

Energy Projections of IEA Countries – National Data 2026

Database documentation

International
Energy Agency

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INTERNATIONAL ENERGY AGENCY

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This documentation provides supporting information for the *Energy Projections of IEA Countries – National Data* database.

This document can be found online at:

<https://www.iea.org/data-and-statistics/data-product/energy-projections-of-iea-countries-national-data>

Please address your inquiries to NationalProjections@iea.org.

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Changes from last edition

This section refers to changes of the database as compared to the 2025 edition of *Energy Projections of IEA Countries – National Data* database.

New Secretariat contact information

The email address to contact the team managing the energy projections database has changed from SLT@iea.org to NationalProjections@iea.org.

Discontinued publication of outdated projections

The following countries are no longer published this cycle due to their submissions being out-of-date: Colombia, Czech Republic, Poland and the United States.

Where available, links to the up-to-date databases and/or publications associated with past submissions are provided; these sources are not aligned with the IEA energy balance framework and cannot be directly compared to the IEA's national energy projections database.

Database dissemination

At the end of 2025, data dissemination through *.TXT format was discontinued. From this publication onward, bulk data are made available for download in CSV format, fully aligned with the structure and content of the .Stat Data Explorer.

Please note, the short names included in this document correspond to the codes used in the .Stat Data Explorer. These may differ from the legacy short names in the IVT and TXT files, which were discontinued in January 2025.

.Stat structure change

The structure of the data published on .Stat has changed for the Balances and Indicators datasets. This may affect API queries that users have set up for each dataset.

For the Balances dataset, the following changes have been made to provide greater clarity about the units associated with each datapoint and increase coherence across data displayed in .Stat.

- The “Balance measure” dimension has been updated to distinguish between energy balance flows and the *Installed electrical capacity* flow, the only non-energy-balance flow in the dataset.
- The “Unit” concept is now a filterable dimension instead of an attribute. Furthermore, all energy balance flows are now available in units of MTOE, TJ and GWh.
- The *Electricity output* and *Heat output* flows are now published in units of MTOE, TJ and GWh and are displayed in .Stat with the same units as other energy balance flows. In previous editions, *Electricity output* and *Heat output* were disseminated in units of TWh and PJ, respectively, and were displayed in .Stat under these units irrespective of the units selected for the other energy balance flows.

For the Indicators database, the “Product” dimension has been removed, and the “Unit” concept is now a filterable dimension instead of an attribute. These changes were made to harmonise the Indicators dataset structure with similar IEA datasets.

Updated descriptions

Without changing the underlying definitions, some flow, indicator and product definitions have been updated in the Definitions section for clarity purposes. **No short names were changed.**

In addition, the Methodological notes section has been updated for clarification and harmonisation purposes. In particular, the Emissions from fuel combustion in projection years section has been updated to better reflect the methodology used for emissions calculations in projection years. Also, the Macroeconomic drivers of CO₂ emissions trends section explaining Kaya decomposition has been removed because decomposition values were previously dropped from the publication.

Energy Projections of IEA Countries – National Data: Introduction

National projections have become increasingly relevant within the evolving landscape of commitments taken by many countries globally. To accelerate energy transitions, long-term perspectives are essential in planning national energy systems and analysing their socio-economic and environmental impacts. Governments and other data users benefit from these projections for monitoring the progress towards national energy and climate targets, refining energy models and informing policy reviews and recommendations.

The IEA has collected information on energy balance projections from its members for decades. In the past, this data collection supported IEA in-depth and standard reviews of energy policies of member countries under the guidance of the Standing Group for Long-Term Cooperation (SLT). These reviews formed the basis for the historical *Energy Policies of IEA Countries* and *Energy Policies and Programmes of IEA countries* annual publications dating back to 1978.

To better support policy assessment in an evolving energy landscape, this data collection was upgraded over the last years through a consultation of data providers from national administrations, other experts and feedback from the SLT committee. The main upgrades of the questionnaire were the definition of four categories of scenarios, with an associated request to countries to share multiple projections when available; and the addition of data for new and emerging technologies within the projections of energy balances. The Secretariat also improved the questionnaire functionalities and developed a broader set of transitions indicators with the objective of facilitating overall tracking to countries and data users alike.

In line with the recent revamp of the projections questionnaire, *Energy Projections of IEA Countries – National Data* is a newly designed IEA database comprising national projections of upgraded energy balances, and a new extended set of transitions indicators developed by the Secretariat based on the projections of national energy balances.

Database structure

The *Energy Projections of IEA Countries – National Data* database includes annual data for:

- Countries: IEA member and accession countries (see sections Data availability, Geographical coverage and Country notes for details on availability of projections by country);
- Years: historical: 1960, 1970, 1980, 1990, 2000, 2010, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024 and projections: 2030, 2040 and 2050, unless otherwise specified. Note: data for historical years are available for all countries; data for projections are available for a smaller set.
- Scenarios: up to five scenario categories, where available (see sections Data availability and Country notes for details on availability of scenarios by country);

The database includes the following two datasets:

Balances

Energy balances in matrix form (18 product categories; 25 flows) (Mtoe and TJ) collected directly from member countries.

Detailed definitions of each flow and product are presented in sections Flow dimension and Product dimension. The historical energy balance data are derived from the IEA *World Energy Balances* database.

Indicators

85 energy, economic and coupled indicators (various units) are derived by combining the energy balances data from member countries with emissions and economic data.

More detail about the derivation of the Indicators database can be found in the Flow dimension and Methodological notes sections. Historical transition indicators are derived from the IEA World Energy Balances database and IEA *Greenhouse Gas Emissions from Energy* database.

Qualifiers and the data collection process

Data published in the Balances dataset are what countries submit to the IEA Secretariat and can be partial. Please note that the IEA Secretariat only qualifies not available and estimated data and does not qualify flows or totals that may be partial.

In addition, product and flow combinations that cannot exist are given a value of zero and qualified as “Missing value; data cannot exist.” Product and flow combinations that are not submitted or modelled by countries do not appear in the Stat Data Explorer. In some cases, these product and flow combinations that are not submitted or modelled could represent so-called “true” or “real” zeroes that are not separately qualified in the IEA data collection process.

The process for obtaining the energy balance database involves data compilers from national administrations compiling their national projections data into a standardised IEA questionnaire according to a provided guide¹. Given the unstandardised nature of national projections data across countries, mapping national projection datapoints to a standardised energy balance format can be challenging. In some cases, national projections may not easily align with the flows and/or product combinations defined in the database, which could result in totals reported in the database being partial. In other cases, national projections may define aggregates that, according to the database product definitions, are a combination of two or more products. When these aggregates cannot be easily separated, the aggregate may be reported in such a way that individual component flows of each product may not sum to the total values reported in the database, although the total itself is complete.

The approach by the Secretariat in resolving challenges related to mapping national data to the questionnaire is to prioritise the accuracy of aggregates in the database, starting with those at the highest level (i.e., economy-wide total energy supply, total transformation and total final consumption, then product and sector-wide totals), while respecting the rules of the IEA energy balance. Where there are known challenges related to partial data, the Secretariat details them in the Country notes section of this document. While effort has been taken to either identify or resolve any mapping-related challenges, partial flows may remain.

¹ The National Projections Questionnaire and its associated *Compiler’s Guide* are available at: <https://www.iea.org/about/data-and-statistics/questionnaires>.

Definitions

Please note, the short names included in this document correspond to the codes used in the .Stat Data Explorer and the CSV files available for bulk download on the explorer. These short names may differ from the legacy short names in the IVT and TXT files, which were discontinued in January 2025.

Scenario dimension

The database includes projections data corresponding to multiple scenario categories, if available at national level, corresponding to different pathways (business as usual, more or less ambitious targets, etc).

The “scenario” dimension includes different scenario categories including: business as usual, stated policies, achieving national targets, achieving defined outcomes and other.

The “scenario” categories do not correspond to the included historical data. Hence, the historical data are disseminated the same across all scenario categories that exist for a given country. If projections data are not submitted, the historical data have been disseminated under the “business as usual” category.

If projections data corresponding to multiple scenarios have been collected from a country, and the country has classified more than one of the submitted scenarios under the same scenario cluster, one of the two scenarios has been disseminated under the “other” category to allow differentiation between the two sets of data. Such cases are described in the Country notes section.

Please refer to the Methodological notes section for additional details about how each scenario is defined.

Scenario	Short name	Definition
Business as usual	BAU	The “business as usual” scenario category aims to capture scenarios that include only government policies which have been already adopted, and therefore project how the national energy landscape may evolve if the existing structures in energy supply and demand remain unchanged.
Stated policies	STEPS	The “stated policies” scenario category aims to capture scenarios that take into account national climate and/or energy-related policies and measures which have been already adopted by the government, together with pertinent policy proposals, announced commitments and plans which have been announced but are yet to be formally adopted.
Aspirational - achieving national targets	ASPTARGET	Scenarios within this category set an energy pathway consistent with specific target(s). By this means, they demonstrate what should be achieved across sectors and by various actors and by when, for the targets to be achieved. For example, a net zero scenario could set out a pathway for the national energy sector to achieve net zero emissions by a certain year. Or a Paris Agreement compliant scenario demonstrates a pathway consistent with the goal of limiting the global increase in temperature to 2 or 1.5°C (with a certain probability).
Aspirational - achieving defined outcomes	ASPOUTCOME	The scenarios within this category set an energy pathway consistent with defined outcomes rather than targets. Examples include scenarios consistent with achieving affordability of energy sources or long/short-term energy security purposes. Some scenarios could have multiple desired outcomes.
Other	OTHER	Scenarios which do not fall under any of the above general categories can be categorised as ‘Other’. “Other” also captures cases of duplicate scenarios, where countries submit two scenarios corresponding to the same category. See the above paragraphs for more details.

Flow dimension

The flows corresponding to the energy balance dataset are detailed in the table below. References to defined energy product categories are in **bold** and references to defined energy balance flows are in *italics*.

Energy balances

Flow	Short name	Definition
Indigenous production	INDPROD	Comprises the production of primary energy, i.e. hard coal, lignite, peat, crude oil, NGLs, natural gas, biofuels and waste, nuclear, hydro, geothermal, solar and the heat from heat pumps that is extracted from the ambient environment (only heat generated from heat pumps that is sold to third parties is included in the energy balance). Production is calculated after removal of impurities (e.g. sulphur from natural gas).
Imports	IMPORTS	Comprise amounts having crossed the national territorial boundaries of the country whether or not customs clearance has taken place. <u>For coal:</u> 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. <u>For oil and natural gas:</u> 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. <u>For electricity:</u> Amounts are considered as imported when they have crossed the national territorial boundaries of the country. If electricity is “wheeled” or transited through a country, the amount is shown as both an import and an export.
Exports	EXPORTS	Comprise amounts having crossed the national territorial boundaries of the country whether or not customs clearance has taken place. <u>For coal:</u> 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. <u>For oil and natural gas:</u> 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

Flow	Short name	Definition
		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. <u>For electricity:</u> Amounts are considered as exported when they have crossed the national territorial boundaries of the country. If electricity is “wheeled” or transited through a country, the amount is shown as both an import and an export.
International marine bunkers	BUNKERS_MARINE	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.
International aviation bunkers	BUNKERS_AVIATION	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.
Stock change (national territory)	STCHANAT	Reflects the difference between opening stock levels on the first day of the year and closing levels on the last day of the year of stocks on national territory held by producers, importers, energy transformation industries and large consumers. A stock build is shown as a negative number, and a stock draw as a positive number.
Total energy supply	TES	Total energy supply (TES) is made up of <i>indigenous production + imports - exports - international marine bunkers - international aviation bunkers ± stock changes</i>. Note, exports, bunkers and stock changes incorporate the algebraic sign directly in the published number.
Transformation processes and own use	TRANENER	Shows the total of the energy transformation activities (<i>Electricity, CHP and heat plants and Other transformation processes</i>) and energy used by energy-producing plants as well as losses (<i>Energy industry own use and distribution losses</i>).
Electricity, CHP and heat plants	ELECHEAT	<i>Electricity, CHP and heat plants</i> should contain inputs of each fuel for the production of electricity and heat. This flow includes both main activity producers and autoproducer plants. However, for autoproducers 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

Flow	Short name	Definition
		final consumption of fuels in the appropriate consuming sector. - Notes: Gross electricity generation from hydro plants should not include that generated by pumped storage. The energy absorbed for pumped storage is accounted for under <i>Energy industry own use and distribution losses</i> (see the Hydropower product definition). - If electricity is being used to produce heat in heat pumps or electric boilers where the heat is sold to a third party, the electricity inputs are subtracted from the electricity production shown under the Electricity product. They are added to the Heat product instead under <i>Electricity, CHP and heat plants</i>.
Other transformation processes	TRANOTH	<i>Other transformation processes</i> includes conversion losses in gas manufacture, oil refineries, coke ovens and blast furnaces, liquefaction, and other non-specified transformation.
Energy industry own use and distribution losses	TOTENGY_LOSSES	<i>Energy industry own use and distribution losses</i> contains the primary and secondary energy consumed by transformation industries for heating, pumping, traction and lighting purposes. These are shown as negative numbers. Included here are, for example, coal mines' own use of energy, power plants' own consumption (which includes net electricity consumed for pumped storage) and energy used for oil and gas extraction. <i>Energy industry own use and distribution losses</i> also includes losses in gas distribution, electricity transmission and coal transport. Notes: - Fuels used for pipeline transport are included in <i>Transport</i>. - Electricity generation losses are included in outputs of electricity reported under <i>Electricity, CHP and heat plants</i>.
Statistical differences	STATDIFF	Includes the sum of the unexplained statistical differences for individual fuels. For projection years, this can represent the difference in methodologies between supply and demand side models used to generate national projections.
Total final consumption	TFC	Is the sum of the consumption in the end-use sectors and <i>non-energy use</i>. Energy used for transformation processes and for own use of the energy producing industries is excluded. Consumption by the agriculture, forestry and fishing sectors, as well as military use, are included here and not in any other flow.

Flow	Short name	Definition
Industry	TOTIND	Covers all activity in mining, manufacturing and construction, except for fuel production and transformation sectors. 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.
Transport	TOTTRANS	Consumption in transport covers all transport activity (in mobile engines) regardless of the economic sector to which it is contributing (except for military fuel use). Non-energy use in transport is excluded from transport and reported separately. Transport includes <i>Road</i> .
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.
Residential	RESIDENT	Includes consumption by households, excluding fuels used for transport. Includes households with employed persons, which is a small part of total residential consumption.
Commercial and public services	COMMPUB	Includes consumption corresponding to commercial and public services.
Non-energy use	NE_TOT	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. Non-energy use includes <i>non-energy use-chemical/petrochemical</i> .
Non-energy use - chemical/petrochemical	NE_CHEM	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. Note: this flow was called “of which petrochemical feedstocks” in previous editions.
Electricity output	ELOUTPUT	Shows total quantities of gross electricity generated in TWh by all electricity and CHP plants. Electricity generated from pumped storage should not be included.

Flow	Short name	Definition
Heat output	HEATOUT	Shows quantities of heat produced for sale by CHP and heat plants. Heat produced in electric boilers is reported under the Electricity product and heat produced in heat pumps is reported under the Heat product. Electricity produced from chemical heat is included under the Heat product.
Installed electrical capacity	CAPACITY_ELEC	Represents the net maximum capacity, which is the maximum active power that can be supplied, continuously, with all plants running at the point of outlet (i.e. after taking the power supplies for the station auxiliaries and allowing for the losses in those transformers considered integral to the station). Note: This is a memo category and is reported separately from the main balance. See the Methodological notes section for more details about this memo category.
Input to hydrogen and synthetic fuels production	INH2PROD	Includes the data corresponding to fuel/electricity inputs for hydrogen and synthetic fuels production. Note: This is a memo category, and its values are included in the main balance across non-memo flows. See the Methodological notes section for more details about memo categories.
Input to heat pumps	INHEATPUMP	Includes the data corresponding to electricity and/or recovered heat (non-ambient) inputs to all types of heat pumps, including small-scale residential ones. Note: This is a memo category, and its values are included in the main balance across non-memo flows. See the Methodological notes section for more details about memo categories.

The flows corresponding to the Indicators dataset are detailed in the following table:

Transition indicators

Flow	Short name	Notes
Gross Domestic Product	GDP	GDP data are derived from three sources: - International Monetary Fund. 2026. World Economic Outlook, April 2026: A Critical Juncture amid Policy Shifts. Washington, D.C. (IMF WEO) - World Development Indicators. 2026. Washington, D.C. The World Bank. (WB WDI) - CEPII – CHELEM database. 2026. (CHELEM) Data from IMF WEO are used as a primary source for the period starting in 1980; if not available, data gaps are filled based on

Flow	Short name	Notes
		the other sources, based on data availability and the hierarchy described below: 1. Data from IMF WEO 2. WDI growth rates applied to IMF WEO data 3. Data from WB WDI for countries not included in IMF WEO for any year 4. CHELEM growth rates applied to IMF WEO data 5. Data from CHELEM Data in year n are rebased to 2020 using nominal GDP figures, GDP deflators and market exchange rates using the following formula with values in USD: $GDP_n = GDP \text{ nominal } USD_{base_year} * Real_GDP_growth_{n \text{ vs } base_year}$
Gross Domestic Product (PPP basis)	GDP_R_PPP	GDPPPP figures are derived using the same sources and methodology as for GDP USD. Data in year n are rebased to 2020 using nominal GDP figures, GDP deflators and PPP rates using the following formula: $GDP_n = GDP \text{ nominal } PPP_{base_year} * Real_GDP_growth_{n \text{ vs } base_year}$ International price comparisons based on exchange rates may not reflect the relative purchasing power in each currency. PPPs are the rates of currency conversion that equalize the purchasing power of different currencies by eliminating the differences in price levels between countries. In their simplest form, PPPs are simply price relatives that show the ratio of the prices in national currencies of the same good or service in different countries.
Population	POP	The main source of these series is the OECD National Accounts Statistics database. Missing data (especially for years 1960-1969) are estimated using growth rates from World Development Indicators, The World Bank, Washington D.C database.
Energy intensity - TES/GDP	TES_GDP	Expressed as megajoules per 2020 USD. Based on national GDP.
Energy intensity - TES/GDP (PPP basis)	TES_GDPPPP	Expressed as megajoules per 2020 USD PPP.
Total energy supply per capita	TES_POP	Expressed as gigajoules per capita.
Total final consumption per capita	TFC_POP	Expressed as gigajoules per capita.

Flow	Short name	Notes
Total final consumption per unit of GDP	TFC_GDP	Expressed as megajoules per 2020 USD. Based on national GDP.
Total final consumption per unit of GDP (PPP basis)	TFC_GDPPPP	Expressed as megajoules per 2020 USD PPP.
Total self-sufficiency	TOT_SELF	<i>Indigenous production</i> divided by <i>Total energy supply</i> expressed as a ratio.
Coal self-sufficiency	COAL_SELF	Production divided by TES expressed as a ratio. Includes Coal and coal products (contains oil shale), and Peat and peat products .
Oil self-sufficiency	OIL_SELF	Production divided by TES expressed as a ratio.
Gas self-sufficiency	GAS_SELF	Production divided by TES expressed as a ratio.
Share of renewables in total energy supply	SHAREREN_TES	Renewable sources TES divided by total TES, expressed as a ratio. Renewable sources include the following products: Hydropower, Geothermal, Solar, Wind, Tide, wave and ocean and other energy sources and Biofuels and renewable waste .
Share of renewables in total final energy consumption - SDG 7.2.1	SHAREREN_TFC	Final energy consumption from all renewable sources divided by total final energy consumption. Renewable energy consumption is derived as the sum of direct final consumption of renewable sources plus the components of electricity and heat consumption estimated to be derived from renewable sources based on generation shares (defined below for electricity and heat). Renewable sources include the following products: Hydropower, Geothermal, Solar, Wind, Tide, wave and ocean and other energy sources and Biofuels and renewable waste . <i>Note: This indicator is developed based on the same methodology used to derive the official SDG 7.2.1 indicator.</i>
Share of fossil fuels in total energy supply	SHAREFOSSIL_TES	Fossil fuel sources TES divided by total TES, expressed as a ratio. Fossil fuel sources include the following: Coal and coal products, Oil and oil products, Natural gas and Total waste, non-renewable portion .
Share of fossil fuels in total final consumption	SHAREFOSSIL_TFC	Final energy consumption from all fossil fuel sources divided by total final energy consumption. Fossil energy consumption is derived as the sum of direct final consumption of fossil sources plus the components of electricity and heat consumption estimated to be derived from fossil sources based on generation shares. Fossil fuel sources include Coal and coal products, Oil and oil products, Natural gas and Total waste, non-renewable portion .

Flow	Short name	Notes
Share of renewables in electricity generation	SHAREREN_ELEOUT	Represents the <i>Electricity output</i> from renewable sources divided by total <i>Electricity output</i>, expressed as a ratio. Renewable sources include electricity from Hydropower, Geothermal, Solar, Wind, Tide, wave and ocean and other energy sources and Biofuels and renewable waste. Note that the output of electricity from renewables and the total output of electricity both exclude electricity derived from heat.
Share of low carbon sources in electricity generation	SHARELC_ELEOUT	Represents the <i>Electricity output</i> from low carbon sources divided by total <i>Electricity output</i>, expressed as a ratio. Low carbon sources include electricity from Hydropower, Geothermal, Solar, Wind, Tide, wave and ocean and other energy sources, Biofuels and renewable waste and Nuclear. Note that the output of electricity from low carbon sources and the total output of electricity both exclude electricity derived from heat.
Share of renewables in heat generation	SHAREREN_HEATOUT	Represents the <i>Heat output</i> of renewable sources divided by total <i>Heat output</i>, expressed as a ratio. Renewable sources include heat from Geothermal, Solar and Biofuels and renewable waste. Notes: - Note that the output of heat from renewables and the total output of heat both exclude heat derived from electricity (electric boilers) and heat (heat pumps). - The ratio only considers heat sold to third parties and does not include the heat output produced for own use.
Share of low carbon sources in heat generation	SHARELC_HEATOUT	Represents the <i>Heat output</i> from low carbon sources divided by total <i>Heat output</i>, expressed as a ratio. Low carbon sources include heat from Geothermal, Solar, Biofuels and renewable waste and Nuclear. Notes: - The output of heat from low carbon sources and the total output of heat both exclude heat derived from electricity (electric boilers) and heat (heat pumps). - The ratio only considers heat sold to third parties and does not include the heat output produced for own use.
CO ₂ from fuel combustion	CO2_FUELComb	Presents the total CO₂ emissions from fuel combustion. This includes CO₂ emissions from fuel combustion in IPCC Source/Sink Category 1 A Fuel Combustion Activities and those, which may be reallocated to IPCC Source/Sink Category 2 Industrial Processes and Product Use under the 2006 IPCC Guidelines. See the IEA estimates of CO₂ emissions methodology section for more details about the methodology for calculating these values for historical and projection years.
CO ₂ from fuel combustion - CCUS adjusted	CO2_FUELComb_CCUS	This indicator is derived by subtracting the total mass of CO₂ captured by CCUS from the total CO₂ emissions from fuel combustion: $CO2_FUELComb_CCUS =$

Flow	Short name	Notes
		CO2_FUELCOMB - CC_TOTAL
CO ₂ emissions from fuel combustion of coal	CO2_FUELCOMB_COAL	Includes CO ₂ emissions from Coal and coal products combustion.
CO ₂ emissions from fuel combustion of oil	CO2_FUELCOMB_OIL	Includes CO ₂ emissions from Oil and oil products combustion.
CO ₂ emissions from fuel combustion of gas	CO2_FUELCOMB_GAS	Includes CO ₂ emissions from Natural gas combustion.
CO ₂ emissions from fuel combustion of other fuels	CO2_FUELCOMB_OTHER	Includes CO ₂ emissions from combustion associated with the Total waste, non-renewable portion product.
GHG emissions from fuel combustion	GHG_FUELCOMB	Presents the total GHG emissions from fuel combustion including CO₂, CH₄ and N₂O. This includes GHG emissions from fuel combustion in IPCC Source/Sink Category 1 A Fuel Combustion Activities and those, which may be reallocated to IPCC Source/Sink Category 2 Industrial Processes and Product Use under the 2006 IPCC Guidelines. See the IEA estimates of GHG emissions methodology section for more details about the methodology for calculating these values for historical and projection years.
GHG emissions from fuel combustion - CCUS adjusted	GHG_FUELCOMB_CCUS	This indicator is derived by subtracting the total mass of CO₂ captured by CCUS from the total GHG emissions from fuel combustion: $\text{GHG_FUELCOMB_CCUS} = \text{GHG_FUELCOMB} - \text{CC_TOTAL}$
GHG emissions from fuel combustion of coal	GHG_FUELCOMB_COAL	Includes total greenhouse gas emissions from Coal and coal products combustion, including CO ₂ , CH ₄ and N ₂ O.
GHG emissions from fuel combustion of oil	GHG_FUELCOMB_OIL	Includes total greenhouse gas emissions from Oil and oil products combustion, including CO ₂ , CH ₄ and N ₂ O.
GHG emissions from fuel combustion of gas	GHG_FUELCOMB_GAS	Includes total greenhouse gas emissions from Natural gas combustion, including CO ₂ , CH ₄ and N ₂ O.

Flow	Short name	Notes
GHG emissions from fuel combustion of other fuels	GHG_FUELCOMB_OTHER	Includes total greenhouse gas emissions, including CO ₂ , CH ₄ and N ₂ O, from combustion associated with the Total waste, non-renewable portion product.
Transport CO ₂ emissions from fuel combustion	CO2_TRANS	This indicator contains CO ₂ emissions from the combustion of fuel for all transport activity, regardless of the sector, except for <i>International marine bunkers</i> and <i>International aviation bunkers</i> , which are not included in transport at a national or regional level. This includes domestic aviation, domestic navigation, road, rail and pipeline transport, and corresponds to IPCC Source/Sink Category 1 A 3.
Industry CO ₂ emissions from fuel combustion	CO2_TOTIND	This indicator contains the CO ₂ emissions from combustion of fuels in industry. The IPCC Source/Sink Category 1 A 2 includes these emissions. However, in the 2006 guidelines, the IPCC category also includes emissions from industry autoproducers that generate electricity and/or heat. Additionally, this flow includes GHG emissions from fuel combustion which may be reallocated to IPCC Source/Sink Category 2 Industrial Processes and Product Use under the 2006 IPCC Guidelines for GHG inventories.
Residential CO ₂ emissions from fuel combustion	CO2_RESIDENT	This indicator contains CO ₂ emissions from fuel combustion in households. This corresponds to IPCC Source/Sink Category 1 A 4 b.
Commercial and public services CO ₂ emissions from fuel combustion	CO2_COMMPUB	This indicator includes CO ₂ emissions from all activities of 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.
Buildings CO ₂ emissions from fuel combustion	CO2_BUILD	Is the sum of CO2_RESIDENT and CO2_COMMPUB.
Other final sectors CO ₂ emissions from fuel combustion	CO2_OTHSECT	This indicator includes CO ₂ emissions from 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), as well as emissions from fuels used for inland, coastal and deep-sea fishing. This 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. In addition, emissions from final sectors not specified above are included in this category. These include emissions from military fuel use for all mobile and stationary consumption (e.g. ships, aircraft, road transport and energy used in living quarters).
International marine bunkers CO ₂ emissions	CO2_MARBUNK	CO ₂ emissions from <i>International marine bunkers</i> . These amounts are not included in the national totals.

Flow	Short name	Notes
from fuel combustion		
International aviation bunkers CO ₂ emissions from fuel combustion	CO2_AVBUNK	CO ₂ emissions from <i>International aviation bunkers</i> . These amounts are not included in the national totals.
Transport GHG emissions from fuel combustion	GHG_TRANS	This indicator contains GHG emissions from the combustion of fuel, including CO ₂ , CH ₄ and N ₂ O, for all transport activity, regardless of the sector, except for <i>International marine bunkers</i> and <i>International aviation bunkers</i> , which are not included in transport at a national or regional level. This includes domestic aviation, domestic navigation, road, rail and pipeline transport, and corresponds to IPCC Source/Sink Category 1 A 3.
Industry GHG emissions from fuel combustion	GHG_TOTIND	This indicator contains the GHG emissions from the combustion of fuel in industry, including CO ₂ , CH ₄ and N ₂ O. The IPCC Source/Sink Category 1 A 2 includes these emissions. However, in the 2006 guidelines, the IPCC category also includes emissions from industry autoproducers that generate electricity and/or heat. Additionally, this flow includes GHG emissions from fuel combustion which may be reallocated to IPCC Source/Sink Category 2 Industrial Processes and Product Use under the 2006 IPCC Guidelines for GHG inventories.
Residential GHG emissions from fuel combustion	GHG_RESIDENT	This indicator contains GHG emissions from the combustion of fuel in households, including CO ₂ , CH ₄ and N ₂ O. This corresponds to IPCC Source/Sink Category 1 A 4 b.
Commercial and public services GHG emissions from fuel combustion	GHG_COMMPUB	This indicator includes GHG emissions from the combustion of fuel, including CO ₂ , CH ₄ and N ₂ O, from all activities of 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.
Buildings GHG emissions from fuel combustion	GHG_BUILD	Is the sum of GHG_RESIDENT and GHG_COMMPUB.
Other final sectors GHG emissions from fuel combustion	GHG_OTHSECT	This indicator includes GHG emissions from the combustion of fuel, including CO ₂ , CH ₄ and N ₂ O, from 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), as well as emissions from fuels used for inland, coastal and deep-sea fishing. This 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. In addition, emissions from final sectors not specified above are included in this category. These include emissions from military fuel use for all mobile and stationary

Flow	Short name	Notes
		consumption (e.g. ships, aircraft, road and energy used in living quarters).
		Represents the sum of fuel combustion CO ₂ emissions from electricity production, combined heat and power plants and heat plants.
Total electricity and heat generation CO ₂ emissions from fuel combustion	CO2_ELEHEAT	Notes: 1. Includes emissions from both autoproducers and main activity plants 2. Emissions from own on-site use of fuel are accounted for. 3. The emissions value only considers heat sold to third parties and does not include the emissions for heat produced for own use. See the IEA estimates of GHG emissions methodology section for more details about the methodology for calculating these values for historical and projection years.
Coal electricity and heat generation CO ₂ emissions from fuel combustion	CO2_ELEHEAT_COAL	Represents the sum of Coal and coal products combustion CO₂ emissions from electricity production, combined heat and power plants and heat plants. Notes: 1. Includes emissions from both autoproducers and main activity plants 2. Emissions from own on-site use of fuel are accounted for. 3. The emissions value only considers heat sold to third parties and does not include the emissions for heat produced for own use.
Oil electricity and heat generation CO ₂ emissions from fuel combustion	CO2_ELEHEAT_OIL	Represents the sum of oil and oil products combustion CO₂ emissions from electricity production, combined heat and power plants and heat plants. Notes: 1. Includes emissions from both autoproducers and main activity plants 2. Emissions from own on-site use of fuel are accounted for. 3. The emissions value only considers heat sold to third parties and does not include the emissions for heat produced for own use.
Gas electricity and heat generation CO ₂ emissions from fuel combustion	CO2_ELEHEAT_GAS	Represents the sum of Natural gas combustion CO₂ emissions from electricity production, combined heat and power plants and heat plants. Notes: 1. Includes emissions from both autoproducers and main activity plants 2. Emissions from own on-site use of fuel are accounted for. 3. The emissions value only considers heat sold to third parties and does not include the emission for heat produced for own use.

Flow	Short name	Notes
Other electricity and heat generation CO ₂ emissions from fuel combustion	CO2_ELEHEAT_OTH	Represents the sum of combustion CO₂ emissions associated with the Total waste, non-renewable portion product from electricity production, combined heat and power plants and heat plants. Notes: 1. Includes emissions from both autoproducers and main activity plants 2. Emissions from own on-site use of fuel are accounted for. 3. The emissions value only considers heat sold to third parties and does not include the emissions for heat produced for own use.
Total electricity and heat generation GHG emissions	GHG_ELEHEAT	Represents the sum of fuel combustion GHG emissions, including CO₂, CH₄ and N₂O, from electricity production, combined heat and power plants and heat plants. Notes: 1. Includes emissions from both autoproducers and main activity plants 2. Emissions from own on-site use of fuel are accounted for. 3. The emissions value only considers heat sold to third parties and does not include the emissions for heat produced for own use. See the IEA estimates of GHG emissions methodology section for more details about the methodology for calculating these values for historical and projection years.
Coal electricity and heat generation GHG emissions	GHG_ELEHEAT_COAL	Represents the sum of Coal and coal products combustion GHG emissions, including CO₂, CH₄ and N₂O, from electricity production, combined heat and power plants and heat plants. Notes: 1. Includes emissions from both autoproducers and main activity plants 2. Emissions from own on-site use of fuel are accounted for. 3. The emissions value only considers heat sold to third parties and does not include the emissions for heat produced for own use.
Oil electricity and heat generation GHG emissions	GHG_ELEHEAT_OIL	Represents the sum of Oil and oil products combustion GHG emissions, including CO₂, CH₄ and N₂O, from electricity production, combined heat and power plants and heat plants. Notes: 1. Includes emissions from both autoproducers and main activity plants 2. Emissions from own on-site use of fuel are accounted for. 3. The emissions value only considers heat sold to third parties and does not include the emissions for heat produced for own use.

Flow	Short name	Notes
Gas electricity and heat generation GHG emissions	GHG_ELEHEAT_GAS	Represents the sum of Natural gas combustion GHG emissions, including CO₂, CH₄ and N₂O, from electricity production, combined heat and power plants and heat plants. Notes: 1. Includes emissions from both autoproducers and main activity plants 2. Emissions from own on-site use of fuel are accounted for. 3. The emissions value only considers heat sold to third parties and does not include the emissions for heat produced for own use.
Other electricity and heat generation GHG emissions	GHG_ELEHEAT_OTH	Represents the sum of combustion GHG emissions, including CO₂, CH₄ and N₂O, associated with the Total waste, non-renewable portion product from electricity production, combined heat and power plants and heat plants. Notes: 1. Includes emissions from both autoproducers and main activity plants 2. Emissions from own on-site use of fuel are accounted for. 3. The emissions value only considers heat sold to third parties and does not include the emissions for heat produced for own use.
CO ₂ Intensity of electricity and heat generation	CO2INT_ELEHEAT	This ratio is based on the total CO₂ emissions from fossil fuels consumed for electricity and heat generation (CO2_ELEHEAT) divided by the total <i>Electricity output</i> and <i>Heat output</i> (in kWh) from all fossil and non-fossil sources. See the IEA estimates of GHG emissions methodology section for more details about the methodology for calculating these values for historical and projection years.
GHG Intensity of electricity and heat generation	GHGINT_ELEHEAT	This ratio is based on total GHG emissions from fossil fuels consumed for electricity and heat generation (GHG_ELEHEAT) divided by the total <i>Electricity output</i> and <i>Heat output</i> (in kWh) from all fossil and non-fossil sources. See the IEA estimates of GHG emissions methodology section for more details about the methodology for calculating these values for historical and projection years.
Total CO ₂ captured by CCUS	CC_TOTAL	Represents the total emission savings through CCUS across the energy landscape.
CO ₂ captured from electricity and heat generation by CCUS	CC_ELECHEAT	Represents the emission savings associated with CCUS in power generation.
CO ₂ captured from hydrogen and synthetic	CC_H2PROD	Represents the emission savings associated with CCUS in the production of blue hydrogen and other synthetic fuels.

Flow	Short name	Notes
fuel production by CCUS		
CO ₂ captured from manufacturing by CCUS	CC_MANUFACT	Represents the emission savings associated with CCUS across the manufacturing sectors, including ammonia production, Iron and steel and cement production.
CO ₂ captured from natural gas processing by CCUS	CC_NGPROC	Represents the emission savings through CCUS at natural gas processing plants.
CO ₂ captured from other sectors by CCUS	CC_OTHER	Represents the emission savings associated with CCUS in other areas of the energy supply, transformation and consumption not defined above.
CO ₂ emissions from fuel combustion per unit of TES	CO2_TES	This ratio is expressed in tonnes of CO ₂ per terajoule. It has been calculated using the total CO ₂ fuel combustion emissions (CO2_FUELCOMB) and <i>Total energy supply</i> (including biofuels and other non-fossil forms of energy).
CO ₂ emissions from fuel combustion per unit of GDP	CO2_GDP	This ratio is expressed in kilogrammes of CO ₂ per 2020 US dollar. It has been computed using the total CO ₂ fuel combustion emissions (CO2_FUELCOMB) and GDP calculated using exchange rates.
CO ₂ emissions from fuel combustion per unit of GDP (PPP basis)	CO2_GDPPPP	This ratio is expressed in kilogrammes of CO ₂ per 2020 US dollar. It has been calculated using CO ₂ Fuel Combustion emissions (CO2_FUELCOMB) and GDP calculated using purchasing power parities.
CO ₂ emissions from fuel combustion per capita	CO2_POP	This ratio is expressed in tonnes of CO ₂ per capita. It has been calculated using CO ₂ fuel combustion emissions (CO2_FUELCOMB).
GHG emissions from energy per unit of TES	GHG_TES	This ratio is expressed in tonnes of CO _{2eq} per terajoule. It has been calculated using the total GHG Energy emissions (GHG_FUELCOMB) and <i>Total energy supply</i> (including biofuels and other non-fossil forms of energy).
GHG emissions from energy per unit of GDP	GHG_GDP	This ratio is expressed in kilogrammes of CO _{2eq} per 2020 US dollar. It has been computed using the total GHG Energy (GHG_FUELCOMB) emissions and GDP calculated using exchange rates.
GHG emissions from energy per unit of GDP (PPP)	GHG_GDPPPP	This ratio is expressed in kilogrammes of CO _{2eq} per 2020 US dollar. It has been computed using the total GHG Energy (GHG_FUELCOMB) emissions and GDP calculated using purchasing power parities.

Flow	Short name	Notes
GHG emissions from energy per capita	GHG_POP	This ratio is expressed in tonnes of CO _{2eq} per capita. It has been computed using the total GHG Energy (GHG_FUELCOMB) emissions).
CO ₂ emissions index	CO2_INDEX	CO ₂ fuel combustion emissions (CO2_FUELCOMB) expressed as an index, where the reference year = 100. Year 2000 is used as the reference year.
Population index	POP_INDEX	Population expressed as an index, where the reference year = 100. Year 2000 is used as the reference year.
GDP per population index	GDP_POP_INDEX	GDP PPP / population expressed as an index, where the reference year = 100. Year 2000 is used as the reference year.
Energy intensity index – TES / GDP	TES_GDP_INDEX	TES / GDP PPP expressed as an index, where the reference year = 100. Year 2000 is used as the reference year.
Carbon intensity index - CO ₂ / TES	CO2_TES_INDEX	CO ₂ emissions / TES expressed as an index, where the reference year = 100. Year 2000 is used as the reference year. Calculated using CO ₂ fuel combustion emissions (CO2_FUELCOMB).
CO ₂ emissions from electricity and heat generation (including CHP) index	CO2_ELEHEAT_INDEX	Total electricity and heat generation CO ₂ emissions (CO2_ELEHEAT) expressed as an index, where the reference year = 100. Year 2000 is used as the reference year.
Electricity and heat output index	IND_ELEHEAT_OUTPUT	Electricity and heat output expressed as an index, where the reference year = 100. Year 2000 is used as the reference year.
Share of electricity and heat output from fossil fuels index	SHAREFOSSIL_ELEHEAT_INDEX	Share of electricity and heat output from fossil fuels expressed as an index, where the reference year = 100. Year 2000 is used as the reference year. The share has been derived by dividing the electricity and heat output from fossil sources by the total electricity and heat output.
CO ₂ intensity of fossil fuel mix index	CO2INT_MIX_INDEX	CO ₂ intensity of the fossil fuel mix expressed as an index, where the reference year = 100. Year 2000 is used as the reference year. The intensity has been derived by dividing the total CO ₂ emissions from electricity and heat generation by the total input to electricity, heat and CHP plants.
Thermal efficiency of electricity and heat plants including CHP index	THERMEFF_ELEHEAT_INDEX	Thermal efficiency of electricity and heat plants (including CHP), expressed as an index, where the reference year = 100. Year 2000 is used as the reference year. The efficiency has been derived by dividing the total electricity and heat output from fossil plants by the overall input to these generation plants.

Product dimension

References to defined energy product categories are in **bold** and references to defined energy balance flows are in *italics*.

Energy balances table

Product	Short name	Definition
Coal and coal products	COAL	Includes all coal, both primary (hard coal, brown coal, anthracite, coking coal, other bituminous coal, sub-bituminous coal and lignite) and derived fuels (patent fuel, coke oven coke, gas coke, coal tar, BKB, gas works gas, coke oven gas, blast furnace gas and other recovered gases) Note that in this database, oil shale is aggregated with coal (however the secondary product shale oil is included under oil).
Peat and peat products	PEAT_AND_PEA_T_PRODUCTS	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 should not be included. Peat includes derived peat products.
Oil and oil products	OIL_TOTAL	Includes crude oil, natural gas liquids, refinery feedstocks, additives/blending components, orimulsion, other hydrocarbons, refinery gas, ethane, LPG, motor gasoline excl. biofuels, aviation gasoline, gasoline type jet fuel, kerosene type jet fuel excl. biofuels, kerosene, gas/diesel oil excl. biofuels, fuel oil, naphtha, white spirit, lubricants, bitumen, paraffin waxes, petroleum coke and non-specified oil products. Synthesised liquid hydrocarbons from other sources (e.g. hydrogen produced from natural gas, coal liquefaction) are transferred into oil and oil products and reported in final consumption.
Natural gas	NATURAL_GAS	Natural gas comprises gases, occurring in underground deposits, whether liquefied or gaseous, consisting mainly of methane. It includes both "non-associated" gas originating from fields producing only hydrocarbons in gaseous form, and "associated" gas produced in association with crude oil as well as 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 gas consumed by gas processing plants and gas

Product	Short name	Definition
		transported by pipeline. Quantities of gas that are re-injected, vented or flared are excluded. <i>Imports and Exports of gaseous synthetic fuels, including hydrogen, are reported under this product.</i>
Nuclear	NUCLEAR	Energy released by nuclear fission or nuclear fusion.
Hydropower	HYDRO	Hydro energy represents the potential and kinetic energy of water converted into electricity in hydroelectric plants. The electricity losses associated with pumped storage electricity are included in the quantities given under Electricity , <i>Energy industry own use and distribution losses</i> .
Wind	WIND	Wind energy represents the kinetic energy of wind exploited for electricity generation in wind turbines.
Geothermal	GEO THERMAL	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: • for electricity generation using dry stream or high enthalpy brine after flashing • directly as heat for district heating, agriculture, etc.
Solar	SOLAR	Solar includes both solar photovoltaic electricity generation and solar thermal electricity and heat generation.
Tide, wave and ocean and other energy sources	OCEAN_OTH_GEN	Tide, wave and ocean represent the mechanical energy derived from tidal movement, wave motion or ocean current and exploited for electricity generation. Other products not included elsewhere are incorporated into this category.
Biofuels and renewable waste	BIOFUELS_RENWASTE	Includes primary solid biofuels, biogases, biogasoline, biodiesels, bio jet kerosene, other liquid biofuels, charcoal and the renewable fraction of municipal waste produced by households, industry, hospitals and the tertiary sector that are collected by local authorities for incineration at specific installations. Hydrogen produced from biogenic sources, and its corresponding inputs, are included in this category.
Total waste, non-renewable portion	WASTE_NONREN	Includes industrial waste of non-renewable origin consisting of solid and liquid products (e.g. tyres) combusted directly, usually in specialised plants, to produce heat and/or power and the non-renewable fraction of municipal waste produced by

Product	Short name	Definition
		households, industry, hospitals and the tertiary sector that are collected by local authorities for incineration at specific installations.
Electricity	ELECTRICITY	Gross electricity production is measured at the terminals of all alternator sets in a station; it therefore includes the energy taken by station auxiliaries and losses in transformers that are considered integral parts of the station. The difference between gross and net production is generally estimated as 7% for conventional thermal stations, 1% for hydro stations, and 6% for nuclear, geothermal and solar stations. If hydrogen or synthetic fuels are produced through power to gas processes by consumption of electricity, the final consumption of these fuels are reported under electricity, while accounting for the conversion losses to synthetic fuel under the transformation sector.
Heat	HEAT	Heat production includes all heat produced by main activity producer CHP and heat plants, as well as heat sold by autoproducer CHP and heat plants to third parties. Fuels used to produce quantities of heat for sale are reported as a transformation activity. The use of fuels for heat which is not sold are included under the sectors in which the fuel use occurs. This product includes heat extracted from ambient air and water by large-scale industrial heat pumps used for selling heat to third parties.
Total	TOTAL	Is the total of all energy sources.
Offshore wind	WIND_OFFSHORE	This product is a subcomponent of the Wind product. The primary energy value ascribed to electricity produced from wind is taken to be the physical energy content of the gross generation. Note: This is a memo category and is not included in Total. Values reported under memo categories are already included in Total through the other non-memo energy flows. See the Methodological notes section for more details about memo categories.
Hydrogen and synthetic fuels	HYDROGEN_SYNTHETIC_FUELS	This product includes all data corresponding to hydrogen and synthetic fuels, irrespective of their source, that are reported across the other energy products. Note: This is a memo category and is not included in Total. Values reported under memo categories are already included in Total through the other non-memo energy flows. See the Methodological notes section for more details about memo categories.

Product	Short name	Definition
Heat pumps	HEAT_PUMPS	This product is for reporting of heat data corresponding to all types of heat pumps, whether the heat is sold or not (i.e., includes large-scale heat pumps and small-scale residential ones). Note: 1. Ambient heat data corresponding to industrial heat pumps who sell heat to third parties is also reported under the Heat product. However, the ambient heat data corresponding to small-scale heat pumps mainly operated within the residential sector, where heat is not sold, are reported as final consumption of electricity. 2. This is a memo category and is not included in Total. Values reported under memo categories are already included in Total through the other non-memo energy flows. See the Methodological notes section for more details about memo categories.

Geographical coverage

Table below only includes definitions for countries where data is available. See the Data availability section for complete details about available data. The definitions below apply to data in historical years. For the coverage of projection years, please refer to any available information and links in the Country notes section.

Geographical coverage

Country/Region	Short name	Definition
Australia	AUSTRALIA	Excludes the overseas territories. Data are reported on a fiscal year basis. By convention data for the fiscal year that starts on 1 July Y-1 and ends on 30 June Y are labelled as year Y.
Austria	AUSTRIA	
Belgium	BELGIUM	
Canada	CANADA	
Denmark	DENMARK	Excludes Greenland and the Faroe Islands, except prior to 1990, where data on oil for Greenland were included with the Danish statistics.
Estonia	ESTONIA	Data start in 1990.
Finland	FINLAND	
France	FRANCE	Includes Monaco and excludes the overseas collectivities: New Caledonia; French Polynesia; Saint Barthélemy; Saint Martin; Saint Pierre and Miquelon; and Wallis and Futuna. Energy data for the following overseas departments: Guadeloupe; French Guiana; Martinique; Mayotte; and Réunion are included for the years from 2011 onwards, and excluded for earlier years.
Germany	GERMANY	Includes the new federal states of Germany from 1970 onwards.
Hungary	HUNGARY	Data start in 1970.
Ireland	IRELAND	
Italy	ITALY	Includes San Marino and the Holy See.
Japan	JAPAN	Includes Okinawa. Starting 1990, data are reported on a fiscal year basis. By convention data for the fiscal year that starts on 1 April Y and ends on 31 March Y+1 are labelled as year Y.
Korea	KOREA	Data start in 1980.

Country/Region	Short name	Definition
Latvia	LATVIA	Data for Latvia are available starting in 1990.
Lithuania	LITHUANIA	Data for Lithuania are available starting in 1990.
Netherlands	NETHERLANDS	Excludes Suriname, Aruba and the other former Netherland Antilles (Bonaire, Curaçao, Saba, Saint Eustatius and Sint Maarten).
New Zealand	NEWZEALAND	
Portugal	PORTUGAL	Includes the Azores and Madeira.
Slovak Republic	SLOVAKIA	Data start in 1980.
Spain	SPAIN	Includes the Canary Islands.
Sweden	SWEDEN	
Switzerland	SWITZERLAND	Includes Liechtenstein for the oil data. Data for other fuels do not include Liechtenstein.
United Kingdom	UK	Shipments of coal and oil to the Channel Islands and the Isle of Man from the United Kingdom are not classed as exports. Supplies of coal and oil to these islands are, therefore, included as part of UK supply. Exports of natural gas to the Isle of Man are included with the exports to Ireland.

Methodological notes

Scenario categorisation

It is important to clearly communicate the purpose and context of the scenarios underlying the projections data to avoid misinterpretation and facilitate accurate comparison across countries' modelling results. This section describes the general categories of scenarios which have been selected as the basis of the projections data included in this database. Please refer to the Country notes section for detailed information corresponding to the country-specific scenarios.

Business as usual

The “business as usual” scenario category aims to capture scenarios that include only government policies which have been already adopted, and therefore project how the national energy landscape may evolve if the existing structures in energy supply and demand remain unchanged.

Scenarios with the “business as usual” category provide a baseline to compare alternative scenarios and a starting point for the understanding and analysis of the energy system by assuming a general continuation of historical trends into the future. The assumption is that the structure of the system remains unchanged or responds in pre-determined forms.

Examples include the European Commission's [EU Reference Scenario 2020](#), the IEA [Current Policies Scenario](#), the EIA's [Annual Energy Outlook Reference Case](#) and Canada's [Energy Future Current Measures Scenario](#).

Stated policies

The “stated policies” scenario category aims to capture scenarios that take into account national climate and/or energy-related policies and measures which have been already adopted by the government, together with pertinent policy proposals, announced commitments and plans which have been announced but are yet to be formally adopted.

A cautious view of the extent and timing to which policy proposals are projected to be implemented and objectives achieved are key in defining this type of scenarios. The

aim of scenarios in this category is to provide a sense of where today's policy ambitions seem likely to drive the energy landscape.

In other words, this scenario type is a policy-based forecast, not a hypothetical scenario which is based on optimizing policy for a desired outcome.

It is typical to set out the gap in between the outcome of these types of scenario and targets such as efforts to limit global temperature increase to 1.5 C°, or wider Paris Agreement objectives. Examples include the IEA [Stated Policies Scenario \(STEPS\)](#) and the EU's [With Additional Measures \(WAM\)](#) scenarios.

Beyond stated policies (aspirational)

Scenarios within this category set an energy pathway consistent with specific target(s) or other particular desired outcomes. By this means, they demonstrate what should be achieved across sectors and by various actors and by when, for the targets or outcomes to be achieved.

Examples include the European Commission's [REG](#) and [MIX](#) and the IEA [Net Zero Emissions by 2050 \(NZE\)](#) and [Announced Pledges Scenario \(APS\)](#) scenarios.

For the purpose of this publication, the “aspirational” scenarios have been divided into the following two sub-categories:

a. Achieving national targets:

This type of scenarios could set out a pathway for the national (or regional) energy sector to achieve a specific target. For example, a net zero scenario could set out a pathway for the national energy sector to achieve net zero emissions by a certain year. Or a Paris Agreement compliant scenario demonstrates a pathway consistent with the goal of limiting the global increase in temperature to 2 or 1.5°C (with a certain probability). Additionally, scenarios consistent with achieving certain sustainable development goals fall within this category.

b. Achieving defined outcomes:

This category of scenarios is consistent with defined outcomes rather than targets. Examples include scenarios consistent with achieving affordability of energy sources or long/short-term energy security purposes. Some scenarios could have multiple desired outcomes.

Other

Scenarios which do not fall under any of the above general categories have been reported under this option. You may refer to the Country notes section for detailed information corresponding to the methodology and model used and any underlying assumptions corresponding to scenarios identified under this category.

Note: If projections data corresponding to multiple scenarios have been collected from a country, and the country has classified more than one of the submitted scenarios under the same scenario cluster, one of the two scenarios has been disseminated under the “other” category to allow differentiation between the two sets of data. Cases where this occurs are documented in the Country notes section.

Energy balance: Key concepts

The energy balance is a presentation of the basic supply and demand data for all fuels, expressed in a common energy unit to facilitate comparison across fuels. The format of the IEA energy balance is based on the International Recommendations on Energy Statistics (IRES), which is a comprehensive framework on the scope of energy statistics, including classifications, units and methodologies. Please refer to the [IEA World Energy Balances documentation](#) for more details on the methodology for developing an energy balance based on energy statistics.

IEA energy balances methodology

The unit adopted by the IEA is the tonne of oil equivalent (toe), defined as 107 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 following sections explain some key concepts required to understand the IEA energy balance presented in this dataset.

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 the concept has no meaning in this case.

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, hydropower and 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 (hydropower, 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 hydropower 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 as follows:

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

Alternative methods to the physical energy content method exist, such as the **partial substitution method**, used in the past by the IEA. In this case, the primary energy equivalent of the above sources of electricity generation would be computed as the hypothetical amount of energy necessary to generate an identical amount of electricity in conventional thermal power plants, considering an average generating efficiency. The principle was abandoned by the IEA and many other international organisations because it had little meaning for countries in which hydro electricity generation was a significant supply source, and because the actual substitution values were hard to establish as they depended on the marginal electricity production efficiencies. Partial substitution also had unreal effects on the energy balance as transformation losses appeared which had no physical basis.

Since the two methods differ significantly in the treatment of electricity from solar, hydropower, wind, etc., the share of renewables in total energy supply will appear to be very different depending on the method used. To interpret shares of various energy

sources in total supply, it is important to understand the underlying conventions used to calculate the primary energy supply.

Main energy balance and memo categories

A full understanding of the published data means understanding the definitions of what is referred to as the “main balance” and the “memo categories.” The main balance represents the full picture of energy supply, transformation and use in the economy, and includes all the non-memo product categories.

Memo categories are separate from the main balance. They are a disaggregation of the main balance with the purpose of providing greater visibility of key products that are mixed across the non-memo product categories. The key point is that everything reported under the memo categories is included in the main balance according to the descriptions in the Definitions section. The only exception is *Installed electrical capacity*, which is a separate measure of power and not energy.

That means the memo category flows, *Input to hydrogen and synthetic fuels production* and *Input to heat pumps* should not be summed in any flow-wise totals related to supply, transformation, or final consumption, else their values would be double counted. Similarly, the memo category products **Offshore wind**, **Hydrogen and synthetic fuels** and **Heat pumps** are not summed in the **Total** column.

The IEA estimates of GHG emissions methodology

Historical CO₂ emissions from fuel combustion

The IEA uses the simplest (Tier 1) methodology to estimate historical CO₂ emissions from fuel combustion based on the 2006 IPCC Guidelines². The computation follows the concept of conservation of carbon. While for the complete methodology the reader should refer to the full IPCC documents, a basic description follows.

Generally, the Tier 1 estimation of CO₂ emissions from fuel combustion for a given fuel can be summarised as follows:

$$\text{CO}_2 \text{ emissions from fuel combustion} \\ \text{CO}_2 = \text{Fuel consumption} * \text{Emission factor}$$

where:

Fuel consumption = amount of fuel combusted;

Emission factor = default emission factor

Emissions are then summed across all fuels and all sectors of consumption to obtain national totals.

The IEA historical estimates of CO₂ emissions from fuel combustion are obtained following harmonised definitions and comparable methodologies across countries. However, they do not represent an official source for national submissions, as national administrations should use the best available country-specific information to complete their emissions reporting. Please note that the IEA historical emissions estimations are only provided as benchmark estimate and do not replace official national submissions.

Historical values are taken from the IEA *Greenhouse Gas Emissions from Energy* dataset and you can refer to its [documentation](#) for additional information.

² The 2006 IPCC Guidelines for National Greenhouse Gas Inventories is available at: <https://www.ipcc-nggip.iges.or.jp/public/2006gl/vol2.html>

Historical non-CO₂ greenhouse gas emissions from fuel combustion

Similar to the historical estimates for the CO₂ emissions from fuel combustion and considering the type and level of disaggregation of activity data available at country level, the Tier 1 methodology from the 2006 IPCC Guidelines has been adopted for the purpose of these estimates.

Unlike CO₂, the non-CO₂ greenhouse gas emissions from fuel combustion are strongly dependent on the technology used. Since the set of technologies, applied in each sector vary considerably, the guidelines do not provide default emission factors for these gases on the basis of fuels only. However, sector-specific Tier 1 default emission factors can provide a reasonable estimate for these emissions.

For estimating the emissions corresponding to stationary combustion, the default Tier 1 non-CO₂ emission factors provided in the 2006 guidelines, assume effective combustion in high temperature. As such, the factors are good representation for steady and optimal conditions and do not take into account the impact of start-ups, shutdowns or combustion with partial loads. The emission factors provided for CH₄ and N₂O in the 2006 guidelines, are based on the 1996 IPCC Guidelines and have been established by a large group of inventory experts. However, due to the absence of sufficient measurements and since the concept of conservation of carbon does not apply in the case of non-CO₂ gases, the uncertainty range associated with these estimates are set at a factor of three.

Similarly, and for mobile combustion, the non-CO₂ emission factors are more difficult to estimate accurately than those for CO₂, as they will depend on vehicle technology, fuel and operating characteristics. The distance-based activity data (i.e vehicle-kilometres travelled) and information corresponding to disaggregated fuel combustion are typically less accurate. Moreover, the CH₄ and N₂O emission rates are largely dependent on the combustion and emission control system of the vehicles. As a result, default fuel-based emission factors are highly uncertain. However, the Tier 1 method does allow using fuel-based emission factors if it is not possible to estimate fuel consumption by vehicle type.

The emissions figures are converted from gCH₄ and gN₂O to gCO_{2eq} using the 100-year Global warming potential (GWP). Please refer to the IEA *Greenhouse Gas Emissions from Energy* dataset [documentation](#) for the most up-to-date GWP values used and for additional information about the methodology for non-CO₂ greenhouse gas emissions.

Historical intensity of electricity and heat generation

For historical years, the intensity is calculated according to the methodology described in the IEA Emissions Factors database and the [documentation](#) can be referred to for more details. The equation used for the calculation is:

$$\frac{\sum_{fuels} \left((Input_{Electricity\ plants} + Input_{CHP\ plants} + Input_{heat\ plants} + Own\ use_{plants}) \times EF_{fuel} \right)}{Ele_{inland} + Heat_{inland}}$$

Where:

- $\sum_{fuels}$: Sum over the fuels.
- $Input_{plants}$: Fuel input into the plants (both main activity and autoproducer) expressed in energy units.
- EF_{fuel} : Default emission factors as provided in the *2006 IPCC Guidelines*. For the CO₂ intensity, only the CO₂ factor is used. For the GHG intensity, EF_{fuel} is weighted by GWPs to include CH₄ and N₂O emission
- $Ele_{inland} + Heat_{inland}$: Electricity and heat generation from all sources (including non-emitting sources).

Emissions from fuel combustion in projection years

For the projection years, GHG and CO₂ emissions estimates are calculated based on energy data by product category or sector, and on the average fuel or sector-specific carbon intensities for the latest three years.

Product category fuel combustion emissions

Equation 1 below is used to estimate total emissions per product category in projection years. The values for total fuel combustion emissions in a country (CO₂_FUELCOMB and GHG_FUELCOMB) are the sum of formula 1 across all energy product categories p .

$$Emissions_{p,y} = TES_{p,y} \times EF_p \quad (1)$$

Where:

p : Defined energy product aggregate, which are **Coal and coal products** (includes **Peat and peat products**), **Oil and oil products**, **Natural gas**, **Total waste, non-renewable portion** and **Biofuels and renewable waste** (only for non-CO₂ emissions).

y : Represents a projection year.

$Emissions_{p,y}$: Either total GHG emissions or CO₂-only emissions of energy product aggregate p in projection year y .

$TES_{p,y}$: *Total energy supply* (TES) for the different defined energy product aggregates p in projection year y .

EF_p : Average emissions factor of product aggregate p based on the last three historical years where data is available. The following formula is used to calculate these average emissions factors:

$$EF_p = \frac{1}{3} \left[\left(\frac{Emissions_{p,i}}{TES_{p,i}} \right) + \left(\frac{Emissions_{p,i-1}}{TES_{p,i-1}} \right) + \left(\frac{Emissions_{p,i-2}}{TES_{p,i-2}} \right) \right] \quad (2)$$

Where:

i : The most recent historical year where data is available

$TES_{p,i}$: *Total energy supply* (TES) for the different defined energy product aggregates p in historical year i .

$Emissions_{p,i}$: Either total GHG emissions or CO₂-only emissions of energy product aggregate p in historical year i .

Sector fuel combustion emissions

The following equation is used to estimate total emissions per sector in projection years:

$$Emissions_{s,y} = \sum_p FC_{p,s,y} \times EF_{p,s} \quad (3)$$

Where:

s : Represents a final consumption sector (industry, residential, commercial and public services, buildings, other final sectors, international marine bunkers and international aviation bunkers). In the Flow dimension section under transition indicators, see the definition of sectoral emissions flows for details about what emissions are included in each sector.

y : Represents a projection year.

p : Defined energy product aggregate, which are **Coal and coal products** (includes **Peat and peat products**), **Oil and oil products**, **Natural gas**, **Total waste, non-renewable portion** and **Biofuels and renewable waste** (only for non-CO₂ emissions).

$Emissions_{s,y}$: Either total GHG emissions or CO₂-only emissions of energy product aggregate p in projection year y .

$FC_{p,s,y}$: Final consumption (FC) in sector s for the different defined energy product aggregates p in projection year y .

$EF_{p,s}$: Average emissions factor of energy product aggregate p in sector s based on the last three historical years where data is available. The following formula is used to calculate these average emissions factors:

$$EF_{p,s} = \frac{1}{3} \left[\left(\frac{Emissions_{p,s,i}}{FC_{p,s,i}} \right) + \left(\frac{Emissions_{p,s,i-1}}{FC_{p,s,i-1}} \right) + \left(\frac{Emissions_{p,s,i-2}}{FC_{p,s,i-2}} \right) \right] \quad (4)$$

Where:

i : The most recent historical year where data is available

$FC_{p,s,i}$: Final consumption (FC) in sector s for the different defined energy product aggregates p in historical year i .

$Emissions_{p,s,i}$: Either total GHG emissions or CO₂-only emissions in sector s for the different defined energy product aggregates p in historical year i .

Electricity and heat sector fuel combustion emissions

For the electricity and heat sector, equation 5 is used to estimate emissions from each product category. The values for total fuel combustion emissions from electricity and heat generation in a country (CO₂_ELEHEAT and GHG_ELEHEAT) are the sum of formula 5 across all energy product categories p .

$$Emissions_{p,y} = Inputs_{p,y} \times EF_p \quad (5)$$

Where:

$Emissions_{p,y}$: Either total GHG emissions or CO₂-only emissions of energy product aggregate p in projection year y .

p : Defined energy product aggregate, which are **Coal and coal products** (includes **Peat and peat products**), **Oil and oil products**, **Natural gas**, **Total waste, non-renewable portion** and **Biofuels and renewable waste** (only for non-CO₂ emissions).

y : Represents a projection year.

$Inputs_{p,y}$: Is the input of energy product aggregate p in projection year y to power plants as reported in the *Electricity, CHP and heat plants* flow.

EF_p : Average emissions factor of product aggregate p in the electricity and heat sector based on the last three historical years where data is available. The following formula is used to calculate these average emissions factors:

$$EF_p = \frac{1}{3} \left[\left(\frac{Emissions_{p,i}}{Inputs_{p,i}} \right) + \left(\frac{Emissions_{p,i-1}}{Inputs_{p,i-1}} \right) + \left(\frac{Emissions_{p,i-2}}{Inputs_{p,i-2}} \right) \right] \quad (6)$$

Where:

i : The most recent historical year where data is available

$Inputs_{p,i}$: Is the input of energy product aggregate p in historical year i to power plants as reported in the *Electricity, CHP and heat plants* flow.

$Emissions_{p,i}$: Either total GHG emissions or CO₂-only emissions in the electricity and heat sector of energy product aggregate p in historical year i .

Intensity of electricity and heat generation

The following equation uses the outputs from equation 5 to derive the intensity of electricity and heat generation:

$$Intensity_y = \frac{\sum_p Emissions_{p,y}}{Output_y}$$

Where:

$Intensity_y$: Is the total GHG emissions or CO₂-only emissions per unit of electricity and heat generation in projection year y .

$Emissions_{p,y}$: Either total GHG emissions or CO₂-only emissions of energy product aggregate p in projection year y , calculated with equation 5.

$Output_y$: Sum of *Electricity output* and *Heat output* from all sources, not just the energy product aggregates p .

Data availability

The table below details the availability of data corresponding to the main structure of the energy balance for each year, the number of scenarios as well as the date of the latest submission to the IEA. The latest submission to the IEA can be re-submissions of past projections. When known, the Country notes section includes the original publication date of the national projections submitted to the IEA.

Projections availability for energy balances data

Country	2030	2040	2050	Number of scenarios	Latest submission to the IEA
Australia	p	p	..	1	2025/2026
Austria	✓	✓	✓	1	2025/2026
Belgium	p	p	p	2	2025/2026
Canada	✓	✓	✓	3	2025/2026
Colombia	..	..	..	N/A	N/A
Czech Republic	..	..	..	N/A	N/A
Denmark	✓	✓	✓	1	2025/2026
Estonia	p	p	p	1	2025/2026
Finland	✓	✓	✓	1	2025/2026
France	✓	✓	✓	2	2022/2023
Germany	✓	✓	✓	1	2023/2024
Greece	..	..	..	N/A	N/A
Hungary	p	p	p	1	2025/2026
Ireland	p	p	p	4	2025/2026
Italy	✓	✓	..	1	2025/2026
Japan	p	p	..	1	2025/2026
Korea	✓	✓	✓	1	2025/2026
Latvia	✓	✓	✓	1	2025/2026
Lithuania	p	p	p	1	2025/2026

Country	2030	2040	2050	Number of scenarios	Latest submission to the IEA
Luxembourg	..	..	..	N/A	N/A
Mexico	..	..	..	N/A	N/A
Netherlands	✓	✓	..	2	2025/2026
New Zealand	p	p	p	1	2025/2026
Norway	..	..	..	N/A	N/A
Poland	..	..	..	N/A	N/A
Portugal	✓	✓	..	1	2025/2026
Slovak Republic	✓	✓	✓	2	2024/2025
Spain	✓	..	..	1	2025/2026
Sweden	✓	✓	✓	1	2025/2026
Switzerland	✓	✓	✓	1	2025/2026
Republic of Türkiye	..	..	..	N/A	N/A
United Kingdom	p	p	p	1	2025/2026
United States	..	..	..	N/A	N/A
European Union - 27	..	..	..	N/A	N/A

Note: “✓” indicates that the projections data are available. “p” indicates that the projections data are partially available, which means that a flow or product that is expected to exist in the projections for a given country is missing. The missing data is detailed in the Country notes section. Partial (p) data is meant to indicate that submitted data is not wholly comparable to historical IEA data. “..” indicates that projections are not available.

For countries with available data, the table below presents the details of availability of the recently introduced granular data corresponding to the emerging fuels and technologies expected to have a prominent role in the upcoming decades.

Projections availability for emerging fuels and technologies

Country	CCUS	Hydrogen and synthetic fuels	Heat pumps
Australia	..	..	..
Austria	..	✓	..
Belgium	..	..	..
Canada	✓	✓	p
Denmark	✓	✓	..
Estonia	..	..	..
Finland	✓	✓	✓
France	✓	✓	✓
Germany	✓	✓	✓
Hungary	✓	p	p
Ireland	..	..	✓
Italy	✓	✓	✓
Japan	..	p	..
Korea	✓	..	..
Latvia	..	✓	✓
Lithuania	..	p	p
Netherlands	✓	..	✓
New Zealand	..	..	..
Portugal	..	✓	✓
Slovak Republic	✓	✓	..
Spain	..	..	..
Sweden	..	✓	..
Switzerland	✓	✓	✓
United Kingdom	..	..	..

Note: “✓” indicates that the projections data are available. “p” indicates that the projections data are partially available, which means that a flow or product that is expected to exist in the projections for a given country is missing. The missing data is detailed in the Country notes section. Partial (p) data is meant to indicate

that submitted data is not wholly comparable to historical IEA data. “..” indicates that projections are not available.

Country notes

This section includes the country notes corresponding to the included projections data in the database. Please refer to the IEA [World Energy Balances, documentation](#) for the country notes related to the included historical data.

The first institution listed under “Source(s)” is the institution that has provided the IEA with the projections data. The collaborating institutions are those that supported the projections with data, expertise or modelling.

Australia

Source(s)

The Department of Climate Change, Energy, the Environment and Water

Scenario(s)

Business as usual

General notes

All projections data are based on the 2025/26 submission to the IEA.

The projections are updated on an annual basis.

Projections for 2050 are not available. Energy supply data and **Electricity** consumption by sector are not available.

Data refer to the fiscal year July to June (e.g. 2030 data represent the period from 1 July 2029 to 30 June 2030).

GDP and population data are sourced from the *2023 Intergenerational Report* published by the Australian Government Treasury, available at: <https://treasury.gov.au/publication/2023-intergenerational-report>.

More details can be found in *Australia's Energy Projections*, published as a special topic (section 4.1) in the [September 2025 Quarterly Update of the National Greenhouse Gas Inventory](#).

Austria

Source(s)

Federal Ministry of Economy, Energy and Tourism

Collaborating institution: Environment Agency Austria

Scenario(s)

Business as usual

General notes

All projections data are based on the 2025/26 submission to the IEA.

Frequency of the projection updates are expected to be biannually.

Energy supply and demand for solar thermal is included under **Geothermal** and cannot be separated in the projections. Thus, **Solar**, represents solar PV only.

The Austrian energy projections use a 100% efficiency to calculate the primary energy equivalent, reported in *Indigenous production*, for **Geothermal Heat output**. The IEA convention is an efficiency of 50%, so the figures reported here will not align with historical data from Austria and to other projections.

All hydrogen production and consumption in the main balance are reported under **Oil and oil products**. This includes hydrogen derived from fossil sources and hydrogen from electrolysis. Under **Memo: Hydrogen and synthetic fuels** the value reported for *imports* includes domestic production of hydrogen.

The projections are developed in relation to the with existing measures (WEM) scenario from the National Energy and Climate Plan (NECP). The corresponding reports are available at:

NECP report: https://www.bmluk.gv.at/themen/klima-und-umwelt/klima/nationale-klimapolitik/energie_klimaplan.html

Energy scenarios for 2025-2050: https://www.umweltbundesamt.at/studien-reports/publikationsdetail?pub_id=2616&cHash=3a07ecb700a17bfd9c5d331267cdf55d

GHG projections for 2025-2050: https://www.umweltbundesamt.at/studien-reports/publikationsdetail?pub_id=2615&cHash=cd3136fb362a87beaf854d0dd5bc77bc

Belgium

Source(s)

FPS Economy (DG Energy)

Collaborating institutions: Federal Planning Bureau

Scenario(s)

Stated policies

Aspirational – achieving national targets

General notes

All projections data are based on the 2025/26 submission to the IEA.

The projections are developed in relation to the with existing measures (WEM) and with additional measures (WAM) scenarios from the National Energy and Climate Plan (NECP). More information can be found at: <https://www.nationalenergyclimateplan.be/en>.

Due to the different structures of the model outputs from the NECP and the IEA energy balance framework, only higher-level aggregates are reported to respect IEA energy balance rules. Values in the **Total** column are complete, while individual products and flows are reported where possible to provide greater detail. The result is that summations of rows will not add to the **Total** column and some of the *Total energy supply* and *total final consumption* flows are partial for individual products.

Statistical differences represent unallocated demand which cannot be separated between flows to the transformation sector and final consumption sectors. *Transportation* values include consumption for international aviation.

Note that due to missing GDP data and the level of aggregation of data in projection years, only population and self-sufficiency indicators are available. Emissions data is unavailable in projection years.

Canada

Source(s)

Natural Resources Canada

Collaborating institution: Canada Energy Regulator (CER)

Scenario(s)

Business as usual

Aspirational – achieving national targets

Other

General notes

All projections data are based on the 2025/26 submission to the IEA.

The projections for this questionnaire are based on forecasts from the Canada Energy Regulator (CER) and featured in the annual CER publication, [Canada's Energy Future 2026: Energy Supply and Demand Projections to 2050](#) (EF2026).

The projections reported in this questionnaire are obtained by applying the percentage growth rates forecast in EF2026 to baseline reference year 2023 IEA energy balance submissions for Canada. Where there is no clear concordance between a specific flow or product from the National Projections Questionnaire and the CER's publication, best efforts are made to identify the most appropriate donor.

The CER produces its projections using an integrated suite of energy-economy models, collectively referred to as the Energy Futures Modelling System.

End-use energy demand and emissions are generated using ENERGY2020, a hybrid energy-economy model developed by Systematic Solutions Incorporated that simulates capital stock turnover in response to economic activity, energy prices, consumer decisions, and climate policy.

Electricity and hydrogen projections are produced using CER-developed models built on Python for Power System Analysis (PyPSA), an open-source electric power system planning and simulation framework.

Projections for crude oil, natural gas, natural gas liquids, and bioenergy are produced using CER-developed modules tailored to each commodity. The macroeconomic context (GDP, population, exchange rates, inflation) is developed iteratively with Stokes Economics, ensuring consistency between the energy and economic outputs.

Of the four scenarios in EF2026, three are included in the IEA submission: Current Measures, Canada Net-zero and Lower scenario.

Current Measures corresponds to the IEA's Business as Usual (BAU) scenario and includes only climate and energy policies that were enacted before the end of November 2025. Canada Net-zero corresponds to the Beyond Stated Policies, Achieving National Targets (ASPTARGET) scenario. Canada Net-zero begins with a pre-defined end point of net-zero GHG emissions for Canada by 2050 and works backwards iteratively to identify a pathway consistent with that outcome. Lower is reported under the Other scenario category. The Lower scenario provides a downside view relative to the Current Measures scenario. It shares the same policy base and technology cost assumptions as Current Measures and differs only in assuming lower Canadian GDP growth, lower LNG export volumes, lower data centre load growth, and lower global oil and natural gas prices.

Additional details can be found at: <https://www.cer-rec.gc.ca/en/data-analysis/canada-energy-future/2026/>

Colombia

Source(s)

Not applicable.

Scenario(s)

Not applicable.

General notes

Updated projections are not available.

Previous submissions to the IEA were based on Colombia's National Energy Plan or Plan Energético Nacional (PEN). More information can be found here: <https://www.upme.gov.co/simec/planeacion-energetica/plan-energetico-nacional-1/#documentos>

Czech Republic

Source(s)

Not applicable.

Scenario(s)

Not applicable.

General notes

Updated projections are not available.

Denmark

Source(s)

Danish Ministry of Climate, Energy and Utilities

Scenario(s)

Business as usual

General notes

All projections data are based on the 2025/26 submission to the IEA.

Projections for 2040 are unavailable.

The projections are updated on an annual basis.

The IEA Secretariat estimated the *Indigenous production*, as well as *Electricity*, *CHP*, and *heat plants* inputs of **Geothermal** in 2030, 2040 and 2050 using an assumed efficiency of 50% to calculate the primary energy equivalent of the reported heat output.

The values reported under **Tide, wave and ocean and other energy sources** represent ambient heat from heat pumps.

Additional details can be found here: <https://www.kefm.dk/klima/klimastatus-og-fremskrivning/klimastatus-og-fremskrivning-2026>

Estonia

Source(s)

Ministry of Climate

Collaborating institution: Estonian Environmental Research Centre

Scenario(s)

Stated policies

General notes

All projections data are based on the 2025/26 submission to the IEA.

Frequency of the projection updates are biannual.

The projections are focused on trends in greenhouse gas (GHG) emissions and, as such, the projections are based on fuel consumption rather than final consumption. This is why values for the **Electricity** and **Heat** products, as well as the *Non-energy use* flow are unavailable.

In addition, the projections focus on domestic production and how internal supply is used to meet domestic demand. As such, the modelling does not explicitly separate exports in the projection years, except for oil shale.

The main assumption for the projection was that step-by-step, the use of oil shale shall decrease for the production of electricity and increase for the production of shale oil. The retort gas that occurs as a side product during the production of shale oil is used for electricity production. The projected future usage of fuel based on the model was applied while using the emission calculations of the 2006 IPCC Guidelines. Note that oil shale is included under **Coal and coal products** and shale oil under **Oil and oil products**.

Due to the high production of oil shales and the special treatment of this product within the energy balance, which results in a high uncertainty of the supply-based emissions estimate, GHG emissions as well as the corresponding indicators have not been developed for the projection years.

Additional details can be found here: <https://kliimaministeerium.ee/rohereform-kliima/kliimapoliitika/kasvuhoonegaaside-heitkogused#kasvuhoonegaaside-pr>

Finland

Source(s)

Ministry of Economic Affairs and Employment

Collaborating institutions: VTT Technical Research Centre, Finnish Environment Institute, Natural Resources Institute Finland and Finnish Institute for Health and Welfare

Scenario(s)

Stated policies

General notes

All projections data are based on the 2025/26 submission to the IEA.

Minor updates to the projections are on an annual basis. When new policy measures are adopted, sectoral models or scenarios are updated, and new statistical data are available. Major updates are scheduled once every four years, when new energy and climate plans and strategies are published.

The scenario describes the development of the energy system with energy and climate policy measures implemented or adopted by December 2025. The submission does not represent any official final projection.

The scenario is modelled and used in the preparation of the Government's energy and climate strategy that was published on December 4th 2025. The time horizon of the projections are mid-term and targeted to the years 2030-2035; the projection figures for 2040-2050 are approximate.

Sectoral scenarios and domestic modelling tools are used for transport, buildings, waste sector and machinery. For energy system and market modelling Times-VTT-model is used.

Some power plants located at industrial sites are owned by energy companies, while other are owned by the industry. Due to the absence of granular data providing differentiating them, the sold heat vs. own heat production is roughly estimated. Additionally, the division of fuels for heat production is indicatively shared between the transformation sector and final consumption of the industry sector. Almost all heat and electricity generation is produced in CHP and HOBs (heat-only boilers), leading to high conversion efficiencies.

Imports of fossil products represent net imports.

The *Heat output* reported under **Nuclear** represents waste heat from small modular reactors providing district heating. An efficiency of 85% is assumed with respect to the calculation of the primary energy equivalent for this heat.

Demand for heat is projected to increasingly be met by non-combustion sources at individual buildings and for district heating. Under the **Heat** column, district heating is reported, which increasingly uses waste heat from data centres, wastewater and flue gas scrubbers. The model does not separate the heat by their initial fuel and the electricity used to drive the heat recovery is included in the figures for heat. This means that under the **Heat** product, values include both waste heat and ambient heat from heat pumps, as well as the electricity used to drive these heat recovery processes.

The data reported under the product **Memo: Heat pump**, include data corresponding to small-scale heat pumps used in the residential and commercial public services sectors. Data corresponding to large-scale heat pumps has been excluded, as the model cannot distinguish between heat from heat exchangers and heat pumps.

CCUS data reported in table 3 is emission savings from paper mills where PCC (precipitated calcium carbonate) is used as filler in papermaking.

Additional information about the modelling assumptions and scenarios can be found here: <https://publications.vtt.fi/pdf/technology/2025/T442.pdf>

France

Source(s)

Ministry of Energy Transition, General Directorate for Energy and Climate

Collaborating institutions Other ministries including finance, agriculture, housing and transport.

Scenario(s)

Stated policies

Aspirational – achieving national targets

General notes

All projections data are based on the 2022/23 submission to the IEA.

Disaggregated values for **Natural gas** in 2050 for the “aspirational – achieving national targets” scenario are unavailable. Values for **Natural gas** are still included in the **Total** product. *Heat output* under **Geothermal** includes values for solar thermal heat, which cannot be separated.

The “With existing measures (WEM)” scenario, takes into account all the policies and measures adopted until end of year 2021. It is mapped to the “stated policies” scenario in the database.

The “With additional measures (WAM)” scenario aims for GHG emission targets which are compatible with the 55 EU package for 2030, and for climate neutrality in 2050. It also aims at reaching additional policy targets such as re-industrialisation, public health, biodiversity protection, etc. the WAM scenario is mapped to the “aspirational – achieving national targets” scenario in the database.

For the WEM scenario additional information is available at:
<https://www.ecologie.gouv.fr/scenarios-prospectifs-energie-climat-air>

For the projections, different sectoral models have been used to describe the physical transformation across sectors and also project energy consumption levels. Following that, the results have been aggregated to develop energy balances as well as the projected GHG inventories.

Germany

Source(s)

Federal Ministry for Economic Affairs and Energy

Collaborating institutions: Öko-Institut, Fraunhofer ISI, IREES

Scenario(s)

Stated policies

General notes

All projections data are based on the 2023/24 submission to the IEA.

Values for the power sector for **Natural gas** are unavailable in 2030. These power sector values for **Natural gas** are still reflected in the **Total** product.

Projections are based on bottom-up modelling with sectoral models and include policies and measures implemented until end of July 2023.

The aim of the scenario modelling is not to develop a complete energy balance but rather aims at projecting GHG emissions estimates under the impact of adopted and announced policies and measures. Hence, there are certain limitations for completing the full energy balance as detailed below:

- The imports and exports projections are net figures and therefore stock changes are not available for the projection years.
- The modelling of non-energy consumption contains a share coming from unspecified fossil fuels. This figure has been allocated to the **Coal and coal products** column.

Additional information are available at (in German language):
<https://www.umweltbundesamt.de/themen/klima-energie/klimaschutz-energiepolitik-in-deutschland/szenarien-fuer-die-klimaschutz-energiepolitik/integrierte-energie-treibhausgasprojektionen#Berichterstattung>

Greece

Source(s)

Not applicable.

Scenario(s)

Not applicable.

General notes

Projections are not available.

Hungary

Source(s)

Ministry for Innovation and Technology, Regional Centre for Energy Policy Research (REKK), Global Green Growth Institute (GGGI)

Scenario(s)

Business as usual

General notes

All projections data are based on the 2025/26 submission to the IEA, which have been re-published from the 2023/2024 submission because no updates have been made to the projections.

Projections are based on the With Existing Measures (WEM) scenario from the TIMES-HU model of the Regional Centre for Energy Policy Research (REKK). The emission trajectory of the scenario follows current trends, assuming that all existing sectoral policy strategies and measures remain in effect, and that there will be no new interventions. The modelling was done in reference to the update of the National Energy and Climate Plan (NECP).

Supply and transformation data corresponding to fossil fuels, **Biofuels and renewable waste**, and **Total waste, non-renewable portion** are not included in the scenario modelling at a disaggregated level. Hence, the corresponding flows in the balance and the related indicators are not available for the projections.

Ireland

Source(s)

Sustainable Energy Authority of Ireland (SEAI)

Collaborating institutions: Economic and Social Research Institute (ESRI), Environmental Protection Agency (EPA), Department of Transport, National Transport Authority (NTA)

Scenario(s)

Business as usual

Stated policies

Aspirational – achieving national targets

Other

Note: The country has submitted two different scenarios both corresponding to the “business as usual” category as defined in this database. Hence, for the purpose of this publication one of the two scenarios has been disseminated under the

“other” category to allow differentiation between the two sets of data. The “High_WEM” scenario has been included under the “business as usual” category, while the “Low_WEM” scenario has been included under the “other” category. Additional information regarding the differences in between the two scenario is listed in the general notes section below. For further clarity, Ireland’s “WAM” scenario is classified as “stated policies” and Ireland’s “CAP” scenario is classified as “Aspirational – achieving national targets”

General notes

All projections data are based on the 2025/26 submission to the IEA.

The projections are updated on an annual basis.

Projection figures for the **Heat** product, and *Non-energy use* and *Heat output* flows are not available. The figures reported under **Tide, wave and ocean and other energy sources** represents wave power.

SEAI's National Energy Modelling Framework (NEMF) is a full national energy-economy model that assesses the impacts of packages of energy policies and measures (PaMs) on energy supply and demand. It combines several SEAI sectoral models with data from the ESRI's Ireland Environment, Energy and Economy (I3E) macroeconomic model to produce policy-rich outlooks for the whole energy system.

The NEMF contains data on 650 individual heat demand archetypes, which provide a detailed description of demand in residential, services and industry sectors, as well as agricultural energy use. The electricity module simulates the scheduling of resources (generation, storage, interconnection and demand side management) to meet electricity demand at an hourly resolution. The transport module estimates the fuel demand of different modes of transport based on projections of the total activity demand (including the impact of demand management measures), the fleet composition (including EV uptake), and other PaMs such as biofuel blending. Additional information are available at:

<https://www.seai.ie/sites/default/files/publications/National-Energy-Projections-Report-2025.pdf>

<https://www.seai.ie/data-and-insights/seai-statistics/energy-data/>

<https://www.seai.ie/publications/Annex-Model-Description.pdf>

The three submitted scenarios are based on the following main assumptions:

1. Included policies:

- a) The “business as usual” and “other” scenarios include implemented and adopted policies as of 31 December 2024
- b) The “stated policies” scenario includes implemented, adopted and planned policies from the Climate Action Plan 2025, but does not assume that all targets will be fully achieved.
- c) The “aspirational – achieving national targets” scenario includes implemented, adopted and planned policies from the Climate Action Plan 2025, and assumes full achievement of demand reduction targets in the Transport sector.

2. Carbon price trajectory: For all scenarios, a varying carbon tax that increases by €7.50 per annum and reaches €100 per tonne by 2030.

3. Emissions Trading Scheme (ETS) price trajectory: For all scenarios, the ETS price trajectory used is the European Commission "Recommended parameters for reporting on GHG projections in 2025" WEM trajectory.

4. Fossil fuel price trajectory:

- a) The “other” scenario fossil fuel price trajectories are informed by the IEA "World Energy Outlook 2024" Announced Pledges scenario.
- b) The “business as usual,” “stated policies” and “aspirational – achieving national targets” scenarios use the fossil fuel trajectories in the European Commission "Recommended parameters for reporting on GHG projections in 2025" central price trajectories.

Italy

Source(s)

Ministry of Economic Development, Ricerca Sistema Energetico (RSE)

Collaborating institutions: MASE (Ministry of Environment and Energy Security), GSE (Gestore dei Servizi Energetici), ISPRA (Italian Institute for Environmental Protection and Research)

Scenario(s)

Aspirational - achieving national targets

General notes

All projections data are based on the 2025/26 submission to the IEA, which have been re-published from the 2024/2025 submission because no updates have been made to the projections.

Projections for year 2050 are not available.

For the scenario projections, the TIMES-RSE model, an energy model of the Markal TIMES family has been used. The scenario is based on the assumption of meeting renewable power targets (REPowerEU) by 2030 and achieve net zero target by 2050.

Additional information on the NECP are available at:
https://commission.europa.eu/energy-climate-change-environment/implementation-eu-countries/energy-and-climate-governance-and-reporting/national-energy-and-climate-plans_en

The technical report (in Italian) is available on the RSE website: <https://www.rse-web.it/rapporti/>.

Japan

Source(s)

The Institute of Energy Economics, Japan

Collaborating institutions: Agency of National Resources and Energy, Ministry of Economy, Trade and Industry, Japan

Scenario(s)

Aspirational - achieving national targets

General notes

All projections data are based on the 2025/26 submission to the IEA, which have been re-published from the 2024/2025 submission because no updates have been made to the projections.

Projections for the year 2050 are not available.

The frequency of updates to the projections are typically once every three years.

For 2030 and 2040, partial information is available for the following: *Electricity output* by product, *Memo: Installed electrical capacity* by product and final consumption of **Electricity** by sector. The remaining flows in the energy balance as well as all related indicators are not available. Additional information, including data that is unable to be included in the IEA energy balance format, is available at the following links:

The 6th Strategic Energy Plan. (in English):
https://www.enecho.meti.go.jp/category/others/basic_plan/pdf/strategic_energy_plan.pdf

Energy supply and demand outlook for 2030, Agency for Natural Resources and Energy, Ministry of Economy, Trade and Industry, Japan (in Japanese):
https://www.enecho.meti.go.jp/category/others/basic_plan/pdf/20211022_03.pdf

The 7th Strategic Energy Plan. (in English):
https://www.enecho.meti.go.jp/category/others/basic_plan/pdf/2025_strategic_energy_plan.pdf

Energy supply and demand outlook for 2040, Agency for Natural Resources and Energy, Ministry of Economy, Trade and Industry, Japan (in English):
https://www.enecho.meti.go.jp/en/category/others/basic_plan/pdf/outlook_for_energy_supply_and_demand_in_fy2040.pdf

For 2030, the projections are based on an econometrics method, which estimates energy demand from macroeconomic indicators. For 2040, the projections are based on a scenario analysis using bottom-up optimisation models. The underlying assumption are consistent with Japan's Nationally Determined Contribution (NDC) of 46% reduction in GHG emissions from the 2013 levels by 2030, 60% reduction by 2035, 73% reduction by 2040 and net zero by 2050.

Korea

Source(s)

Korea Energy Economics Institute (KEEI)

Collaborating institutions: Statistics Korea, Korea Meteorological Administration, Korea Development Institute, Korea Institute for Industrial Economics and Trade

Scenario(s)

Business as usual

General notes

All projections data are based on the 2025/26 submission to the IEA. The projections are updated on an annual basis.

In the 2026 edition, *Electricity*, *CHP and heat plants*, *Other transformation processes* and *Energy industry own use and distribution losses* under **Oil and oil products** and **Total** are not available for 2030, 2040, and 2050. In addition, *Indigenous production* values are qualified as not available for the following products:

- **Nuclear;**
- **Hydropower;**
- **Wind;**
- **Geothermal;**
- **Solar;**
- **Tide, wave and ocean, and other energy sources;**
- **Biofuels and renewable waste;**
- **Total waste, non-renewable portion;** and
- **Total.**

The Korea Energy Economics Institute's STEM model is an integrated outlook system for analysing the impact of changes in climate and energy policies and energy technologies on future energy supply and demand, greenhouse gas emissions in the energy sector, and the economy.

This system consists of economic, energy, and environmental models. The economic model is an equilibrium model that combines a small-scale macroeconomic model and an input-output model, the energy model is a bottom-up model composed of modules by sector, and the environmental model is combined with the energy model to calculate greenhouse gas emissions.

The 'Long-term Energy Outlook' of the Korea Energy Economics Institute assumes that the current climate change and energy policy keynotes will continue the trend without significant changes until 2050. This is the long-term change path of energy consumption and supply expected when given external assumptions about our country's population, economic growth, industrial structure, energy prices, and temperature, and when energy technology is steadily developed at a similar level to the past and current or confirmed policies and regulations are maintained.

It serves as the baseline for assessing the direction and degree of change in energy supply and greenhouse gas emissions when domestic climate change and energy policy and technology change.

Additional information on Korea's projections can be found here:
<https://kesis.keei.re.kr/board.es?mid=a10302050000&bid=0022>.

Latvia

Source(s)

Institute of Physical Energy Collaborating institutions: Ministry of Climate and Energy, The Ministry of Economic Affairs

Scenario(s)

Business as Usual

General notes

All projections data are based on the 2024/25 submission to the IEA, which has been re-published for the 2025/26 reporting cycle because the projections have not been updated.

The projections are updated once every two years.

For the purpose of this publication, the “With Existing Measures” (WEM) scenario submitted by Latvia is classified as Business as Usual (BAU), because it does not include all the targets defined in the EU Directives (such as the EED and RES Directives) for 2030.

The scenario analysis was carried out with the TIMES-Latvia model — a bottom-up, partial-equilibrium, linear programming optimisation model based on the internationally recognised TIMES framework. Since 2022, the Institute of Physical Energetics has customised this model to capture Latvia's specific energy and economic conditions. Before that, the MARKAL-Latvia model (also part of the MARKAL/TIMES family) was applied for GHG emission projections in the energy sector.

TIMES-Latvia represents the full energy supply and demand system of Latvia, covering five key sectors: industry, residential, agriculture, commercial & services, and transport. Each sector is further disaggregated by energy end-use. The model is demand-driven and projects the long-term development of Latvia's energy

system for the period 2024–2060, using macroeconomic forecasts and sectoral drivers such as GDP, population, household numbers, floor area, and transport mileage.

The optimisation determines the least-cost investment pathway and the optimal deployment of technologies over time to satisfy energy service demands. It minimises the total system cost—or equivalently, maximises the combined consumer–producer surplus—while accounting for investment, operating, and fuel costs, as well as emissions constraints. The model incorporates a broad portfolio of current and future technologies, tracking emissions by fuel type, sector, and technology.

Key inputs include: Useful energy demand (e.g., lighting, heating, transport mileage); Price projections for imported energy resources (oil, gas, coal), based on European Commission recommendations and adjusted to Latvian conditions; Domestic fuel price projections, differentiated by geography and availability (e.g., solid biomass is modelled in four price categories); Historical energy system data for 2000–2022, used to calibrate the model to real-world conditions as well as descriptions for existing and future technologies.

Electricity and district heating consumption are calculated endogenously within the model. Energy taxes are incorporated exogenously, following the core price projections. Carbon pricing is aligned with the European Commission’s harmonised trajectory for the EU ETS and the planned ETS II system. Demographic projections indicate a continued decline in Latvia’s population in both the medium and long term. Forecasts for households, dwellings, and residential floor area are based on demographic trends and sector-specific parameters, such as average household size and dwelling area.

In the medium term (2024–2030), the baseline scenario assumes an average annual GDP growth of 2.6%, driven by gains in competitiveness through technology, efficiency, and innovation. In the long term (2031–2050), economic growth is expected to slow to 1.2%–2.2% annually.

Energy price projections for imported fuels (oil, gas, coal) are based on the European Commission’s guidance (“Recommended parameters for reporting on GHG projections in 2025”) and adjusted to reflect Latvia’s market conditions and fuel price correlations. Carbon pricing follows the EC’s harmonised trajectory for the current ETS and planned ETS II.

Energy sector development is shaped by GHG reduction measures focused on improving energy efficiency and increasing the share of renewables. These

changes impact both energy supply and demand, driven by policy implementation, technological progress, and evolving energy markets.

The scenario incorporates all adopted policies as of June 30, 2024. Over the next seven years, energy efficiency programs will prioritise renovation of multi-apartment buildings and public infrastructure, alongside initiatives to replace fossil fuels with renewables across all sectors.

Additional information is available at:

https://videscentrs.lv/mc.lv/files/Klimats/SEG_emisiju_un_ETS_monitorings/Zinojums_par_klimatu/SEG_proгнозу_pilnie_zinojumi/2025/LV_Report%20Projections%20and%20PaMs_2025.pdf

Lithuania

Source(s)

Lithuanian Energy Agency

Collaborating institutions: Ministry of Environment of the Republic of Lithuania, Ministry of Energy of the Republic of Lithuania, Environmental Protection Agency

Scenario(s)

Stated policies

General notes

All projections data are based on the 2025/26 submission to the IEA.

The projections are updated once every two years.

Projections are partially available for final consumption and electricity generation; no supply-side or transformation data is available in the balance. Additionally, GDP and population projections as well as their associated indicators are not available.

The model is based on statistical data, reflecting the factual energy consumption and its long-term trends, considering specific assumptions of the expansion of energy generation capacity, technological improvements, future energy needs and the estimated impact of energy policy measures.

The model is based on the following main assumptions:

1. Main targets in electricity generation:
 - a) Installed capacity of onshore wind farms, GW: 4.5 (2030);
 - b) Installed capacity of offshore wind, GW: 0.7 (2033) and 1.4(2035);
 - c) Installed capacity of solar photovoltaic power plants, GW: 4.1 (2030);
 - d) Installed capacity of hydrogen production (electrolysis), GW: 0.058 (2030) and 1.3 (2035).
2. Main targets for the share of renewables:
 - a) Share of renewables in gross consumption of electricity: 100% (2030);
 - b) Share of renewables in final consumption of energy in transport (with multipliers for biofuels): 29% (2030);
 - c) Share of renewables in final consumption of energy for heating and cooling: 80% (2030);
 - o Share of renewables in gross final consumption of energy: 55% (2030).
3. Main energy consumption and energy savings targets:
 - a) Final energy consumption without green hydrogen production and environmental energy, ktoe: 4430 (2030);
 - b) Primary energy consumption (according to EED 2023/1791), ktoe: 5443 (2030);
 - c) Final energy consumption (according to EED 2023/1791), ktoe: 4385 (2030);
 - d) Cumulative final energy savings (according to EED 2023/1791), TWh: 39,3.
4. Main GHG emissions targets:
 - a) GHG emission reduction target for EU ETS (emission trading system) sectors compared to 2005 levels: -62% (2030);
 - b) GHG reduction targets for sectors not participating in the EU ETS scheme compared to 2005 levels: -21% (2030).

Additional information is available at:

<https://www.e-tar.lt/portal/legalAct.html?documentId=TAR.E151BC09AE62>

<https://www.ena.lt/nn2-nens/>

https://commission.europa.eu/publications/lithuania-final-updated-necp-2021-2030-submitted-2024_en

Luxembourg

Source(s)

Not applicable.

Scenario(s)

Not applicable.

General notes

Projections are not available.

Mexico

Source(s)

Not applicable.

Scenario(s)

Not applicable.

General notes

Projections are not available.

Netherlands

Source(s)

Netherlands Enterprise Agency (RVO), Energy, Climate and Sustainability Directorate

Collaborating institutions: Netherlands Environmental Assessment Agency (Dutch: 'Planbureau voor de Leefomgeving' (PBL), TNO Energy Transition, Statistics Netherlands (CBS) and the National Institute for Public Health and the Environment (RIVM), Wageningen University and Research (WUR)

Scenario(s)

Stated policies

Aspirational - achieving national targets

General notes

All projections data are based on the 2025/26 submission to the IEA, which have been re-published from the 2024/2025 submission because no updates have been made to the projections.

Projections for year 2050 are not available. For 2030 and 2040, the *Heat output* from **Heat**, which represents the total heat outputs of heat pumps where the heat is sold, includes only ambient heat and not the heat derived from the electricity input to heat pumps.

The projections are updated on an annual basis.

Updated projections are reported in the Climate and Energy Outlook (KEV), as required by the national climate act since 2019. The KEV-report describes policies and measures in place or planned and which are included in the projections with regard to energy savings, renewable energy and greenhouse gas emission reductions in the Netherlands as a whole, as well as for various sectors. The KEV includes the policy variants 'with existing measures' (WEM) and 'with additional measures' (WAM), matching the IEA categories of, respectively, the “business as usual” and “stated policies” scenarios. Please note that the WEM scenario (submitted as BAU) is not static and incorporates impacts of policies once these are formally adopted.

These projections are developed by the Netherlands Environmental Assessment Agency (PBL) which is an independent governmental agency, in cooperation with Statistics Netherlands (CBS), TNO Energy Transition, the National Institute for Public Health and the Environment (RIVM) and the Netherlands Enterprise Agency (RVO). PBL has overall responsibility for the KEV and for the projections and the evaluative aspects in the report in specific (including the final editing of the report). This fits with their role in the Netherlands as independent planning agencies and guarantees an independent evaluative view. CBS provides various statistics such as related to economic development and energy balances.

Projections of energy consumption and production levels in the KEV are, in general, calculated with a suite of sectoral models using parameters on economic (volume) development of sectors and prices of energy commodities and technologies. These parameters are selected by the experts at PBL using the best available official data at that time. The models are interlinked ensuring consistency and enabling supply and demand interactions. These models are developed over many years and are described in the background reports of the KEV. Additional information is available at:

The English summary of the Climate and Energy Outlook 2024 (Dutch: 'Klimaat en Energieverkenning (KEV)) is available on the PBL website: <https://www.pbl.nl/en/publications/climate-and-energy-outlook-of-the-netherlands-2024>

The complete KEV (in Dutch) and relevant background reports (including methods applied and assumptions used) are available on the PBL website: <https://www.pbl.nl/kev/consortium-klimaat-en-energieverkenning-kev>

New Zealand

Source(s)

Ministry of Business, Innovation and Employment

Scenario(s)

Other

General notes

All projections data are based on the 2025/26 submission to the IEA.

The projections are updated on an annual basis.

The energy projections model (SADEM) only considers energy supply and energy demand within New Zealand and is why *Export* and international bunkering figures are not available in projection years. The exception to this is **Coal and coal products Exports** which are reported in projection years.

Projections for the **Heat** product and *Heat output* flow are not available.

The model uses econometric, financial, and optimisation models to consider different future scenarios and sensitivities for the energy sector. The submitted scenario corresponds to a “business as usual” scenario complemented with a carbon price reaching NZD \$250 per tonne by 2050, which is why it is categorised under the “other” scenario category. Additional information about the modelling methodology is available at: <https://www.mbie.govt.nz/assets/739f0bf5df/energy-modelling-technical-guide-august-2016.pdf>

Norway

Source(s)

Not applicable.

Scenario(s)

Not applicable.

General Notes

Projections are not available.

Poland

Source(s)

Not applicable.

Scenario(s)

Not applicable.

General notes

Updated projections are not available.

Portugal

Source(s)

Directorate General for Energy and Geology (DGEG)

Scenario(s)

Aspirational - achieving national targets

General notes

All projections data are based on the 2025/26 submission to the IEA. The energy projections are the same as the 2024/2025 submission because no updates have

been made. The GDP and population projections and their associated indicators have been updated in the most recent submission.

Projections for the year 2050 are not available. Values projected under the **Tide, wave and ocean and other energy sources** corresponds to wave energy.

The projections are updated on a regular basis, as they support the decisions regarding NECP 2030 (National Energy and Climate Plan). Projections are updated outside this timeframe if any substantial reason justifies a change, such as the development of national strategies or policies affecting significantly the energy system.

DGEG has prepared several scenarios to base the decisions by the Government regarding strategy, targets, and measures, for the Portuguese NECP 2030. The scenarios have been developed with the national model JANUS, which is implemented over a LEAP platform. For the purpose of this publication, the "With Additional Measures" (WAM) scenario is categorised as "Aspirational - achieving national targets.

NECP targets are policy decisions and not directly the outcomes of the energy modelling. In general, targets are more conservative than the modelling, as they take into account other information and concerns (e.g., security of supply). The projections were developed with back casting techniques and awareness of policy trends, stakeholder perceptions, and recent R&D results; not forward-looking and finding cost-optimal paths considering cost and efficiency curves of technology, fuels and emissions as it is done for instance by the Carbon Neutrality Roadmap 2050.

Additional information is available at:

NECP 2030 (in Portuguese): https://www.dgeg.gov.pt/media/54fldci3/pnec2030_para_aprov_ar.pdf

NECP 2030 annex (in Portuguese): [DR125-001-00295-118818207-071_127_2025.pdf](https://www.dgeg.gov.pt/media/54fldci3/pnec2030_para_aprov_ar.pdf)

Carbon Neutrality Roadmap: https://www.dgeg.gov.pt/media/cndbmebs/rcm-107_2019.pdf

Resident population estimates (central scenario): https://www.ine.pt/ngt_server/attachfileu.jsp?look_parentBoui=753199150&att_display=n&att_download=y

Slovak Republic

Source(s)

Ministry of Economy of the Slovak Republic

Collaborating institutions: Ministry of Environment of the Slovak Republic, Ministry of Economy of the Slovak Republic

Scenario(s)

Stated policies

Aspirational – achieving national targets

General notes

All projections data are based on the 2024/25 submission to the IEA, which has been re-published for the 2025/26 reporting cycle because the projections have not been updated.

As needed, recalibration is done at least every 3 years; scenario updates can be done multiple times a year.

In the 2026 edition, the *Electricity output* and *Heat Output* flows for **Natural gas** are not available for the 2040 and 2050 projection years.

To derive the projections, the model used is Compact Primes Slovakia, developed by E3-Modelling - developed in the General Algebraic Modelling System (GAMS), is a fully-fledged energy demand and supply model, designed as a single-country compact tool. A substantial part of the mathematics of CPS are derived from the well-known PRIMES model, a largescale modular system of sub-models, covering multiple countries. The model is actor and market oriented, and so it represents individual actors' decisions in supply and demand of energy and the balancing of their decisions in simultaneous markets cleared by prices.

The WEM scenario (With Existing Measures) is a reference scenario. The scenario contains measures and policies that have been adopted by 2021. This scenario includes currently (2023) valid sectoral legislative regulations. The calibration year of the scenario was 2019.

Modelling only includes a summary category of biomass and waste, so the distinction between renewable and non-renewable waste is therefore not possible.

In the reporting, values for **Biomass and renewable waste** include non-renewable waste.

For final consumption in *Industry*, the model does not calculate heat demand; instead it calculates steam demand. In the cells of final consumption of heat in *Industry*, the values for steam are reported.

Energy consumption of heat pumps was not specifically modelled; values are therefore zero.

Electricity output for **Natural gas** includes, in 2040 and 2050, electricity generated from all gasses, which can include clean gas.

International aviation bunkers, *Stock changes* were not calculated within the model.

Model calculates only net *Imports*. If the value is positive, the number was written in *Imports*, and if negative, the value was written in *Exports*.

For *Memo: Installed electrical capacity* oil is not distinguishable from natural gas plants, so the combined value is reported under **Natural gas**.

The distinction between *Non-energy use* and *Non-energy use chemical/petrochemical* is not possible in the model.

Additional information is available at:
<https://www.mhsr.sk/uploads/files/A65vdZIY.pdf?csrt=11227970159270649411>

Spain

Source(s)

Ministry for the Ecological Transition and the Demographic Challenge

Scenario(s)

Aspirational - achieving national targets

General notes

All projections data are based on the 2025/26 submission to the IEA, which have been re-published from the 2024/2025 submission because no updates have been made to the projections.

Projections for 2040 and 2050 are not available. Aggregated figures for some flows and products in 2040 and 2050 are available in the LT-LEDS below.

The projections are based on Spain's Long-term low greenhouse gas emission development strategies (LT-LEDS). Additional information is available at:

https://www.miteco.gob.es/es/prensa/anexoelp2050_tcm30-516147.pdf

<https://www.miteco.gob.es/es/energia/participacion/2024/detalle-participacion-publica-k-717.html>

Sweden

Source(s)

Swedish Energy Agency in collaboration with other governmental institutions.

Scenario(s)

Stated policies

General notes

All projections data are based on the 2025/26 submission to the IEA, which have been re-published from the 2024/2025 submission because no updates have been made to the projections.

The projections are updated once every two years.

The projections are based on the reference scenario used for calculating projections of greenhouse gas emissions according to Regulation (EU) No 525/2013 - European Union Greenhouse gas Monitoring Mechanism Regulation (MMR). Hence, the scenario is classified as "stated policies."

For the projections, the modelling for solar power allocates all of its production to the energy industry and not to other sectors. There are no forecasts for the import/export of **Oil and oil products**, hence *Imports* for this product should be interpreted as "net imports of crude oil and oil products".

Values under **Total waste, non-renewable portion** include other non-renewable fuels not classified as waste. Furthermore, the *Statistical difference* reported under **Biofuels and renewable waste** represents the use of biofuels for non-energy purposes/feedstocks.

The power efficiency of products is generally high due to the widespread use of flue gas condensation.

Switzerland

Source(s)

Swiss Federal Office of Energy

Collaborating institutions: Prognos AG, TEP Energy, Infras AG

Scenario(s)

Aspirational - achieving national targets

General notes

All projections data are based on the 2025/26 submission to the IEA. The energy projections are the same as the 2024/2025 submission because no updates have been made to the energy model. The GDP and population projections and their associated indicators have been updated in the most recent submission.

Projections are updated typically once every five to ten years.

The projections are based the main scenario used for the Swiss long-term climate strategy to 2050 and for the submission of the strategy to the UN Climate Change Secretariat. The target scenario is based on net-zero emissions in 2050; nuclear phase out by 2034 and a balanced electricity annual balance in 2050.

Additional information is available at:

<https://www.bfe.admin.ch/bfe/de/home/politik/energieperspektiven-2050-plus.html>

Projections of *Imports* are net imports.

Switzerland's energy projections use a 100% efficiency to calculate the primary energy equivalent, reported in *Indigenous production*, for **Geothermal Heat output**. The IEA convention is an efficiency of 50%, so the figures reported here will not align with historical data and other country's projections.

Data reported under **Biofuels and renewable waste** include power-to-X and power-to-hydrogen figures from renewable sources and biogenic fuels.

The *Energy industry own use and distribution losses* flow under the **Electricity** product include electricity consumption by electrolyzers and carbon capture and storage (CCS). Similarly, **Heat** figures reported under the *Energy industry own use and distribution losses* flow include heat consumption by CCS.

Republic of Türkiye

Source(s)

Not applicable.

Scenario(s)

Not applicable.

General notes

Projections are not available.

United Kingdom

Source(s)

Department of Energy Security and Net Zero (DESNZ)

Scenario(s)

Business as usual.

General notes

All projections data are based on the 2025/26 submission to the IEA.

Projections are updated annually.

Partial projections are available for 2030, 2040 and 2050 for **Coal and coal products**, **Oil and oil products**, **Natural gas** and **Electricity**. For other energy products, information is not available. Due to the partial nature of the data, only some final consumption indicators are available in projection years alongside total GDP and population.

The Energy and Emissions Projections publication provides projections of energy, emissions and electricity generation. These projections include policies that have

been implemented and those that are planned - where the level of funding has been agreed and the design of the policy is near final.

Additional information and data are available at:

<https://www.gov.uk/government/publications/energy-and-emissions-projections-2024-to-2050>

United States

Source(s)

Not applicable.

Scenario(s)

Not applicable.

General notes

Updated projections are not available. Past submissions were based on the EIA's annual energy outlook (AEO). The most up-to-date information about the AEO can be found here: <https://www.eia.gov/outlooks/aeo/>.

European Union

Source(s)

Not applicable.

Scenario(s)

No information is available.

General notes

Projections are available; they cannot be publicly disseminated by the IEA.

Units and conversions

General conversion factors for energy

To	TJ	Gcal	Mtoe	MBtu	GWh
From:	multiply by:				
terajoule (TJ)	1	2.388×10^2	2.388×10^{-5}	9.478×10^2	2.778×10^{-1}
gigacalorie (Gcal)	4.187×10^{-3}	1	1.000×10^{-7}	3.968	1.163×10^{-3}
million tonnes of oil equivalent (Mtoe)	4.187×10^4	1.000×10^7	1	3.968×10^7	1.163×10^4
million British thermal units (MBtu)	1.055×10^{-3}	2.520×10^{-1}	2.520×10^{-8}	1	2.931×10^{-4}
gigawatt hour (GWh)	3.600	8.598×10^2	8.598×10^{-5}	3.412×10^3	1

Decimal prefixes

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

Abbreviations

Btu:	British thermal unit
GWh:	gigawatt hour
kcal:	kilocalorie
kg:	kilogramme
kJ:	kilojoule
Mt:	million tonnes
t:	metric ton = tonne = 1,000 kg
GHG:	greenhouse gas
CO ₂ :	carbon dioxide
N ₂ O:	nitrous oxide
CH ₄ :	methane
CO _{2eq} :	carbon dioxide equivalent
GWP:	global warming potential
TJ:	terajoule
toe:	tonne of oil equivalent = 10 ⁷ kcal
CHP:	combined heat and power
GCV:	gross calorific value
NCV:	net calorific value
GDP:	gross domestic product
PPP:	purchasing power parity
TES:	total energy supply
TFC:	total final consumption
EU:	European Union
SLT:	Standing Group for Long-Term Cooperation
IEA:	International Energy Agency
IPCC:	Intergovernmental Panel on Climate Change
ISIC:	International Standard Industrial Classification
OECD:	Organisation for Economic Co-Operation and Development
c	confidential
..	not available
N/A:	not applicable

International Energy Agency (IEA).

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Typeset in France by IEA – September 2026

Cover design: IEA