Methodology

The Energy Institute Statistical Review of World Energy provides a globally consistent data time series. Here we outline the main definitions, conversion factors and calculations used to produce the report.

Total energy supply

In 2025, the Energy Institute switched to using the Physical Energy Content method to calculate total energy supply (TES). The report had previously used a fossil-fuel equivalent method to calculate primary energy consumption. TES is a measure of the total amount of energy that a country needs to supply to meet its final end-use demand. It reflects the energy that is either produced domestically or imported, minus what is exported or stored. Some energy sources are consumed directly while others may be converted into fuels or electricity for final consumption with transmission, distribution, and efficiency losses occurring throughout the system.

The change represents a significant shift in how the contributions of some fuels, particularly non-combustible forms of renewable energy, are measured. The approach is now consistent with the United Nations' International Recommendations for Energy Statistics (IRES) for calculating national energy balances. By tying non-combustible renewables closer to a marketable commodity (electricity generation) rather than the previous arbitrary measure that included conversion losses that did not exist, it better reflects today's global energy system as it continues to transition away from fossil fuels. The primary energy consumption measure, calculated using the old fossil fuel equivalent approach, will continue to be made available online.

Instead of comparing renewable energy to fossil fuels, under the new approach, non-combustible renewable energy such as wind, solar photovoltaic, hydro, ocean, wave etc. become 'energy products' in the statistical sense at the point of generation of electricity and their 'primary energy equivalent' measured as the gross amount of electricity generated. The kinetic energy of the wind or the water does not enter the statistical 'energy balance', although remains 'energy' in a scientific sense. Consequently, for these sources of energy, an efficiency assumption of 100% is assumed with kilowatt-hours (kWh) converted to British Thermal Units (BTU) using a standard heat conversion factor for electricity of 3,412BTU per kWh.

In the case of non-fossil fuel generation such as nuclear, geothermal and concentrating solar, where the primary energy input is heat, the heat, which is a marketable commodity, is treated as the first point of entry. As it can be difficult to obtain measurements of the heat flow to the turbines, the heat input is estimated based on an efficiency of 33% for nuclear and concentrating solar, and 10% for geothermal. For electricity generation involving the combustion of biomass, an efficiency factor of 33% is used.

The table below summarises the assumptions and treatment of fuels:

Efficiency factors used to calculate total energy supply	
Energy source	**Efficiency**
Biomass	33%
Concentrating solar	33%
Geothermal	10%
Hydro	100%
Nuclear	33%
Ocean	100%
Solar PV	100%
Tidal	100%
Wave	100%
Wind	100%

Note: 1 kWh = 3,412 BTU per kWh

The treatment of fossil fuels remains precisely the same as under the previous methodology and their primary energy consumption continues to be reported in net terms. The gross calorific value to net calorific value adjustment is fuel specific. Fuels used as inputs for conversion technologies (gas-to-liquids, coal-to-liquids and coal-to-gas) are counted as production for the source fuel and the outputs are counted as consumption for the converted fuel.

Oil

Oil reserves

Total proved reserves of oil are generally taken to be those quantities that geological and engineering information indicates with reasonable certainty can be recovered in the future from known reservoirs under existing economic and geological conditions. The data series for proved oil reserves in this year's review does not necessarily meet the definitions, guidelines and practices used for determining proved reserves at company level, for instance as published by the US Securities and Exchange Commission nor does it necessarily represent the EI's view of proved reserves by country. Rather the data series has been compiled using a combination of primary official sources and third-party data.

Oil reserves include field condensate and natural gas liquids as well as crude oil. This inclusive approach helps to develop consistency with the oil production numbers published in the Review, which also include these categories of oil. The reserves and R/P ratio for Canada includes Canadian oil sands and the reserves and R/P ratio for Venezuela includes the Orinoco Belt. Liquid hydrocarbon fuels from non-hydrocarbon sources, such as ethanol from corn or sugar or synthetic oil derived from natural gas (so-called GTL or gas-to-liquids), are not included in either the reserves or production series.

R/P ratios represent the length of time that those remaining reserves would last if production were to continue at the previous year's rate. They are calculated by dividing remaining reserves at the end of the year by the production in that year.

Reserves-to-production (R/P) ratios are available by country and feature in the table of oil reserves. There is a time series of crude oil reserves from 1980, which can be found in the Excel workbook. Data are measured in thousand million barrels.

Please note that the reserves tables have not been updated this year. The historical methodology and tables continue to be made available online.

Oil production

Oil production data includes crude oil, shale oil, oil sands, condensates (lease condensate or gas condensates that require further refining) and NGLs (natural gas liquids – ethane, LPG and naphtha separated from the production of natural gas). It excludes liquid fuels from other sources such as biofuels and synthetic derivatives of coal and natural gas. It also excludes liquid fuel adjustment factors such as refinery processing gain and oil shales/kerogen extracted in solid form.

The split of crude/condensate and natural gas liquids figures are available. The crude condensate table includes crude oil, shale/ tight oil, oil sands, lease condensate or gas condensates that require further refining. It excludes liquid fuels from other sources such as biomass and synthetic derivatives of coal and natural gas. The NGLs table includes ethane, LPG and naphtha separated from the production of natural gas and excludes condensates. World oil production tables are available in both thousand barrels daily and million tonnes.

Liquids, oil and oil product consumption

Oil consumption as defined in previous Statistical Reviews (ie including biofuels) has been renamed 'liquids' consumption and a table is still included on this original basis. In addition, greater granularity has been included on the product split of both oil products and biofuels (breaking out ethane and LPG/naphtha in oil products and the ethanol/biodiesel split of biofuels). Total liquids consumption comprises inland demand plus international aviation and marine bunkers and refinery fuel and loss. Consumption of biogasoline (such as ethanol), biodiesel and derivatives of coal and natural gas are also included.

Oil consumption figures include inland demand plus international aviation and marine bunkers and refinery fuel and loss. Consumption of biogasoline (such as ethanol) and biodiesel are excluded. Derivatives of coal and natural gas are included.

Oil product consumption – gasoline includes motor and aviation gasoline, gasolines and light distillate feedstock (LDF). Diesel/gasoil includes marine gasoil. 'Fuel oil' includes marine bunkers and crude oil used directly for fuel. 'Others' consists of refinery gas, solvents, petroleum coke, lubricants, bitumen, wax, other refined products and refinery fuel and loss. Data are supplied in thousand barrels daily figures.

Oil prices

The key crudes quoted are Brent, West Texas Intermediate (WTI), Nigerian Focados and Dubai in US$ per barrel. The spot crude price history from 1972 and annual crude price history from 1861 are available in the historical data Excel workbook.

Refining

The refinery capacity data presented in this Review represents the sum of reported atmospheric crude distillation and condensate splitting capacity. Capacity should comprise the amount of

input that a distillation facility can process under usual operating conditions, taking into account scheduled downtime. Figures are in thousand barrels daily at year end per calendar day. Refinery throughputs are based on the quantity of crude processed in atmospheric distillation units. While the figures are primarily intended to reflect crude oil throughput, in some cases they may also capture condensates processed alongside crude oil. Figures are in thousands of barrels per day.

Oil trade movements

The tables exclude the intra-area movements of oil (for example, crude oil and products moving between countries within Europe). They do not include biofuels. Bunkers fuel is not included as exports. Crude imports and exports include condensates. Saudi Arabian exports from 1980 are also available in the oil trade movements table in the Excel workbook. The split of crude oil and products are detailed. Data in the tables are in million tonnes and thousand barrels per day.

Natural gas

Natural gas reserves

Total proved reserves of natural gas are generally taken to be those quantities that geological and engineering information indicates with reasonable certainty can be recovered in the future from known reservoirs under existing economic and operating conditions. The data series for proved natural gas reserves in this year's Review does not necessarily meet the definitions, guidelines and practices used for determining proved reserves at company level, for instance as published by the US Securities and Exchange Commission nor does it necessarily represent the EI's view of proved reserves by country. Rather, the data series has been compiled using a combination of primary official sources and third-party data.

Although every effort is made to come up with a consistent series for reserves based on a common definition, different countries use different methodologies, and the data have varying levels of reliability. R/P ratios represent the length of time that those remaining reserves would last if production were to continue at the previous year's rate. They are calculated by dividing remaining reserves at the end of the year by the production in that year.

As far as possible, the data represents standard cubic metres (measured at 15°C and 1013 mbar) and have been standardised using a gross calorific value (GCV) of 40 MJ/m^3. There is a time series of natural gas reserves, which can be found in the Excel workbook. Data are measured in billion cubic metres.

Please note that the reserves tables have not been updated this year. The historical methodology and tables continue to be made available online.

Natural gas production

Gas production comprises marketed production and excludes gas flared or recycled gas. It includes natural gas produced for gas-to-liquids transformation. As far as possible, the data above represents standard cubic metres (measured at 15°C and 1013mbar). as they are derived directly from tonnes of oil equivalent using an average conversion factor and have been standardised using a gross calorific value (GCV) of 40MJ/m^3, they do not necessarily equate with gas volumes expressed in specific national terms.

Natural gas production is provided in three different units of measurement to accommodate regional customary usage. World natural gas production PDF tables are in both billion cubic metres, and exajoules. Data in the Excel workbook are also in billion cubic feet per day (bcf/d).

Natural gas consumption

Natural gas consumption excludes natural gas converted to liquid fuels but includes derivatives of coal as well as natural gas consumed in gas-to-liquids transformation. As far as possible, the data above represents standard cubic metres (measured at 15ºC and 1013mbar); as they are derived directly from tonnes of oil equivalent using an average conversion factor and have been standardised using a gross calorific value (GCV) of 40MJ/m^3 they do not necessarily equate with gas volumes expressed in specific national terms. The difference between these world consumption figures, and the world production statistics is due to variations in stocks at storage facilities and liquefaction plants, together with unavoidable disparities in the definition, measurement, or conversion of gas supply and demand data.

Consumption data in the PDF data table is in billion cubic meters (bcm) and exajoules, data in billion cubic feet per day (bcf/d) can be found in the Excel workbook.

Natural gas prices

Annual prices are given for benchmark natural gas hubs together with contracted pipeline and LNG imports. The benchmark hub prices incorporate US (Henry Hub), Netherlands TTF index, Zeebrugge, and the UK (NBP). Contract prices are represented by LNG imports into Japan, South Korea, and China (mainland). The prices for LNG and European border are calculated as CIF prices, where CIF = cost + insurance + freight (average freight prices) in US dollars per million British thermal units (Btu).

Natural gas trade movements

Trade flows are on a contractual basis and may not correspond to physical gas flows in all cases. The data illustrates the flow of pipeline natural gas and LNG between sources of production and the regions of consumption. As far as possible, the data represents standard cubic metres (measured at 15ºC and 1013 mbar) and has been standardised using a gross calorific value (GCV) of 40 MJ/m^3.

Hydrogen production

The data includes blue and green hydrogen produced from electrolysis, but green hydrogen data excludes legacy electrolysis. The data are published in the units thousand tonnes per year. Please refer to S&P Global Energy for more detailed methodology. Please note that we have discontinued publishing hydrogen prices.

Coal

Coal reserves

Total proved reserves of coal are generally taken to be those quantities that geological and engineering information indicates with reasonable certainly can be recovered in the future from known deposits under existing economic and operating conditions.

Total proved coal reserves are shown for anthracite and bituminous (including brown coal) and sub-bituminous and lignite. Reserves-to-production (R/P) ratios represent the length of time that those remaining reserves would last if production were to continue at the previous year's

rate. They are calculated by dividing remaining reserves at the end of the year by the production in that year. The R/P ratios are calculated excluding other solid fuels in reserves and production. R/P ratios are available by country and feature in the table of coal reserves.

Please note that the reserves tables have not been updated this year. The historical methodology and tables continue to be made available online.

Coal production

Coal production includes data for commercial solid fuels only. Included in the hard coal category are bituminous and anthracite (hard coal). The sub-bituminous coal includes lignite and brown coal. Other commercial solid fuels are also included. The data includes coal produced for coal-to-liquids and coal-to-gas transformations. In the PDF, coal production is published in the units exajoules and million tonnes.

Coal consumption

Coal consumption includes data for solid fuels only. Included in the hard coal category are bituminous and anthracite. The sub-bituminous coal includes lignite and brown coal. Other commercial solid fuels are also included. The figures exclude coal converted to liquid or gaseous fuels, but includes coal consumed in transformation processes. Differences between world consumption figures and the world production statistics are accounted for by stock changes, and unavoidable disparities in the definition, measurement or conversion of coal supply and demand data.

Coal prices

Annual prices quoted include the Northwest Europe marker price, Japan steam spot CIF price, South China spot price, and the US Central Appalachian coal spot price index. Coal prices except for the US Central Appalachian price are calculated as CIF prices, where CIF = cost + insurance + freight (average freight prices). The US Central Appalachian price is FOB = free on board. All prices are quoted in US dollars per tonne.

Coal trade movements

Commercial solid fuels only, ie bituminous coal and anthracite (hard coal), and lignite and brown (sub-bituminous) coal, and other commercial solid fuels. Intra-area movements (for example, between countries in Europe, Other CIS, Other Africa, Other Asia Pacific) are excluded.

Nuclear energy

The data are based on gross generation and not accounting for cross-border electricity supply. Total energy supply is energy content of the primary heat input required by nuclear power stations to generate the reported electricity output. Details on thermal efficiency assumptions are available online. Data for the units are in terawatt-hours (TWh) in the PDF. The data are available in the Excel workbook in exajoules.

Hydroelectricity

The data are based on gross generation and not accounting for cross-border electricity supply. Total energy supply is the physical energy content of the gross electrical output of a hydroelectric plant. Details on efficiency assumptions are available online. In the

hydroelectricity consumption PDF table, the units are in terawatt-hours (TWh). The data are available in the Excel workbook in exajoules.

Renewable energy

The data are based on gross generation and not accounting for cross-border electricity supply. For non-combustible renewables, total energy supply is the physical energy content of their gross electrical output. Details on efficiency assumptions are available online. For renewables such as geothermal power and concentrating solar, total energy supply is energy content of the primary heat input they require to generate the reported electricity output. Details on thermal efficiency assumptions are available online. A more extensive data series on each individual fuel generation is made available online, as well as all datasets in units terawatt-hours (TWh) and the exajoules equivalent.

Behind-the-meter and off-grid Solar PV

The data are based on individual projects and aggregated together on a country level. The data combines behind-the-meter and off-grid capacity for solar PV. Capacities are given on AC-basis.

Biofuels production and consumption

The data includes biogasoline (such as ethanol) and biodiesel including sustainable aviation fuels. Volumes have been adjusted for energy content. The biofuels PDF tables are in thousand barrels of oil equivalent per day figures. The data are available in petajoules in the Excel workbook.

Price data for sustainable aviation fuels (SAF) is sourced from S&P Global Energy, for more detailed methodology refer to S&P Global Energy.

Electricity

Electricity generation is based on gross electrical output.

Data centre (DC) demand

The data are based on S&P Global Energy data (451 Research). The estimates come from a bottom-up approach using S&P Global Energy's data centre database and making assumptions on % running rate of data centres. DC Power Demand (TWh) represents estimates on total DC power demand in terawatts per hour, derived from Net Utilised IT Power and average PUE assumption and average DC running time assumption by DC owner. This estimate includes power utilised for IT equipment, as well as for cooling, lighting and security systems.

Battery energy storage systems (BESS) capacity

The data are based on individual projects and aggregated together on a country level. Countries with installed capacity of over 1,000MWe have been itemised, while countries where installed capacity falls below this threshold have been aggregated into a regional total. The behind-the-meter data also includes off-grid capacity. Capacities are given on AC-basis.

Carbon

Carbon emissions from consuming fossil fuels are estimated by applying the Default CO_2 Emission Factors for Combustion to the consumption of each energy product type (coal, natural gas, and various oil products) from the list of IPCC emission factors. Biofuels are considered as

not emitting CO_2, consistent with the practice of the IEA. The method accounts for fuel consumption used for non-combustion purposes, such as the use of oil products and natural gas in the petrochemicals industry or of oil to produce bitumen for road construction.

Estimates of the share of non-combusted fossil fuels taken from the IEA's energy balances are subtracted from the total consumption of fossil fuels before applying the relevant emission factors.

Carbon emissions from flared natural gas are calculated using data series on volumes of gas flared from two sources: Cedigaz up to 2012, and the Payne Institute for Public Policy, Colorado School of Mines, from 2013 onward. Payne Institute's data include flaring from upstream and downstream oil and gas, while Cedigaz includes flaring from upstream only.

Volumes of gas flared have been standardised using a gross calorific value (GCV) of 40MJ/m^3. The IPCC Default CO_2 Emission Factor for Combustion for natural gas (56,100kg CO_2 per TJ) is used, and perfect combustion has been assumed. These emissions represent around 1% of total CO_2 emissions.

Data for methane emissions associated with the production, transportation and distribution of fossil fuels for 1990-2025 are sourced, where available, from the IEA (all rights reserved). For countries not covered by the IEA, additional data has been sourced from Kayrros. For a selected number of fossil fuel producing countries where methane emission data is not currently available through either provider, an estimate of historical methane emissions has been derived using regional average methane intensity of production. There is a wide range of uncertainty with respect to both current estimates of methane emissions and the global warming potential of methane emissions. To ensure alignment with financial and government reporting standards, the methane to CO_2e factor is a 100-year global warming potential (GWP) of 25, recommended by the IPCC in AR4.

Carbon emissions from industrial processes refer only to non-energy CO_2 emissions from cement production sourced from Robbie Andrews.

Carbon Capture, Usage, and Storage data refer to installed capacity for direct air capture, oxy-combustion, pre-combustion and post-combustion in million tonnes per year. For more detailed methodology please refer to S&P Global Energy.

Minerals

Total proved reserves of minerals are generally taken to be those quantities that geological and engineering information indicates with reasonable certainty can be recovered in the future from known resources under existing economic and geological conditions. The data series for mineral reserves in this year's Statistical Review does not necessarily meet the definitions, guidelines and practices used for determining proved reserves at company level nor does it necessarily represent the Energy Institute's view of proved reserves by country. Rather the data series has been compiled using a combination of primary official sources and third-party data.

Rare earth minerals, as defined by the US Geological Survey, includes the following: cerium, dysprosium, erbium, europium, gadolinium, holmium, lanthanum, lutetium, neodymium, praseodymium, samarium, terbium, thulium and ytterbium.

Using S&P Global Energy data

Revisions and corrections

Each year revisions are made to historical data when updated or where more reliable data sources have become available. Corrections are also made when errors are identified in data.

Leap year adjustments

In the Energy Institute Statistical Review of World Energy, we adjust our growth rates for leap years. This means across this year's Statistical Review we have adjusted for 2024 being a leap year (ie having 366 days) to avoid artificial year-on-year growth rates. This includes all percentage growth rates and absolute year-on-year changes. It is noted when this has not been applied. We apply this adjustment solely to the year-on-year change and not the 10-year growth rate as the effect is negligible over a 10-year period. Additionally, this adjustment doesn't apply to any daily or monthly units eg thousand barrels daily (kbd) because these figures are unaffected by a leap year.

Appendices Approximate conversion factors

Appendices Approximate conversion factors

Crude oil*

From	To				
	tonnes (metric)	kilolitres	barrels	US gallons	tonnes per year
	Multiply by				
Tonnes (metric)	1	1.165	7.33	307.86	–
Kilolitres	0.8581	1	6.2898	264.17	–
Barrels	0.1364	0.159	1	42	–
US gallons	0.00325	0.0038	0.0238	1	–
Barrels/day	–	–	–	–	49.8

*Based on worldwide average gravity.

Oil products

From	To convert					
	barrels to tonnes	tonnes to barrels	kilolitres to tonnes	tonnes to kilolitres	tonnes to gigajoules	tonnes to barrels oil equivalent
	Multiply by					
Ethane	0.059	16.850	0.373	2.679	49.400	8.073
Liquefied petroleum gas (LPG)	0.086	11.600	0.541	1.849	46.150	7.542
Gasoline	0.120	8.350	0.753	1.328	44.750	7.313
Kerosene	0.127	7.880	0.798	1.253	43.920	7.177
Gas oil/diesel	0.134	7.460	0.843	1.186	43.380	7.089
Residual fuel oil	0.157	6.350	0.991	1.010	41.570	6.793
Product basket	0.124	8.058	0.781	1.281	43.076	7.039

*Based on worldwide average gravity.

Natural gas (NG) and liquefied natural gas (LNG)

From	To convert						
	billion cubic metres NG	billion cubic feet NG	petajoules NG	million toe	million tonnes LNG	tonnes to gigajoules	tonnes to barrels oil equivalent
	Multiply by						
1 billion m^3 NG	1.000	35.315	36.000	0.860	0.735	34.121	5.883
1 billion ft^3 NG	0.028	1.000	1.019	0.024	0.021	0.966	0.167
1 petajoule NG	0.028	0.981	1.000	0.024	0.021	0.952	0.164
1 million toe	1.163	41.071	41.868	1.000	0.855	39.683	6.842
1 million tonnes LNG	1.360	48.028	48.747	1.169	1.000	46.405	8.001
1 trillion Btu	0.029	1.035	1.050	0.025	0.022	1.000	0.172
1 million boe	0.170	6.003	6.093	0.146	0.125	5.800	1.000

Units

1 metric tonne	= 2204.62 lb. = 1.1023 short tons
1 kilolitre	= 6.2898 barrels
1 kilolitre	= 1 cubic metre
1 kilocalorie (kcal)	= 4.1868 kJ = 3.968 Btu
1 kilojoule (kJ)	= 1,000 joules = 0.239 kcal = 0.948 Btu
1 petajoule (PJ)	= 1 quadrillion joules (1 x 1015)
1 exajoule (EJ)	= 1 quintillion joules (1 x 1018)
1 British thermal unit (Btu)	= 0.252 kcal = 1.055 kJ
1 barrel of oil equivalent (boe)	= 5.8 million Btu = 6.119 million kJ
1 kilowatt-hour (kWh)	= 860 kcal = 3600 kJ = 3412 Btu

Calorific equivalents

One exajoule equals approximately:

Heat units	239 trillion kilocalories 948 trillion Btu
Solid fuels	40 million tonnes of hard coal 95 million tonnes of lignite and sub-bituminous coal
Gaseous fuels	See Natural gas and LNG table
Electricity	278 terawatt-hours

All fuel energy content is net or lower heating value (i.e., net of heat of vaporisation of water generated from combustion).

1 barrel of ethanol = 0.58 barrels of oil equivalent
1 barrel of biodiesel = 0.86 barrels of oil equivalent
1 tonne of ethanol = 0.68 tonne of oil equivalent
1 tonne of biodiesel = 0.88 tonne of oil equivalent

Other terms
Tonnes: Metric equivalent of tons

Percentages
Calculated before rounding of actuals.

Rounding differences
Because of rounding, some totals may not agree exactly with the sum of their component parts.