity generation in TWh x 0.086 / 0.33 = primary energy equivalent in Mtoe.

Heat

Information on heat is supplied in terajoules and is converted as follows: Data in TJ / 41 868 = Data in Mtoe.

In the case of heat produced in a geothermal plant, if the actual geothermal efficiency is not known, then the primary equivalent is calculated assuming an efficiency of 50%. The calculation to be carried out is the following: Heat production in TJ x 0.0000238 / 0.50 = primary energy equivalent in Mtoe.

For heat produced in a solar thermal plant, the primary equivalent is equal to the heat consumed. Data in TJ / 41 868 = data in Mtoe.

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

Examples

The following examples indicate how to calculate the net calorific content (in ktoe) of the quantities expressed in original units in World Energy Statistics.

<table>
<thead>
<tr>
<th>From original units</th>
<th>To Mtoe (on a NCV basis)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coking coal production (Poland) for 2016 in thousand tonnes</td>
<td>divide by 41 868 and then multiply by 29.606</td>
</tr>
<tr>
<td>Natural gas in terajoules (gross)</td>
<td>multiply by 2.38846 x 10^-5 and then multiply by 0.9</td>
</tr>
<tr>
<td>Motor gasoline (Poland) in thousand tonnes</td>
<td>divide by 41 868 and then multiply by 44.000</td>
</tr>
<tr>
<td>Heat in terajoules (net)</td>
<td>multiply by 2.38846 x 10^-5</td>
</tr>
</tbody>
</table>
### 10. ABBREVIATIONS

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Btu</td>
<td>British thermal unit</td>
</tr>
<tr>
<td>GWh</td>
<td>gigawatt hour</td>
</tr>
<tr>
<td>kcal</td>
<td>kilocalorie</td>
</tr>
<tr>
<td>kg</td>
<td>kilogramme</td>
</tr>
<tr>
<td>kJ</td>
<td>kilojoule</td>
</tr>
<tr>
<td>Mt</td>
<td>million tonnes</td>
</tr>
<tr>
<td>m³</td>
<td>cubic metre</td>
</tr>
<tr>
<td>t</td>
<td>metric ton = tonne = 1,000 kg</td>
</tr>
<tr>
<td>TJ</td>
<td>terajoule</td>
</tr>
<tr>
<td>toe</td>
<td>tonne of oil equivalent = $10^7$ kcal</td>
</tr>
<tr>
<td>CHP</td>
<td>combined heat and power</td>
</tr>
<tr>
<td>GCV</td>
<td>gross calorific value</td>
</tr>
<tr>
<td>GDP</td>
<td>gross domestic product</td>
</tr>
<tr>
<td>HHV</td>
<td>higher heating value = GCV</td>
</tr>
<tr>
<td>LHV</td>
<td>lower heating value = NCV</td>
</tr>
<tr>
<td>NCV</td>
<td>net calorific value</td>
</tr>
<tr>
<td>PPP</td>
<td>purchasing power parity</td>
</tr>
<tr>
<td>TES</td>
<td>total energy supply</td>
</tr>
</tbody>
</table>

**AfDB:** African Development Bank  
**EU-28:** European Union - 28  
**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

- 0 or 0.0 negligible  
- c confidential  
- e estimated  
- .. not available  
- x not applicable