International Energy Agency
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ENERGY EFFICIENCY INDICATORS 2017 EDITION

DATABASE DOCUMENTATION

This document provides information regarding the 2017 edition of the *Energy efficiency indicators* database. This document can be found at the following link: http://data.iea.org/payment/products/120-energy-efficiency-indicators-2017-edition.aspx

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1. DATABASE STRUCTURE

The *Energy efficiency indicators* database includes annual data for:

- countries: 26 countries;
- years: 2000-2015, unless otherwise specified.

In its B2020 version, the database includes the following four files:

EEI RESIDENTIAL.IVT **Residential sector detailed data and indicators**
Residential energy end-use (8 products; 17 end uses) (PJ);
Residential activity data (6 flows);
Residential energy indicators (6 flows);
Residential carbon indicators (4 flows);

EEI SERVICES.IVT **Services sector detailed data and indicators**
Services energy end-use (8 products; 6 end uses) (PJ);
Services activity data (6 flows);
Services energy indicators (5 flows);
Services carbon indicators (4 flows);

EEI INDUSTRY.IVT **Industry sector detailed data and indicators**
Industry energy use (8 products; 20 sub-sectors) (PJ);
Industry activity data (6 flows);
Industry energy indicators (2 flows);
Industry carbon indicators (2 flows);

EEI TRANSPORT.IVT **Transport sector detailed data and indicators**
Transport energy end-use (10 products; 13 end uses) (PJ);
Transport activity data (5 flows);
Transport energy indicators (6 flows);
Transport carbon indicators (4 flows).
Transport activity indicators (6 flows)

The database in excel version, is structured into several sheets, as follows:

RESIDENTIAL-Energy	Residential energy end-use (8 products; 17 end uses) (PJ);
SERVICES-Energy	Services energy end-use (8 products; 6 end uses) (PJ);
INDUSTRY-Energy	Industry energy use (8 products; 20 sub-sectors) (PJ);
TRANSPORT-Energy	Transport energy end-use (10 products; 13 end uses) (PJ);
ACTIVITY DATA	Sectorial activity data (15 products)
Residential Energy Indicators	Residential energy indicators by end use (6 flows);
Services Energy Indicators	Services energy indicators by end use (5 flows);
Industry Energy Indicators	Industry energy indicators by sub-sector (2 flows);
Transport Energy Indicators	Transport energy indicators by mode/vehicle type (6 flows);
Residential Carbon Indicators	Residential carbon indicators by end use (4 flows);
Services Carbon Indicators	Services carbon indicators by end use (4 flows);
Industry Carbon Indicators	Industry carbon indicators by sub-sector (2 flows);
Transport Carbon Indicators	Transport carbon indicators by mode/vehicle type (4 flows).

2. METHODOLOGICAL NOTES

The IEA energy efficiency indicators data collection

In 2009, IEA Members committed to collect energy efficiency indicators data through a new annual questionnaire. The questionnaire collects energy consumption and activity data for various end-uses, sub-sectors and modes/vehicle types across the four sectors: residential, services, industry and transport. The questionnaire is available online at the IEA energy efficiency statistics web page: www.iea.org/statistics/topics/energyefficiency/.

The IEA also developed a manual on energy efficiency data and indicators, *Energy Efficiency Indicators: Fundamentals on Statistics*; and one on how to use indicators to inform policies, *Energy Efficiency Indicators: Essentials for Policy Making*, both of which can be downloaded from the above IEA web page.

Notes on data quality

The analysis of demand-side energy efficiency trends requires highly disaggregated end-use energy data across the sectors of final consumption: residential, services, transport and industry. Examples of such disaggregated data include energy consumption by end-use (space heating, cooking, appliances, etc.) for the residential sector; or energy consumption by mode/vehicle type (passenger cars, motorcycle, freight trucks, etc) for transport. Deriving energy efficiency indicators also requires consistent "activity data" covering the wide range of activities specific to each sub-sector/end-use, such as floor area, passenger-kilometres, production of key manufacturing output (cement, aluminium, iron, etc.), number of employees in each service category, etc.

While almost all countries have developed energy statistics to produce national energy balances, more disaggregated end-use energy and activity data are not always as readily available. Therefore, the development of energy efficiency indicators generally requires additional efforts, such as mapping the different available data through administrative sources, setting up new data collections; but also establishing new institutional arrangements to share and manage the different data.

The IEA end-use data collection agreed in 2009 is still work in progress, with developing quality and coverage across Member countries. Currently, IEA countries generally have relatively detailed data for the industry sector thanks to well established data collections to develop energy balances. Relatively important progress has been observed in the coverage of the residential sector, while detailed data for the services sector still remain not available for most countries. The availability of transport data varies greatly across countries, with activity data (passenger-kilometres, tonne-kilometres, vehicle stock etc.) often requiring additional development.

Furthermore, as indicators are calculated as a ratio of energy consumption and corresponding activity, and as the various data may not be collected by the same institution, the data quality assessment is particularly important. For example, consistency of boundaries and definition between energy and activity data is essential to create meaningful indicators, and to analyse their trends. Data users should also be aware that small changes in intensities may be caused by uncertainty in measurement of energy or activity data, and thus weight should be given to long-term trends. Other important validation criteria include internal consistency, consistency with external data sources, and

plausibility (values of indicators need to fall within expected ranges to be meaningful).[1]

The IEA Secretariat is continuously working with member countries to improve the overall quality of the energy efficiency indicators database, including its consistency with the data provided by national administrations to develop the IEA energy balances and with the data reported by other organisations. We expect to keep improving data quality over time, and are grateful for the feedback to this publication received from the different data providers and data users. In any case, the Energy Efficiency Indicators database presents the most complete and updated data available.

Comparability with the IEA energy balances

This publication is based on the IEA energy efficiency indicators data collection which is additional to that used for the IEA energy balances. Due to the emphasis on final end-uses across sectors, some differences occur between the final energy consumption in this publication and the total final energy consumption reported in the IEA energy balances, for the following reasons:

- In this publication, non-energy use is excluded from final energy consumption;
- Energy consumption in ferrous metals (part of basic metals and called iron and steel in the IEA balances) also includes energy consumption and losses in transformation for blast furnaces and coke ovens, which are accounted under the energy and the transformation sectors in the IEA energy balances;
- Energy consumption in mining also include energy consumed to extract oil, gas and coal;
- Transport excludes pipeline transportation and fuel tourism;
- Military energy consumption is excluded, while it is included in the total final energy consumption in the IEA Energy Balances under the other non-specified category.

Besides these systematic differences, some discrepancies might occur due to the higher data disaggregation of this publication, and to the need to adapt different approaches/methodologies (e.g. bottom-up vs top-down) to collect or estimate these data at a country level. Additionally, for some countries different offices/ institutions are responsible for preparing the energy balances and the energy efficiency data shown in this publication, which may also lead to unintended discrepancies.

For more information on IEA energy balances methodologies, please see the documentation of the *World Energy Balances* [2].

Estimates of CO_2 emissions by end-use

The estimates of CO_2 emissions from fuel combustion presented in this publication are calculated using the IEA energy efficiency database, the IEA energy balances and the default methods and emission factors from the *2006 IPCC Guidelines for National Greenhouse Gas Inventories.*

This publication presents only CO_2 emissions from fuel combustion, from all reported energy uses of fuels, excluding emissions from non-energy use of fuels and including emissions reallocated from electricity and heat generation (using the same methodology as in the IEA (2017) *CO_2 emissions from fuel combustion* publication).

CO_2 emissions from fuel combustion

CO_2 = Fuel consumption * Emission factor,

where:

Fuel consumption = amount of fuel combusted,

Emission factor = implied emission factor, based on energy balances fuel mix within and default emission factors

1. For a more comprehensive discussion of validation criteria by sector, please see the chapter on *Data validation* in *Energy Efficiency Indicators: Fundamentals on Statistics*: http://www.iea.org/publications/freepublications/publication/IEA_EnergyEfficiencyIndicatorsFundamentalsonStatistics.pdf.

2. http://wds.iea.org/wds/pdf/WORLDBAL_Documentation.pdf

Fossil fuel categories in the energy efficiency indicators template (coal, oil, gas) are more aggregated than those within the IEA energy balances. Country-specific implied emission factor for oil, coal and gas are computed based on the mix of individual products reported within the IEA energy balances. Emissions are then summed across all fuel categories to obtain total emissions for a given end-use or sub-sector.

Emissions estimates could differ from those published in the IEA (2017) *CO_2 emissions from fuel combustion* publication mainly because the energy consumption data may differ from the IEA energy balances (see previous section). Also, the IEA Secretariat estimates of CO_2 emissions from fuel combustion may not be the same as the figures that a country submits to the UNFCCC for a variety of reasons.

Temperature correction[1]

The amount of energy required for space heating (and space cooling) is highly dependent on the ambient temperature, and this impact on energy consumption may easily mask the effects of energy efficiency improvements. For example, a country may dramatically reduce the amount of energy needed for space heating over a year simply due to an exceptionally warm winter. The opposite may also be true. The reduction in energy consumption due to the energy efficiency improvements in heating systems may be offset by an extra energy demand due to an extremely cold winter.

Therefore, in order to accurately monitor the evolution of energy consumption for space heating in the residential sector (in this publication services' space heating is not temperature corrected) over time, it is essential to eliminate the impact of temperature variations and to analyse temperature-corrected data. In this publication one of the most common methodologies has been adopted for such correction, namely the use of heating degree days (HDD).

HDD are a simplified measure of the intensity and duration of cold weather over a certain period in a given location. The value of HDD for a period, for example a winter, is determined by subtracting for each day the average daily temperature from a base temperature (assumed to be the temperature below which heating systems are turned on), and then adding up this difference for the days of the period for which the average outside air temperature is lower than the base temperature. When the outside air temperature is equal to or higher than the base temperature, HDD are zero. The higher heating degree days, the colder the season, the greater the amount of energy required for space heating. HDD can be defined as:

Heating degree days

$$HDD = \sum_{k=1}^{n} (T_{base} - T_k)$$

$$T_{base} > T_k,$$

where:

T_{base} is the base temperature,

T_k is the average temperature of day k,

n is the total number of days in the given period.

As noted above, two factors are key for the calculation of HDD. The first is the base temperature, which should be set at the level of outside air temperature at which residents of a given region tend to turn on their heating systems. This level can vary across different regions depending on many factors, such as the ability to tolerate cold temperatures, the variety of building types, the thermal properties of buildings, the density of occupants, etc. For example, the base temperature in the United Kingdom is typically 15.5°C while in the United States it is typically 65°F (equivalent to 18°C). The base temperature should be carefully determined based on the characteristics of the region, since this choice will impact the temperature correction of the energy consumption data. It may also evolve in time, for example if people already turn on their thermostat at higher outside temperatures.

The second factor is the time series of average daily temperatures. For example, if the average temperature on one day is 5 degrees below the base temperature, there are five HDD for that day. To get the annual number of HDD, all positive values of HDD are summed for each day in the year.

When the national HDD figures are available, the data of energy consumption for space heating can be corrected for temperature variations. This publication

1. See Annex C *in Energy Efficiency Indicators: Fundamentals on Statistics.*

uses a simplified methodology, which assumes that the elasticity for adjusting heating requirements is 1, as shown below:

Temperature correction

$$Energy_{TCi} = Energy_{actual\ i} * \frac{HDD_{period\ average}}{HDD_{year\ i}},$$

where:

$Energy_{TCi}$ is the temperature-corrected energy consumption for the year *i*,

$Energy_{actual\ i}$ is the actual energy consumption in year *i*,

$HDD_{period\ average}$ is the average heating degree days of the given period (2000-latest year), and

$HDD_{year\ i}$ is the total heating degree days in the year *i*.

Such correction intends to remove the fluctuations in energy consumption due to fluctuations in temperature in the given year compared with the average temperature of a country. For example, if a year has 500 HDD and the annual average HDD for the country is 250, the corrected energy consumption for space heating would be half of the actual energy consumption. Of course, comparison of space heating efficiency indicators across countries is still difficult as a country on average experiencing colder temperatures than another country will need on average to consume more to heat the same floor area.

Similarly, cooling degree days (CDD) are a measure of the intensity of warm weather to correct energy consumption data for space cooling. In this publication, temperature correction are made only for calculating intensity indicators, therefore energy consumption data show the fluctuations due to temperature change. Space cooling is temperature corrected only for countries where CDD are data available.

3. END-USES DEFINITIONS

Residential		
Flow	**Short name**	**Definition**
Total Residential	R_TOTAL	Includes consumption by households, excluding fuels used for transport. Includes households with employed persons [ISIC Rev. 4 Divisions 97 and 98] which are a small part of total residential consumption. The different end-uses within the residential sector are described below.
Residential space heating	R_SPACE_H	Represents the residential sector space heating end-use. Space heating includes the different means of heating spaces, which can be achieved through many systems and fuels. Heating systems can broadly be separated into two types, namely central heating and dedicated area/room heating. Central heating systems can heat the entire dwelling; they include hot water and steam systems with radiators, floor or wall furnaces, district heating, heat pumps, etc. Area-dedicated heating systems can be divided into several categories: standalone electric heaters, fireplaces, and stand-alone stoves using oil products or other fuels, such as coal or wood. It is not rare that households use a combination of several systems, e.g. electrical heaters to complement insufficient base central systems. Heating systems can generate heat using a number of energy sources such as electricity, natural gas, coal, fuel oil, liquefied petroleum gas (LPG), kerosene, biofuels, and active or passive solar energy.
Residential space cooling	R_SPACE_C	Represents the residential sector space cooling end-use. Space cooling includes all equipment used for cooling a living area, which can be divided into two broad categories: central cooling systems and room-dedicated systems. Central air conditioners feed into a duct system that could also be used by a central heating system. Wall air conditioners and split systems are used to cool a room. There are other possible cooling systems such as swamp coolers (or evaporative coolers), which cool air through evaporation of water; heat pumps that can be used in reverse mode to cool the air or district cooling. Most of the cooling systems in the residential sector run exclusively on electricity.

Residential		
Flow	**Short name**	**Definition**
Residential water heating	R_WATER_H	Water heating, also known as domestic hot water, includes systems that are used for heating water for showers, bathing, washing, etc. A number of tank-based or tankless systems can be used to heat the water. Water heating can be produced alone or in combination with space heating systems. The main energy sources used by water heating systems include natural gas, LPG, electricity, biofuels and, increasingly, solar thermal energy in a growing number of countries.
Residential cooking	R_COOKING	Cooking includes energy consumed to cook meals using a wide range of stoves, from advanced induction stoves to traditional three-stone stoves. A number of energy sources are used for cooking such as natural gas, electricity, biofuels, LPG, kerosene and coal. Beside stoves, ovens are also included in the energy consumption for cooking. Cooking appliances such as toasters and microwave ovens, due to the difficulty in separating their respective consumption, are normally reported under other appliances.
Residential lighting	R_LIGHTING	Residential lighting includes energy consumed for interior or exterior lighting of dwellings today mainly powered by electricity. Incandescent lamps, which have been around for more than a century, are slowly being replaced by more efficient fixtures, e.g. fluorescent tubes, compact fluorescent lamps and LEDs (light-emitting diodes). More and more countries are passing regulations to phase out the use of incandescent bulbs. Households that do not have any access to electricity still rely on traditional forms of lighting such as kerosene and LPG lamps, and sometimes even candles and flashlights. Moreover, off-grid solar applications for lighting may become more prominent in the future.
Residential appliances	R_APPLIANC	Residential appliances encompasses two main categories: large (or major) appliances (sometimes also called white appliances or white goods) and other (usually much smaller) appliances. Residential appliances are disaggregated as below.
Refrigerators	R_REFRIG	Refrigerator can be defined as a box, room, or cabinet in which food, drink, etc., are kept cool by means of ice or mechanical refrigeration.
Freezers	R_FREEZER	Freezers can be defined as a box, room, or cabinet held at or below 0°C (32°F).
Refrigerator/Freezer combinations	R_REFFREEZ	Refrigerator/Freezer combinations refers to a single appliance that have both a refrigerator and a freezer compartment.
Dish washers	R_DISH_W	Dish washer is a machine for washing dishes, kitchen utensils, etc., automatically.
Clothes washers	R_CLOTH_W	Clothes washers also known as washing machines are appliances for washing clothing, linens, etc.
Clothes dryers	R_CLOTH_D	Clothes dryers are appliances used to dry clothing, linens, etc.
Televisions	R_TV	Televisions, also including home entertainment devices.

Residential		
Flow	**Short name**	**Definition**
Personal computers	R_PC	Personal Computers, also including other information technology devices.
Other appliances	R_OTHER	Other appliances, including all appliances not specified above, such as phones, hair driers, microwaves, vacuum cleaners etc. For country specific information, please refer to country notes.
Non-specified	R_NONSPEC	Non-specified includes all consumption for energy uses that are not specified above. For some countries, this category could also include data from end-uses listed above. For country specific information, please refer to the chapter on *Country notes*.

Services		
Flow	**Short name**	**Definition**
Total Services	S_ALL	Services sector includes commercial activities and public services [ISIC Division 33 to 99].
Services space heating	S_SPACE_H	Represents the services sector space heating end-use. Space heating includes the different means of heating spaces, which can be achieved through many systems and fuels. Heating systems can broadly be separated into two types, namely central heating and dedicated area/room heating. Central heating systems can heat the entire dwelling; they include hot water and steam systems with radiators, floor or wall furnaces, district heating, heat pumps, etc. Area-dedicated heating systems can be divided into several categories: standalone electric heaters, fireplaces, and stand-alone stoves using oil products or other fuels, such as coal or wood. It is not rare that households use a combination of several systems, e.g. electrical heaters to complement insufficient base central systems. Heating systems can generate heat using a number of energy sources such as electricity, natural gas, coal, fuel oil, liquefied petroleum gas (LPG), kerosene, biofuels, and active or passive solar energy.
Services space cooling	S_SPACE_C	Represents the services sector space cooling end-use. Space cooling includes all equipment used for cooling a living area, which can be divided into two broad categories: central cooling systems and room-dedicated systems. Central air conditioners feed into a duct system that could also be used by a central heating system. Wall air conditioners and split systems are used to cool a room. There are other possible cooling systems such as swamp coolers (or evaporative coolers), which cool air through evaporation of water; heat pumps that can be used in reverse mode to cool the air or district cooling. Most of the cooling systems in the residential sector run exclusively on electricity.
Services lighting	S_LIGHTING	Services lighting includes energy consumed for interior or exterior lighting in the services sector today mainly powered by electricity.
Other building energy use	S_NONSPEC	Other building energy use includes all consumption in the services sector for uses that are not space heating, space cooling and lighting. If data for one or more uses specified above (space heating, space cooling & lighting) are not available, then Other building energy use should also include data for consumption in these uses. i.e. other = total - (space heating + space cooling + lighting)
Non-building energy use	S_GENERIC	Includes all the consumption that happens in the services sector outside buildings (e.g. street lighting etc.)

Industry		
Flow	**Short name**	**Definition**
Manufacturing [ISIC 10-18, 20-32]	M_TOTAL	It includes all the manufacturing subsectors listed below [ISIC Division 10 to 18 and 20 to 32]. Manufacture of coke and refined petroleum products [ISIC Division 19] is excluded from Manufacturing.
Food and tobacco [ISIC 10-12]	M_FOOD	Includes food, beverages and tobacco manufacturing [ISIC Divisions 10 to 12].
Textile and leather [ISIC 13-15]	M_TEXTILE	Includes textile and leather [ISIC Divisions 13 to 15].
Wood and wood products [ISIC 16]	M_WOOD	Includes wood and wood products (other than pulp and paper) [ISIC Division 16].
Paper pulp and printing [ISIC 17-18]	M_PAPPRINT	Includes paper, pulp and printing [ISIC Divisions 17 and 18].
Chemicals and chemical products [ISIC 20-21]	M_INDCHEMS	Includes chemical and petrochemical industry [ISIC Divisions 20 and 21] excluding petrochemical feedstocks.
Rubber and plastic [ISIC 22]	M_RUBPLAST	Includes rubber and plastics [ISIC Division 22]. If not available could be included under non-specified manufacturing.
Non-metallic minerals [ISIC 23]	M_NONMETAL	Includes non-metallic minerals such as glass, ceramic, cement, etc. [ISIC Division 23].
Of which: cement	M_CEMENT	Include the energy used for the production of cement [ISIC Division 23 Class 94]. This Class is included under Non-Metallic Minerals [ISIC Division 23].
Basic metals [ISIC 24]	M_METALS	Includes manufacture and casting of ferrous metals and non-ferrous metals [ISIC Division 24].
Ferrous metals [ISIC 2410+2431]	M_FERROUS	Covers manufacture and casting of iron and steel including energy used in blast furnaces and coke ovens [ISIC Class 2410 and Class 2431];
Non-ferrous metals [ISIC 2420+2432]	M_NONFERRO	Includes manufacture and casting of non-ferrous metals (e.g. aluminium) [ISIC Class 2420 and Class 2432].
Machinery [ISIC 25-28]	M_MACHINE	Includes machinery: fabricated metal products, machinery and equipment other than transport equipment [ISIC Divisions 25 to 28].
Transport equipment [ISIC 29-30]	M_CARS	Includes [ISIC Divisions 29 and 30].
Other manufacturing [ISIC 31-32]	M_OTHERS	Includes the manufacture of furniture and other manufacturing (e.g. jewellery) [ISIC Division 31 and 32].
Non-specified manufacturing	M_NONSPEC	Represents energy use in manufacturing that cannot be allocated to the previous categories.

Industry		
Flow	**Short name**	**Definition**
Memo: Coke and refined petroleum products [ISIC 19]	M_REFINING	This division includes the transformation of crude petroleum and coal into usable products [ISIC Division 19]. The dominant process is petroleum refining, which involves the separation of crude petroleum into component products through such techniques as cracking and distillation. This division also includes the manufacture for own account of characteristic products (e.g. coke, butane, propane, petrol, kerosene, fuel oil etc.) as well as processing services (e.g. custom refining). This division includes the manufacture of gases such as ethane, propane and butane as products of petroleum refineries. Not included is the manufacture of such gases in other units (2011), manufacture of industrial gases (2011), extraction of natural gas (methane, ethane, butane or propane) (0600), and manufacture of fuel gas, other than petroleum gases (e.g. coal gas, water gas, producer gas, gasworks gas) (35420). The manufacture of petrochemicals from refined petroleum is classified in division 20.
Agriculture, forestry and fishing [ISIC 01-03]	O_AGROFISH	Includes agriculture, forestry and fishing [ISIC Division 01 to 03].
Mining [ISIC 05-09]	O_MINING	Covers mining and quarrying including coal, oil and gas extraction [ISIC Division 05 to 09].
Construction [ISIC 41-43]	O_CONSTR	Includes [ISIC Divisions 41 to 43].

Transport		
Flow	**Short name**	**Definition**
Total passenger and freight transport	TOTAL	Transport covers all transport modes using commercial energy, independently of the sector where the transport activity occurs. As a consequence, cycling, walking or sailing are not covered in this sector, even though these modes could represent sizeable activities in terms of passenger-kilometres (pkm). Transport excludes international marine and aviation bunkers, pipeline transportation, and when possible fuel tourism (unlike world energy balances). The transport sector is divided by segment (passenger and freight), mode (road, rail, air and water) and by vehicle type (e.g. cars, motorcycles, etc).
Total passenger transport	P_TOTAL	Includes all mode of transportation dedicated to transporting passengers.
Cars/light trucks	P_CARS	Includes passenger light-duty vehicles carrying up to eight persons, cars, minivans, sport utility vehicles and personal-use pickup trucks. [1] Passenger cars cover a number of categories, such as taxis, hire cars, ambulances and motor homes.
Motorcycles	P_MCYCL	Includes powered 2- to 4-wheeled road motor vehicles not exceeding 400 kilograms.
Buses	P_BUS	Includes urban, suburban and intercities mini-coaches, trolleybuses, minibuses and bus vehicles.
Passenger trains	P_RAIL	Includes any movement of passengers through railway, on a given railway network, regional, urban or suburban, within the national boundaries. Passenger rail transport includes trains, metro vehicles and trams (streetcars). Rail transport can be powered by electricity, diesel or steam.
Domestic passenger airplanes	P_AIR	Includes passenger airplanes, aircrafts configured for the transport of passengers, used for domestic travels. For country-specific coverage, please refer to country notes.
Domestic passenger ships	P_WATER	Covers the movement of passengers, by any kind of vessel, boat or ship, undertaken at sea, or on lakes and rivers, within the national boundaries. International water transport is excluded from national totals, while inland waterways transport is included. For country-specific coverage, please refer to country notes.
Total freight transport	F_TOTAL	Includes all mode of transportation dedicated to transporting goods.

1. For some countries, pick-up trucks are reported either in passenger transport or freight transport according to their main use. For country-specific information, please refer to the chapter on *Country notes*.

Transport		
Flow	**Short name**	**Definition**
Freight trucks	F_TRUCKS	Covers the movement of goods within the national boundaries by road vehicles designed, exclusively or primarily, to carry goods: light duty freight vehicles (vans and pickups), heavy-duty goods vehicles (trucks or lorries), road tractors, and agricultural tractors permitted to use roads open to public traffic.
Freight trains	F_RAIL	Includes any movement of goods by railway vehicles on a given railway network, regional, urban or suburban, within the national boundaries. Rail transport can be powered by electricity, diesel or steam.
Domestic freight airplanes	F_AIR	Covers the movement of goods by aircrafts configured for the transport of freight or mail, operating within the national boundaries. For country-specific coverage, please refer to country notes.
Domestic freight ships	F_WATER	Covers the movement of goods by any kind of vessel, boat, barge or ship, undertaken at sea, or over lakes and rivers, within the national boundaries. International water transport is excluded from national totals, although it has been the largest carrier of freight throughout recorded history. For country-specific coverage, please refer to country notes.
Memo: Total road	ROAD	It includes passenger (cars, motorcycles, buses) and freight (trucks) road transportation.
Memo: Total trains	RAIL	It includes passenger and freight trains transportation.
Memo: Total airplanes	AIR	It includes domestic passenger and freight airplanes.
Memo: Total ships	WATER	It includes domestic passenger and freight ships and excludes fuel used for ocean, coastal and inland fishing (included under agriculture) and military consumption.

4. PRODUCT DEFINITIONS

The Product dimension includes energy products and activity data, as described below.

PRODUCTS		
Flow	**Short name**	**Definition**
Oil and oil products (PJ)	E_OIL	Includes crude oil, natural gas liquids, refinery feedstocks, additives as well as other hydrocarbons (including emulsified oils, synthetic crude oil, mineral oils extracted from bituminous minerals such as oil shale, bituminous sand, etc., and oils from coal liquefaction), refinery gas, ethane, LPG, aviation gasoline, motor gasoline, jet fuels, kerosene, gas/diesel oil, fuel oil, naphtha, white spirit, lubricants, bitumen, paraffin waxes, petroleum coke and other oil products. Data shown for the transport sector in this publication present the disaggregation of oil products described below.
Motor gasoline (PJ)	E_GASOL	It is light hydrocarbon oil for use in internal combustion engines such as motor vehicles, excluding aircraft. Motor gasoline is distilled between 35°C and 215°C and is used as a fuel for land based spark ignition engines. Motor gasoline may include additives, oxygenates and octane enhancers, including lead compounds such as TEL (tetraethyl lead) and TML (tetramethyl lead). In this publication and differently from the IEA energy balances, motor gasoline for transport includes liquid biogasoline or ethanol.
Diesel and light fuel oil (PJ)	E_DIESEL	Includes diesel oil for fuel use in compression ignition (diesel) engines fitted in road vehicles. Distillation range is 160°C to 390°C. In this publication and differently from the IEA energy balances, diesel for transport includes liquid biodiesels.
LPG (PJ)	E_LPG	LPG are light paraffinic hydrocarbons derived from refinery processes, crude oil stabilisation plants and natural gas processing plants. They consist mainly of propane (C_3H_8) and butane (C_4H_{10}) or a combination of the two. They could also include propylene, butylene, isobutene and isobutylene. LPG are normally liquefied under pressure for transportation and storage.

PRODUCTS		
Flow	**Short name**	**Definition**
Heavy fuel oil (PJ)	E_HFO	Fuel oil defines oils that make up the distillation residue. It comprises all residual fuel oils, including those obtained by blending. Its kinematic viscosity is above 10 cSt at 80°C. The flash point is always above 50°C and the density is always higher than 0.90 kg/l.
Jet fuel and aviation gasoline (PJ)	E_JETF	Includes Gasoline type jet fuel and Kerosene type jet fuel as described below: Gasoline type jet fuel includes all light hydrocarbon oils for use in aviation turbine power units, which distil between 100°C and 250°C. This fuel is obtained by blending kerosenes and gasoline or naphthas in such a way that the aromatic content does not exceed 25% in volume, and the vapour pressure is between 13.7 kPa and 20.6 kPa. Additives can be included to improve fuel stability and combustibility. Kerosene type jet fuel is a medium distillate used for aviation turbine power units. It has the same distillation characteristics and flash point as kerosene (between 150°C and 300°C but not generally above 250°C). In addition, it has particular specifications (such as freezing point) which are established by the International Air Transport Association (IATA). It includes kerosene blending components. Kerosene type jet fuel excluding bio does not include the liquid biofuels blended with jet kerosene.
Gas (PJ)	E_GAS	Gas includes natural gas (excluding natural gas liquids).
Coal and coal products (PJ)	E_COAL	Coal includes all coal, both primary (including hard coal and lignite) and derived fuels (including patent fuel, coke oven coke, gas coke, BKB, gas works gas, coke oven gas, blast furnace gas and other recovered gases), as well as peat (including peat products) and oil shale.

PRODUCTS		
Flow	**Short name**	**Definition**
Combustible renewables and wastes (PJ)	E_WOOD	Combustible renewables and wastes comprises solid biofuels, liquid biofuels, biogases, industrial and municipal wastes. Combustible renewables and wastes data are often based on incomplete information, with particularly high caution on data quality. Solid biofuels are defined as any plant matter used directly as fuel or converted into other forms (e.g. charcoal) before combustion. This covers a multitude of woody materials generated by industrial process or provided directly by forestry and agriculture (firewood, wood chips, bark, sawdust, shavings, chips, sulphite lyes also known as black liquor, animal materials/wastes and other solid biofuels). Liquid biofuels include biogasoline, biodiesel and other liquid biofuels. Liquid biofuels consumed in the transport sector are included, in this publication, under motor gasoline and diesel. Biogases comprise landfill gas, sewage sludge gas and other biogases from anaerobic fermentation. Note that biofuels refer only to the amounts of biomass specifically used for energy purposes. Therefore, the non-energy use of biofuels is null by definition. Municipal waste consists of products that are combusted directly to produce heat and/or power and comprises wastes produced by households, hospitals and the tertiary sector that are collected by local authorities for incineration at specific installations. Industrial waste of non-renewable origin consists of solid and liquid products (e.g. tyres) combusted directly, usually in specialised plants, to produce heat and/or power.
Heat (PJ)	E_DHEAT	Heat includes all heat produced by main activity producer CHP and heat plants, as well as heat sold by autoproducer CHP and heat plants to third parties. Fuels used to produce quantities of heat for sale are included in transformation processes under the rows *CHP plants* and *Heat plants*. The use of fuels for heat which is not sold is included under the sectors in which the fuel use occurs.
Electricity (PJ)	E_ELEC	Electricity includes electricity generated from all sources.
Other sources (PJ)	E_OTHER	Other includes all the forms of energy not included in the list above (e.g. geothermal and solar thermal heat direct use etc.).
Total final energy (PJ)	E_FINAL	Represents total consumption of energy including all the products listed above.

ACTIVITY DATA		
Flow	**Short name**	**Definition**
Population (10^6)	ACT_POP	Total population.
Occupied dwellings (10^6)	ACT_DWEL_OCC	Includes only primary residences excluding unoccupied dwellings and secondary residences.
Residential floor area (10^9 m2)	ACT_R_AREA	Includes only floor area of occupied dwellings.
Heating degree days (10^3)	ACT_H_DDAYS	Heating Degree Days (HDD) are a simplified measure of the intensity and duration of cold weather over a certain period in a given location. The value of HDD for a period, for example a winter, is determined by subtracting for each day the average daily temperature from a base temperature (assumed to be the temperature below which heating systems are turned on), and then adding up this difference for the days of the period for which the average outside air temperature is lower than the base temperature. When the outside air temperature is equal to or higher than the base temperature, HDD are zero. The higher heating degree days, the colder the season, the greater the amount of energy required for space heating.
Cooling degree days (10^3)	ACT_C_DDAYS	Similarly to HDD, cooling degree days (CDD) are a measure of the intensity of warm weather to correct energy consumption data for space cooling. In this publication, temperature correction are made only for calculating intensity indicators, therefore energy consumption data show the fluctuations due to temperature change. Space cooling is temperature corrected only for countries where CDD are data available.
Stocks (million units)	ACT_STOCK	Includes stock of appliances within occupied dwellings.
Services employment (10^6)	ACT_S_EMPLOY	Includes the employment total in full-time equivalents in the services sector. The number of full-time equivalent jobs, defined as total hours worked divided by average annual hours worked in full-time jobs. In some cases it refers to services' employment total in persons.
Services floor area (10^9 m2)	ACT_S_AREA	Includes only floor area of services' buildings.
Value added (10^9 USD PPP 2010)	ACT_GDP_P	Value added in USD at the price level and purchasing power parities (PPPs)[1] of the year 2010.
Cement production (10^6 t)	ACT_CEMENT	Includes the production of cement in tons. It excludes trades.
Steel production (10^6 t)	ACT_STEEL	Includes the production of steel in tons. It excludes trades.

1. Purchasing power parities are the rates of currency conversion that equalise the purchasing power of different currencies.

ACTIVITY DATA		
Flow	**Short name**	**Definition**
Passenger-kilometres (10^9 pkm)	ACT_PKM	Pkm is a unit of measure of passenger transport activity. One passenger-kilometre represents the transport of one passenger over one kilometre. For all vehicles, it is the total distance travelled of all passenger summed up.
Tonne-kilometres (10^9 tkm)	ACT_TKM	Tkm is a unit of measure of goods transport activity. One tonne-kilometre represents the transport of one tonne over one kilometre. For all vehicles, it is the total distance travelled of all tonnes summed up.
Vehicle-kilometres (10^9 vkm)	ACT_VKM	Vkm is a unit of measure of vehicle activity. One vehicle-kilometre represents the movement of a vehicle over one kilometre. For all vehicles, it corresponds to the product of the number of vehicles in stock and the average distance travelled by vehicle.
Vehicle stock (10^6)	ACT_VST	Represents the total stock of vehicles (by type) registered in the country.

5. INDICATOR DEFINITIONS

Energy and general indicators		
Flow	**Short name**	**Definition**
Per capita energy intensity (GJ/cap)	EI_PC	Energy intensity per capita calculated as energy consumption divided by total population.
Per floor area energy intensity (GJ/m2)	EI_FA	Energy intensity per floor area (residential or services) calculated as energy consumption divided by floor area.
Per floor area TC energy intensity (GJ/m2)	EI_FA_CC	Energy intensity per floor area (residential or services) calculated as energy consumption divided by floor area (temperature corrected to take into account different average temperatures in different years).
Per dwelling energy intensity (GJ/dw)	EI_PD	Energy intensity per occupied dwelling calculated as energy consumption divided by occupied dwellings.
Per dwelling TC energy intensity (GJ/dw)	EI_PD_CC	Energy intensity per occupied dwelling calculated as energy consumption divided by occupied dwellings (temperature corrected to take into account different average temperatures in different years).
Per unit equipment energy intensity (MJ/unit)	EI_PU	Energy intensity per unit of appliance. It is calculated as energy consumption divided by the number of appliances within occupied dwellings. It represents the average unit consumption of each type of appliance in the country.
Per value added energy intensity (MJ/USD PPP 2010)	EI_GDP	Energy intensity per value added (USD PPP 2010). It is calculated as the ratio between energy consumption and value added.
Per services employee energy intensity (GJ/employee)	EI_PE	Energy intensity per employee calculated as energy consumption divided by employees (services sector only).
Per physical output energy intensity (GJ/t)	EI_PHYSICAL	Energy intensity per physical output calculated as energy consumption divided production of cement or steel.
Fuel intensity (litres/100 vkm)	EI_FUEL_INT	Fuel intensity calculated as litres consumed to drive 100 km.

Energy and general indicators		
Flow	**Short name**	**Definition**
Passenger-kilometres energy intensity (MJ/pkm)	EI_PKM	Represents the energy consumed to drive one passenger over the distance of one kilometre.
Vehicle-kilometres energy intensity (MJ/vkm)	EI_VKM	Represents the energy consumed to drive one vehicle over the distance one kilometre.
Tonne-kilometres energy intensity (MJ/tkm)	EI_TKM	Represents the energy consumed to transport one tonne of goods over a distance of one kilometre.
Passenger-kilometres per capita (10^3 pkm/cap)	EI_PKM_PC	Represents the ratio between passenger-kilometre and total population.
Passenger load factor (pkm/vkm)	EI_LOAD_P	Represents the average number of passengers per vehicle. It can be calculated dividing pkm by vkm.
Vehicle-kilometres per capita (10^3 vkm/cap)	EI_VKM_PC	Represents the ratio between vehicle-kilometre and total population.
Vehicle use (10^3 vkm/vehicle)	EI_VUSE	Represents the ratio between vehicle-kilometre and vehicle stock.
Tonne-kilometres per capita (10^3 tkm/cap)	EI_TKM_PC	Represents the ratio between tonne-kilometre and total population.
Freight load factor (tkm/vkm)	EI_LOAD_F	Represents the average tonnes of goods transported by one vehicle. It can be calculated dividing tkm by vkm.

Carbon indicators		
Flow	**Short name**	**Notes**
Per capita carbon intensity (tCO_2/cap)	CI_PC	Carbon intensity per capita calculated as tonnes of CO_2 divided by total population[1] .
Per floor area carbon intensity (tCO_2/m2)	CI_FA	Carbon intensity per floor area calculated as emissions divided by floor area (residential or services).
Per dwelling carbon intensity (tCO_2/dw)	CI_PD	Carbon intensity per dwelling calculated as emissions divided by occupied dwellings.
Per value added carbon intensity ($kgCO_2$/USD PPP 2010)	CI_GDP	Carbon intensity per value added (USD PPP 2010). It is calculated as the ratio between emissions and value added.
Per services employee carbon intensity (tCO_2/employee)	CI_PE	Carbon intensity per employee calculated as emissions divided by employees (services sector only).
Per physical output carbon intensity (tCO_2/t)	CI_PHYSICAL	Carbon intensity per physical output calculated as emissions divided production of cement or steel.
Passenger-kilometres carbon intensity ($kgCO_2$/pkm)	CI_PKM	Represents the carbon emitted to drive one passenger over the distance of one kilometre.
Vehicle-kilometres carbon intensity ($kgCO_2$/vkm)	CI_VKM	Represents the carbon emitted to drive one vehicle over the distance one kilometre.
Tonne-kilometres carbon intensity ($kgCO_2$/tkm)	CI_TKM	Represents the carbon emitted to transport one tonne of goods over a distance of one kilometre.

1. Consistent with the IEA (2017) *CO_2 emissions from fuel combustion* publication.

6. COUNTRY NOTES

General notes

The notes given in this document refer to data for the years 2000 to 2015 published in the *Energy Efficiency Indicators Highlights* publication, as well as the database on the online data service.

Data are obtained from National Administrations through annual submission of a questionnaire or from the Odyssee database, as indicated for each country in the section on sources.

In some instances, it has been necessary for the IEA Secretariat to estimate some data; explanations of the estimates are provided in the country notes.

For the 2017 edition, value added data have been revised from a 2005 basis to a 2010 basis. This may cause differences from previous releases of data and indicators.

Australia

Sources

Australian Government, Department of the Environment and Energy.

Years covered

2000-2015.

General note

All data refer to the financial year (e.g. July 2014 to June 2015 for 2015).

Discrepancies between the IEA energy efficiency indicators and the IEA energy balances figures are under investigation. A program of work is underway to improve the quality and consistency of these data in Australia. As such, these data should be used carefully.

Residential sector

Data for residential energy consumption have been revised for all end uses.

Data for TVs include TVs only. Data for home entertainment are reported under other appliances.

Data for energy consumption of swimming pools and spas are included under other appliances. Data for energy consumption of natural gas for swimming pools and spas is included in other end-uses, other sources.

Industry and services sectors

Data for energy consumption and value added for paper and printing also include wood.

Data for energy consumption and value added for chemicals also include rubber and plastics and manufacture of coke and refined petroleum products.

Data for energy consumption and value added for machinery includes transport equipment.

Data for value-added for other manufacturing are not available.

Transport sector

Revisions in the upcoming annual data cycle are expected, which are expected to reallocate some energy use from freight transport into passenger transport, as a significant proportion of light commercial vehicle use in Australia is for passenger vehicles rather than for freight movement. These revisions are expected to result in a higher energy intensity for passenger cars; a lower energy intensity for freight road transport; and a lower occupancy of passenger cars than what is shown in this publication.

Austria

Sources

Austrian Energy Agency; Odyssee database.

Years covered

2000-2014 (2015 – partially).

General note

Some discrepancies between the IEA energy efficiency indicators and the IEA energy balances figures might occur.

Residential sector

Data for stocks of PCs are not available.

Data on energy consumption per appliance type and appliance diffusion is not available for the year 2015.

Industry and Services sectors

The data for value added have been revised and show a significant decrease in 2009 for basic metals (ISIC 24), leading to a considerably higher intensity of the sector. This does not reflect physical intensity, as it is based on financial data (notably value added).

Transport sector

Data for energy consumption and activity (passenger-kilometres and tonne-kilometres) of freight airplanes and passenger ships are not available. Energy consumption data might be partially included under passenger airplanes and freight ships, respectively.

Data for energy consumption and activity for the transport sector is not available for the year 2015.

Belgium

Sources

Odyssee database supplied by the Observatoire Energie - Ministry of Energy.

Years covered

2000-2013 (2014/2015 – partially).

General note

Results of the IEA decomposition analysis are not available.

Data for the energy consumption of the transport sector are not available for all modes. Data for this sector were obtained from the country energy balance. Still, the share of transport energy use may be underestimated due to missing data.

Some discrepancies between the IEA energy efficiency indicators and the IEA energy balances figures may arise from estimations included to avoid breaks in the time series of natural gas and electricity consumption resulting from a change in the methodology. Work is ongoing to align data and revise historical time series.

Residential sector

Data for energy consumption for residential appliances include lighting.

Data for energy consumption of residential appliances is available only as a total included under other appliances. Data for energy consumption for space cooling are not available.

Data for energy consumption disaggregated by end use is not available for the years 2014 and 2015.

Industry and Services sectors

Data for value added of several sub-sectors for the year 2015 are not available.

Transport sector

Data for passenger cars occupancy are not available for the years 2014 and 2015, and data for freight road load are not available for the full time series.

Data for energy consumption for motorcycles, buses, freight road, freight airplanes and passenger ships are not available. These latter data might be partially included under passenger airplanes and freight ships, respectively.

Data for energy consumption for passenger cars only include LPG, and hence are not representative of this transport mode.

Canada

Sources

Natural Resources Canada, Statistics Canada.

Years covered

2000-2015.

General notes

Data for energy consumption of combustible renewables and waste are included under other sources.

Differences between the IEA energy efficiency indicators and the IEA energy balances result from different timing of reporting requirements, sources used, as well as definitions and scope of coverage. Work to align the two approaches is ongoing, and the following publications may include revisions.

Detailed energy use information for Canada is available from Canada's National Energy Use Database: http://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/home.cfm.

Industry and Services sectors

Data for value added for Canada are based on price levels and PPPs of 2005, instead of 2010 as for other countries.

Pulp and paper represents 99% of the energy use and 65% of the value-added in the paper and printing category.

The energy consumption for the non-metallic minerals sub-sector for the years 2014 and 2015, as well as the split of fuels for some data points of the time series, were estimated by the IEA Secretariat.

Some data have been combined due to confidentiality issues. For example, electricity and renewables and waste are combined in the food [ISIC 10-12] sub-sector.

Transport sector

Data for buses include urban/local light rails (metro trains, light trains and urban buses).

Data on the energy use for air transport include both domestic and international transport. The energy use and activity data for marine transport include domestic and trans-border, but exclude other international transport.

Differences between data in the IEA energy efficiency indicators and the IEA energy balances for the consumption of motor gasoline and automotive diesel in road transport are due to the allocation of the consumption for transport purposes under the services sector in the IEA energy balances.

Czech Republic

Sources

Ministry of Industry and Trade.

Years covered

2000-2015.

General note

Some discrepancies between the IEA energy efficiency indicators and the IEA energy balances figures might occur. Work is ongoing to align the data.

Residential sector

Data for energy consumption for space cooling are not available.

Data for energy consumption for 2015 for lighting are estimated by the IEA Secretariat.

Disaggregated data of energy consumption by appliance type and of appliances stocks are not available for the year 2015.

Data for energy consumption for clothes dryers are available from 2004 onwards.

Industry and Services sectors

Data for energy consumption for rubber and other manufacturing are available only from the years 2007 onwards.

Data for energy consumption for 2015 for rubber and plastics, machinery, transport equipment, other manufacturing, non-specified manufacturing and construction are based on IEA secretariat estimates.

Data for value added for 2015 for all sub-sectors are based on IEA secretariat estimates.

Transport sector

Data for vehicle-kilometres of passenger cars and freight road transport – and thus occupancy of passenger cars and load of freight road transport – are not available for several years.

Data for energy consumption and passenger-kilometres for motorcycles are not available.

Data for energy consumption for freight airplanes and passenger ships might be included under passenger airplanes and freight ships, respectively.

Denmark

Sources

Danish energy Agency through the Odyssee database.

Years covered

2000-2014.

Residential sector

The data for combustible renewables and waste in space heating includes the heat contribution of heat pumps.

Data for energy consumption of water heating is included under space heating. Lighting energy consumption is included under other appliances.

Data for PCs are not available.

Transport sector

Data for tonne-kilometres of freight road transport include only Danish registered vehicles with a capacity of over 6 tonnes.

Data for activity of motorcycles are not available.

Finland

Sources

Odyssee database supplied by Statistics Finland.

Years covered

2000-2014 (2015 – partially).

General note

Some discrepancies between the IEA energy efficiency indicators and the IEA energy balances might occur.

Residential sector

Data for energy consumption for space cooling are not available.

Data for PCs are not available.

Data for energy consumption for other appliances includes electric saunas and electric pre-heating of cars.

Data for energy consumption are not available for the year 2015.

Industry and Services sectors

Data for energy consumption for the services sector for the year 2015 is based on IEA Secretariat estimates.

Data for energy consumption for rubber [ISIC 22] for the year 2015 is based on IEA secretariat estimates.

Transport sector

Data for passenger-kilometres of motorcycles and passenger ships, and tonne-kilometres data for freight airplanes and freight ships are not available.

Data for the energy consumption of freight airplanes and passenger ships are not available. They might be partially included under passenger airplanes and freight ships, respectively.

Data for energy consumption are not available for the year 2015.

Work is ongoing to improve data for energy consumption of passenger cars and freight road transport.

France

Sources

Odyssee database; Ministère de l'Environnement, de l'Énergie et de la Mer.

Years covered

2000-2015.

General note

Energy and activity data include only metropolitan France except for value-added for the industry and services sub-sectors, which includes overseas departments.

Residential sector

Data for PCs are not available for the whole time series.

Industry and Services sectors

Data for 2015 on the energy consumption of the services sector are based on IEA secretariat estimates.

Germany

Sources

Federal Ministry for Economic Affairs and Energy, Federal Ministry for Transport and Digital Infrastructure, Federal Statistical Office, Fraunhofer-Gesellschaft.

Years covered

2000-2015.

General note

Discrepancies between the IEA energy efficiency Indicators, the IEA energy balances and national figures result from differences in the data scope and definitions, e.g. air transport. Work is ongoing to align these sources.

Data presented for Germany in this publication come from the submission to the IEA as of January 2017.

Residential sector

Data for residential energy consumption have been revised for the years between 2006 and 2015 according to a new methodology.

Data for space cooling are available from 2013 onwards. PCs data are not available.

Data for combustible renewables and waste include direct use of geothermal and solar thermal heat.

Industry and Services sectors

Data for the energy consumption of construction are not available.

Data for the energy consumption of agriculture is based on a national survey. However, the data are not compatible with the national energy balances. Work is in progress to solve this issue.

Greece

Sources

Odyssee database (CRES) supplied by Ministry for Environment and Energy.

Years covered

2000-2014 (2015 – partially).

Residential sector

In 2013, taxation on oil products for space heating increased substantially, leading to reduced consumption in the residential sector. According to external sources, the consumption of oil products has been partially replaced by non-commercial solid biofuels not yet reported. This leads to a significant reduction of total space heating consumption in 2013, affecting also the energy intensity of this end use. The space heating intensity shown should, thus, be considered with caution. Work is ongoing to address this issue for the next editions of this publication.

Data for the energy consumption for other appliances includes lighting.

Data for PCs are not available.

Energy consumption split by appliance type is not available for the years 2014 and 2015.

Industry and Services sectors

Data for rubber and other manufacturing are not reported separately.

Transport sector

Data for vehicle-kilometre of buses and freight trucks from 2000 to 2009 are based on IEA secretariat estimates.

The full amount of energy consumption from water transport is allocated to freight ships.

The full amount of energy consumption from air transport is allocated to passenger airplanes.

Hungary

Sources

Hungarian Energy and Public Utility Regulatory Authority.

Years covered

2000-2015.

General note

Results of the IEA decomposition analysis are not available.

Some breaks in energy consumption data may occur between 2012 and 2013, resulting from an energy consumption survey introduced in 2014. For instance, some energy consumption was reallocated between

industry and services sectors. There are also some breaks in the time series of value added data.

Residential sector

Data for energy consumption for space heating from combustible renewables and waste from 2000 to 2009 are based on IEA secretariat estimates.

Data for occupied dwelling for 2015 are based on IEA secretariat estimates.

Data for energy consumption disaggregated by end-use for the years 2011 to 2014 are estimated by the IEA Secretariat.

Data for energy consumption for other appliances includes all residential appliances, cooling and lighting. Energy consumption for space cooling is reported separately for the year 2015.

Industry and Services sectors

Data for combustible renewables and wastes consumption in the services sector for 2000 to 2009 are based on IEA secretariat estimates.

Data for energy consumption for rubber and other manufacturing are reported separately from 2013 onwards.

Transport sector

Data for energy consumption and activity (passenger-kilometres) for passenger cars include motorcycles.

Data for passenger car occupancy are not available after 2010.

Data for energy consumption of passenger and freight trains from 2000 to 2012 are based on IEA secretariat estimates.

Data for activity (passenger-kilometre) of passenger trains from 2000 to 2006 are based on IEA Secretariat estimations.

Data for activity and energy consumption of air transport is not available. Energy consumption of freight ships includes passenger ships up to 2012.

Data for activity (tonne-kilometres) of freight transport include both domestic and international travels.

Ireland

Sources

Sustainable Energy Authority of Ireland through the Odyssee database.

Years covered

2000-2014 (2015 – partially).

General note

Between 2008 and 2009, there is a break in series for certain oil products due to a new methodology being applied to sectoral demand by Sustainable Energy Ireland. This change can also explain breaks between 2006 and 2007.

Residential sector

Data for energy consumption in the residential sector relies significantly on estimates. The Irish administration is working on more precise data, which will be included in future versions of this publication.

Data for energy consumption for lighting and residential appliances split by appliance type are not available.

Data for stock of appliances are partially estimated by the IEA Secretariat. Data for PCs are not available.

Industry and Services sectors

Data for value added of the chemicals [ISIC 20-21] and other manufacturing sub-sectors for the year 2015 are not available.

Transport sector

Discrepancies between the IEA energy efficiency indicators and the IEA energy balances for oil products are due to different reporting sources. Work is ongoing to align the two data-sets, and revisions may occur in the future.

Data for activity of passenger transport (passenger kilometre) are not available for 2015.

Data for tonne-kilometres of ships are not available after 2008.

Data for energy consumption of freight road transport exclude light duty vehicles.

Data energy consumption of motorcycles are not available.

Italy

Sources

Ministry of Economic Development, Terna and ENEA; Ricerca Sistema Energetico (RSE).

Years covered

2000-2015.

Residential sector

The methodology used to calculate combustible renewables and waste consumption in the residential sector from 2002 was revised, leading to a break in series between 2001 and 2002.

Data on appliances diffusion for the year 2015 is not available.

Industry and Services

Data for value added for wood and wood products, paper and printing, basic metals, machinery, non-metallic minerals and rubber and plastics for the year 2015 are based on IEA secretariat estimates.

Japan

Sources

Ministry of Economy Trade and Industry (METI), Agency for Natural Resources and Energy.

Years covered

2000-2015.

Residential sector

Data for energy consumption for residential appliances include lighting.

Data for energy consumption of residential appliances disaggregated by appliance type are not available. The average dwelling surface was estimated as the ratio between the total dwelling area and the number of occupied dwellings.

Data for diffusion of dish washers are available from 2004 onwards.

Industry and Services

All data for value added are based on 2005 instead of 2010, as for the other countries.

Transport sector

Data for energy consumption and passenger-kilometre of motorcycles are not available.

Korea

Sources

Korea Energy Economics Institute.

Years covered

2000-2014.

Residential sector

Data for other appliances include electricity consumption for cooking and night-time electricity, which represents mostly space heating. This may affect cooking end-use indicators.

Data for diffusion of clothes dryers are not available.

Industry and Services sectors

Data for energy consumption for chemicals [ISIC 20-21] includes rubber [ISIC 22].

Data for energy consumption for other manufacturing includes electricity, gas and water supply.

The shares of industry sub-sector in value added and energy intensities may differ from last year publication, as the source of macroeconomic data is now the OECD Annual National Accounts database.

Transport sector

In the current edition of this publication, the energy consumption of domestic passenger and freight airplanes has been revised by the Korean administration.

Data for passenger cars include passenger vans (up to 15 passengers).

Luxembourg

Sources

STATEC–NSI Luxembourg.

Years covered

2000-2015.

General note

There may be some discrepancies between this publication and the IEA energy balances. Work is ongoing to improve data consistency.

Residential sector

Data for energy consumption disaggregated by end-use is available from year 2008 onwards.

Data for the energy consumption of residential appliances disaggregated by appliance type is not available.

Data for diffusion of appliances are available only for year 2011.

Industry and Services sectors

Heat consumption in industry is reported only from 2003.

Energy consumption of combustible renewables and waste in the wood manufacturing sub-sector is reported only from 2005, leading to a break in the energy intensity time series.

Due to confidentiality issues data for energy consumption of chemicals [ISIC 20-21] includes rubber [ISIC 22], whereas regarding value added, rubber [ISIC 22] are included in the manufacture of non-metallic mineral products [ISIC 23]. For this reason the corresponding intensities are not calculated.

Data for value added of basic metals [ISIC 24] and Machinery [ISIC 25-28] are not available.

Transport sector

Data for energy consumption of motorcycles and freight airplanes are not available.

Data for passenger-kilometres for motorcycles, passenger airplanes and passenger ships are not available.

Data for tonne-kilometres of freight airplanes are not available.

Data for vehicle-kilometres for passenger cars are available from 2008 onwards.

Data for load of freight road transport are not available for the entire time series, and occupancy of passenger cars is not available prior to 2008.

The full amount of energy consumption in water transport is allocated to passenger ships.

Work is ongoing to revise data for energy consumption of buses, passenger cars and freight road transport.

Netherlands

Sources

Energy research Centre of the Netherlands (ECN) through the Odyssee database.

Years covered

2000-2014 (2015 – partially).

Residential sector

Data for PCs are not available for the whole time series.

Industry and Services sectors

The IEA Secretariat estimated some data for energy consumption from heat, oil, and combustible renewables and waste.

Data for energy consumption for rubber [ISIC 22] and other manufacturing are included in other sub-sectors.

Data for energy consumption for the year 2015 is not available.

Transport sector

Data for passenger-kilometres of motorcycles, passenger airplanes and passenger ships are not available.

Data for tonne-kilometres of freight road transport include national transport by Dutch vehicles and the share of international transport by Dutch vehicles taking place within Dutch borders (estimated as 100 km per international trip).

Data for tonne-kilometres for freight ships includes only freight traffic in rivers.

Data for energy consumption for domestic passenger ships and domestic freight airplanes is not available.

Data for energy consumption and activity for the year 2015 is not available.

New Zealand

Sources

Energy efficiency and conservation authority (EECA).

Years covered

2000-2015.

Residential sector

Data for energy consumption for residential lighting for the period between years 2000 to 2006 have been revised by the national administration.

Industry and Services sectors

Data for value added are based on 2005 instead of 2010, as for other countries.

Data for value added for chemicals [ISIC 20-21] includes rubber [ISIC 22] and refining and coke processing [ISIC 19].

Poland

Sources

Central Statistical Office.

Years covered

2000-2015.

General note

Some discrepancies between the IEA energy efficiency indicators and the IEA energy balances figures might occur. Work is ongoing to improve data consistency.

Residential sector

Data for energy consumption disaggregated by end use is available only for the year 2015.

Data for energy consumption for other appliances in 2015 includes lighting.

Data on appliances stock are available up to 2014. Data for stocks of PCs and clothes dryers is not available.

Industry and Services sectors

Data for value added for the year 2015 are based on IEA Secretariat estimates.

Transport sector

Data for passenger-kilometres are not available for 2015.

Data for passenger-kilometres for motorcycles are not available.

Data for load of freight road transport are not available.

Data for energy consumption and activity (passenger-kilometres and tonne-kilometres) of passenger ships and freight airplanes are not available. Data for energy consumption might be partially included under freight ships and passenger airplanes, respectively.

Portugal

Sources

Direção Geral de Energia e Geologia, Diretora de Serviços de Planeamento e Estatística.

Years covered

2000-2015.

General notes

There may be some discrepancies between the IEA energy efficiency indicators and the IEA energy balances. Work is ongoing to improve data consistency.

Some transport energy consumption may be included under industry and services.

Residential sector

Data on average dwelling surface for the years 2014-2015 are estimated by the IEA secretariat.

Data for energy consumption of residential appliances disaggregated by appliance type are available from 2010.

Results from a survey on energy consumption of solid biofuels in households led to break in series of combustible renewables and wastes between 2009 and 2010.

Data for diffusion of appliances are available up to 2012.

Data for diffusion of PCs and clothes dryers are available only for years 2010-2012.

Industry and Services sectors

Data for value added for the year 2015 are not available.

Data on combustible renewables and wastes (solid biofuels) were revised based on a survey for industry, resulting in breaks in the energy consumption data for some sub-sectors between 2011 and 2012, e.g. for non-metallic minerals. Further revisions are expected in the future.

Transport sector

Data for passenger-kilometres of motorcycles are not available.

Data for energy consumption and activity (passenger-kilometres) of passenger ships are not available. Some amounts may be partially included under freight ships.

Data for the activity (tonne-kilometres) of freight airplanes are available from 2010, whereas the corresponding energy consumption data are not available for the time series. Some amounts may be partially included under passenger airplanes. Hence, the data series for domestic freight airplanes was removed from the publication figure for consistency purposes.

Data for the stock of freight trucks include commercial road transport from 2010 onwards. However, data for tonne-kilometres of freight trucks exclude commercial road transport.

Data for passenger cars occupancy and load of freight road transport are not available for 2014.

Data for energy consumption from 2013 to 2015 have been estimated by the IEA Secretariat.

Slovak Republic

Sources

Ministry of Economy.

Years covered

2000-2014 (2015 – partially).

General note

Results of the IEA decomposition analysis are not available.

Data for the energy consumption of transport are not available for all modes. Data for this sector were obtained from the country energy balance. Still, the share of transport energy use may be underestimated due to missing data.

Residential sector

Data for energy consumption for space heating include cooking.

Data for energy consumption for space cooling are not available.

Data for energy consumption for other appliances include dish washers, clothes dryers and PCs.

Data for diffusion of dish washers, clothes dryers and PCs are not available.

Industry and Services sectors

Data for energy consumption for rubber [ISIC 22] and other manufacturing are included under non-specified manufacturing, while data for value added are reported separately.

Transport sector

The disaggregation of energy consumption in transport is not available for some modes/vehicle types (e.g. freight road transports/trucks).

Data for the activity of domestic passenger ships and domestic freight airplanes are not available until 2013.

Data for vehicle-kilometres of passenger trains are available from 2011 onwards.

Data for load of freight road transport are not available for the entire time series.

Data for energy consumption of motorcycles, buses, domestic passenger ships, freight road transport and domestic freight airplanes are not available. Freight airplanes and passenger ships consumption might be partially included under passenger airplanes and freight ships, respectively.

Data for energy consumption of freight ships are available only from 2006 to 2011.

Spain

Sources

Instituto para la diversificación y ahorro de energía (IDEA) through the Odyssee database.

Years covered

2000-2015.

General note

Results of the IEA decomposition analysis are not available.

Residential sector

Data for electricity consumption for different end-uses have been revised back to 2010 according to a new methodology by the Spanish administration. This causes some breaks between 2009 and 2010.

Data for energy consumption of residential appliances disaggregated by appliance type is not available.

Data for diffusion of residential appliances are available up to 2010.

Industry and Services sectors

Data for energy consumption for rubber [ISIC 22] and other manufacturing are included under non-specified manufacturing, while data for value added are available separately.

Data for value added for 2014-2015 for all sub-sectors are based on IEA secretariat estimates.

Data for value added for 2014-2015 for coke and refined petroleum products [ISIC 19] are not available.

Sweden

Sources

Swedish Energy Agency through the Odyssee database.

Years covered

2000-2014 (2015 – partially).

Residential sector

Data on average dwelling occupancy is not available for the year 2015.

Data for stocks and diffusion of residential appliances are available only up to 2013.

Data for energy consumption for space cooling are not available.

Data for energy consumption and stocks of appliances split by appliance type is available until 2013.

Data for energy consumption of residential appliances include lighting for the years 2014-2015, and data for other appliances include clothes dryers, TVs and PCs.

Industry and Services sectors

Data for value added is not available for several industry sub-sectors for the year 2015.

Data for the energy consumption of services for the year 2015 are not available.

Transport sector

Data for energy consumption and activity are not available for 2015.

At the time of this publication, activity data have been partially revised. These revisions will be included in the next edition of this book. Work is ongoing to improving data consistency with the IEA energy balances data.

Split of road transport energy consumption for 2014 is based on IEA secretariat estimates.

Switzerland

Sources

Swiss Federal Office of Energy SFOE.

Years covered

2000-2015 (partially).

Residential sector

Data for energy consumption for space cooling are not available.

Industry and Services sectors

Data for energy consumption for the wood manufacturing sub-sector are not available, while data for value added are.

Data for energy consumption for machinery also include transport equipment, while data for value added are available separately. The intensity figures are calculated aggregating data for value added.

Data for value added for manufacturing sub-sectors for the year 2015 are not available.

Transport sector

Discrepancies in data for the transport energy consumption in relation to the IEA energy balances are due to different accounting methodologies (e.g. fuel tourism is excluded in this publication, different calorific values may be used, etc.).

Data for passenger-kilometres for domestic passenger airplanes and ships are not available.

United Kingdom

Sources

Department for Business, Energy and Industrial Strategy (BEIS).

Years covered

2000-2015.

Residential sector

The combined energy consumption of clothes washers and clothes dryers is allocated in equal shares to each category.

Data for energy consumption for other residential appliances include microwaves, kettles and space cooling.

United States

Sources

United States Energy Information Administration (EIA); for transport activity data: Bureau of Transportation Statistics (BTS).

Years covered

2000-2015.

General note

Data can show breaks between 2011 and 2012 due to a new methodology based on the Annual Energy Outlook 2015 reference case (EIA).

Transport sector

The data for freight road tonne-kilometres and energy consumption have been revised for years 2008-2011 and 2000-2015 respectively, leading to a significant increase in the intensity of freight road transport and a decrease in energy saving coming from this sector. These changes are based on temporary estimates of the Freight Analysis Framework (FAF4) and the IEA Secretariat and might be further updated by the Bureau of Transportation Statistics during the upcoming annual data cycle.

7. 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

Conversion factors for mass

To:	kg	t	lt	st	lb
From:	multiply by:				
kilogramme (kg)	1	1.000×10^{-3}	9.842×10^{-4}	1.102×10^{-3}	2.205
tonne (t)	1.000×10^{3}	1	9.842×10^{-1}	1.102	2.205×10^{3}
long ton (lt)	1.016×10^{3}	1.016	1	1.120	2.240×10^{3}
short ton (st)	9.072×10^{2}	9.072×10^{-1}	8.929×10^{-1}	1	2.000×10^{3}
pound (lb)	4.536×10^{-1}	4.536×10^{-4}	4.464×10^{-4}	5.000×10^{-4}	1

Conversion factors for volume

To:	gal U.S.	gal U.K.	bbl	ft^3	l	m^3
From:	multiply by:					
U.S. gallon (gal U.S.)	1	8.327×10^{-1}	2.381×10^{-2}	1.337×10^{-1}	3.785	3.785×10^{-3}
U.K. gallon (gal U.K.)	1.201	1	2.859×10^{-2}	1.605×10^{-1}	4.546	4.546×10^{-3}
barrel (bbl)	4.200×10^{1}	3.497×10^{1}	1	5.615	1.590×10^{2}	1.590×10^{-1}
cubic foot (ft^3)	7.481	6.229	1.781×10^{-1}	1	2.832×10^{1}	2.832×10^{-2}
litre (l)	2.642×10^{-1}	2.200×10^{-1}	6.290×10^{-3}	3.531×10^{-2}	1	1.000×10^{-3}
cubic metre (m^3)	2.642×10^{2}	2.200×10^{2}	6.290	3.531×10^{1}	1.000×10^{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)

8. ABBREVIATIONS

MJ:	megajoule (10^6 joules)
GJ:	gigajoule (10^9 joules)
PJ:	petajoule (10^{15} joules)
GWh:	gigawatt hour
CO_2:	carbon dioxide
m^2:	square metre
pers:	person
pass:	passenger
dw:	dwelling
PCs:	personal computers and information technologies
TVs:	televisions and home entertainment
TC:	temperature corrected
HDD:	heating degree days
CDD:	cooling degree days
USD:	United States dollar
GDP:	gross domestic product
PPP:	purchasing power parity
VA:	value added
pkm:	passenger-kilometres
tkm:	tonne-kilometres
c	confidential
..	not available
x	not applicable