

Definition of the Revised APEC Energy Data Reporting Format

A. General note

The format includes all "commercial" sources of energy, both primary and secondary. Data for non-commercial energy should be given in a separate table. This table is divided into three main parts; the first shows supply element; the second gives the transformation; the third shows final consumption broken down into the various end-use sectors.

B. Sectors

1. Indigenous production

Quantities of fuels extracted within the economy.

2. Opening stocks

Stock level at the beginning of the year.

3. Closing stocks

Stock level at the end of the year.

4. Stock change

Defined as the opening stocks minus the closing stocks. A decrease in stocks, shown in the table as a positive number, is added to supply and an increase in stocks, shown as a negative number, is deducted from supply.

5. Imports

Quantities of energy entering the territory usually excluding energy in transit.

6. Exports

Quantities of energy sold by a economy outside its borders.

7. Bunkers

Also known as international marine bunkers; quantities of fuel supplied to sea-going ships whatever their flags and category.

8. Total primary energy supply

Defined as indigenous production plus imports minus exports minus bunkers plus or minus stock change.

9. Transformation sector (input)

All the primary energy and some secondary energy (coal products) amounts to be input or consumed into transformation sectors such as refineries, power plants and gas plants, in order to generate the secondary energy.

(i) Coal Transformation

Consumption amounts of hard coals such as coking coal, steam coal, subbituminous coal and lignite for production of coke, coke oven gas, blast furnace gas and briquettes.

(ii) Refining

Consumption amounts of crude oil, NGL and condensate for production of petroleum products, such as naphtha, mogas, jet fuel, kerosene, diesel oil, fuel oil, LPG and so on. Consumption amounts of natural gas for production of synthetic petrol is also included.

(iii) Gas processing

Consumption amounts of coal such as coking coal, steam coal, coal products such as coke and coke oven gas, petroleum products such as LPG, naphtha, refinery gas, and natural gas.

(iv) Power generation (public utilities)

Consumption amounts of;

- Coal, Coal products (coke oven gas and blast furnace gas)
- Crude oil, Petroleum products (fuel oil, LPG and naphtha)
- Natural gas
- Hydro plants
- Nuclear plants
- Geothermal plants
- Other (Photovoltaic, wind, tide etc.)

(v) Power generation (private, auto producers)

Consumption amounts of;

- Coal, Coal products
- Crude oil, Petroleum products
- Natural gas
- Hydro plants
- Geothermal plants
- Other (Photovoltaic, wind, tide etc.)

10. Transformation sector (output)

The secondary energy amounts to be generated from the transformation sector.

(i) Coal transformation

Production amounts of coke, coke oven gas and briquettes.

(ii) Gas recovering

Production amounts of blast furnace gas.

(iii) Refining

Production amounts of petroleum products such as naphtha, mogas, jet fuel, kerosene, diesel oil, fuel oil, LPG, refinery gas and others. Synthetic petrol from natural gas is also included.

(iv) Gas processing

Production amounts of town gas and coke.

(v) Power generation (public utilities)

Generation amounts of electricity derived from thermal plants, hydro plants, nuclear plants, geothermal plants and other.

(vi) Power generation (private, auto producers)

Generation amounts of electricity derived from thermal plants, hydro plants, nuclear plants, geothermal plants and other.

11. Transformation sector (losses and own use)

This category comprises both losses and own use. Losses include all losses due to transport and distribution, including those from pipelines. Own use include all own use of refinery plants, power plants and gas works plants.

12. Final energy consumption total

Defined as agriculture plus residential commercial plus industry plus transport plus non-energy.

13. Agriculture

Energy use in performing agricultural, hunting, forestry and fishing operations.

14. Residential Commercial

(i) Residential

All consumption by households

(ii) Commercial

Consumption of the commercial and public sectors specified in the sub-sectors:

- Wholesale and retail trade
- Hotels and restaurants
- Financial intermediation
- Real estate, renting and business activities
- Public administration and defense, compulsory social security
- Education
- Health and social work
- Other community, social and personal service activities
- Extra-territorial organization and bodies
- Post and telecommunications

15. Industry

Consumption of the industry sector is specified in the following sub-sectors (energy use for transport by industry is not included here but reported under transport):

- Iron and steel industry
- Chemical industry
- Non-ferrous metals basic industries
- Non-metallic mineral products such as glass, ceramic, cement, etc.
- Transport equipment
- Machinery. Fabricated metal products, machinery and equipment other than transport equipment
- Mining (excluding fuels) and quarrying
- Food processing, beverages and tobacco
- Pulp, paper and printing
- Wood and wood products (other than pulp and paper)
- Construction
- Textiles and leather
- Collection, Purification and Distribution of water
- Non-specified (any manufacturing industry not included above)

16. Transport

Consumption of the Transport sector covers all transport activity regardless of the economic sector to which it is contributing, and is divided into the following sub-sectors:

- Air transport (international and domestic)
- Road transport

-Railways

17. Non-energy

Non-energy use covers use of other petroleum products such as white spirit, paraffin waxes, lubricants, bitumen and other products (tar, sulphur, and grease). They are shown separately by final consumption sector under the heading non-energy use and are included on total final consumption. It is assumed that the use of these products is exclusively non-energy use. It should be noted that petroleum coke is shown as non-energy use only when there is evidence of such use, otherwise it is shown under energy use in industry or other sectors. Feedstocks for the petrochemical industry are accounted for in industry (paragraph 15). This covers all oil including naphtha, except the other petroleum products listed above, and gas used as petrochemical feedstocks. Gas used as raw material for chemical products such as methanol and ammonia/urea is also included.

C. Sources

1. Coal

Defined as hard coal plus anthracite plus lignite.

(i) Hard coal

Defined as steam coal plus coking coal plus subbituminous coal.

a. Steam coal

Steam coal is coal used for steam raising and space heating purposes and includes all Anthracite coals and Bituminous coals not included Coking coal. Its gross calorific value is greater than 23,865 kJ/kg (5,700 kcal/kg), but usually lower than that of coking coal.

b. Coking coal

Coking coal refers to coal with a quality that allows the production of a coke suitable to support a blast furnace charge. Its gross calorific value is greater than 23,865 kJ/kg (5,700kcal/kg) on an ash-free but moist basis.

c. Subbituminous coal

Non-agglomerating coals with a gross calorific value of between 17,435 kJ/kg (4,165kcal/kg) and 23,860 kJ/kg (5,700kcal/kg) containing more than 31 percent volatile matter on a dry mineral matter free basis.

(ii) Anthracite

Same as steam coal above mentioned.

(iii) Lignite (Brown coal)

Lignite is a non-agglomerating coal with a gross calorific value of less than 17,435 kJ/kg (4,165 kcal/kg), and greater than 31 percent volatile matter on a dry mineral matter free basis.

2. Coal products

Defined as coke plus briquettes plus coke oven gas plus blast furnace gas.

(i) Coke

This category comprises both "coke oven coke" and "gas coke". Coke oven coke is the solid product obtained from the carbonization of coal, principally coking coal, at high temperature. Gas coke is a by-product of hard coal used for the production of town gas in gas works. Gas coke is used for heating purposes.

(ii) Briquettes

Briquettes are composition fuels manufactured from brown coal, produced by briquetting under high pressure. These figures include peat briquettes, dried brown coal, fines and dust and brown coal breeze.

(iii) Coke oven gas

Coke oven gas is obtained as a by-product of the manufacture of coke oven coke for the production of iron and steel.

(iv) Blast furnace gas

Blast furnace gas is produced during the combustion of coke burnt in furnaces in the iron and steel industry. It is recovered and used as a fuel for various purposes, among others in power plants.

3. Crude oil and NGL

Crude oil is a mineral oil consisting of a mixture of hydrocarbons of natural origin, yellow to black in color, of variable density and viscosity. It also includes lease condensate (separator liquids) which are recovered from gaseous hydrocarbons in lease separation facilities. NGL is liquid or liquefied hydrocarbons produced in the manufacture, purification and stabilization of natural gas. This is those portions of natural gas which are recovered as liquids in separators, field facilities, or gas processing plants. NGL includes ethane, propane, butane, pentane, natural gasoline and condensates. It may also include quantities of non-hydrocarbons.

4. Petroleum products

Total of all petroleum products, such as LPG, naphtha, mogas, jet fuel, kerosene, diesel oil, fuel oil, refinery gas and other petroleum products.

(i) LPG

This is the light hydrocarbon fraction of the paraffin series, derived from refinery processes and from crude oil stabilization plants comprising propane (C₃H₈) and butane (C₄H₁₀) or a mixture of these two hydrocarbons.

(ii) Naphtha

Naphtha includes light or medium oils, a cut covering the end of the motor spirit and the beginning of the kerosene range. Naphtha distills between 30 °C and 210 °C.

(iii) Mogas

This is light hydrocarbon oil for use in internal engines such as motor vehicles, excluding aircraft. Motor gasoline is distilled between 35 °C and 215 °C and treated by reforming, catalytic cracking or blending with aromatic fraction to reach a sufficiently high octane number (80 RON).

(iv) Jet fuel

This category comprises both gasoline and kerosene type jet fuels meeting specifications for use in aviation turbine power units.

Gasoline type: This includes all light hydrocarbon oils, distilling between 100 °C and 250 °C. It distills at least 20 percent in volume at 143 °C.

Kerosene type: This medium oil with same distillation characteristics and flash point as kerosene, with a maximum aromatic content of 22 percent in volume, and treated to give a kinematic viscosity of less than 18cST at -20 °C (and a freezing point below -47 °C), octane number varying from 80 to 145 RON.

(v) Kerosene

Kerosene comprises refined petroleum distillate intermediate in volatility between gasoline and gas/diesel oil. It is a medium oil distilling between 150 °C and 300 °C, which distills at least 65 percent in volume at 250 °C. Its specific gravity is in the region of 0.80 and the flash point is above 38 °C.

(vi) Diesel oil

Diesel oil includes heavy gas oils. Gas oils are obtained from the lowest fraction from atmospheric distillation of crude oil, while heavy gas oils obtained by

vacuum redistillation of the residual from atmospheric distillation.

(vii) Fuel oil

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 more than 0.90.

(viii) Refinery gas

Refinery gas is defined as non-condensable gas obtained during distillation of crude oil or treatment of oil products (e.g. cracking) in refineries. It consists mainly of hydrogen, methane, ethane, and olefins.

(ix) Other petroleum products

The category, "Other petroleum products", groups together white spirit and SBP, lubricants, bitumen, paraffin waxes and others (tar, sulfur, grease).

5. Gas

Defined as natural gas plus town gas.

(i) Natural gas

Natural gas consists mainly of methane occurring naturally in underground deposits associated with crude oil or gas recovered from coal mines (colliery gas). Sewage gas is also included.

(ii) Town gas

Town gas covers all types of gas produced in public utility or private plants, whose main purpose is production, transport and distribution of gas. It includes gas produced by carbonization (including gas produced by coke ovens at gas works), by total gasification with or without enrichment with oil products, by cracking of natural gas, and by reforming and simple mixing of gases and/or air. Town gas also includes substitute natural gas, which is a high calorific value gas manufactured by chemical conversion of a hydrocarbon fossil fuel.

6. Hydro power

Power generation from hydro plants, including pumped up plants.

7. Nuclear power

Power generation from nuclear plants.

8. Geothermal power

Power generation from geothermal plants.

9. Geothermal

Heat obtained from geothermal energy.

10. Solar

Heat obtained from solar energy.

11. Other commercial

Comprises all commercial materials used as fuels such as peat, wood and wood waste, municipal, vegetal and industrial waste and sulphite lies ("black liquor"), as residual from the paper industry.

12. Electricity

Shows net electricity production which is defined as gross production less own use of power plants which appears in the "losses and own use" sector. Net electricity production is measured at the station busbars, after deduction of electricity consumed within the station. Fuel consumption in thermal power plants are split into public utilities and autoproducers.

13. Heat

Heat obtained from the combined heat and power plants (CHP) and from autoproducer's heat that is sold to a third party (e.g. to a network).

D. Conversion Factors

Net calorific value must be applied for conversion from physical quantities to thermal quantities as following "IEA Energy Statistics".

Definition of Columns and Rows of the Energy Balance Table

A. Unit

For the purpose of presenting its energy balances the APEC has adopted kcal and Joule. 10^7 kilo calories (41.868 giga joules) is defined as one ton of oil equivalent. This quantity of energy is, within a few percent, equal to the net heat content of 1 ton of crude oil.

B. Conversion (from original to TOE)

The Coordinating Agency has adopted specific factors supplied by the member economies for each flow or use. The balances are expressed in term of "net" heat value. The difference between the "net" and "gross" heat value for each fuel is the latent heat in condensation of the water vapor produced during combustion of the fuel. For coal and oil, net heat value is 5 percent less than gross, for most forms of natural and manufactured gas the difference is 9-10 percent, while for electricity there is no difference. The use of net heat value is consistent with the practice of the Statistical Offices of the European Communities and the United Nations.

C. Layout

The energy balances are presented in tabular format: columns for the various sources of energy and rows for the different origins and uses.

(1) Columns

Across the top of the table from left to right, there are thirteen columns with the following headings:

Column 1:

Coal includes all primary coal, such as hard coal, lignite and brown coal.

Column 2:

Coal Products includes all fuels derived from coal including patent fuel, coke oven coke, gas coke, briquettes, coke oven gas and blast furnace gas.

Column 3:

Crude Oil comprises crude oil, refinery feedstocks and natural gas liquids. Natural LPG is included in Column 4.

Column 4:

Petroleum products comprises LPG, refinery gas,

aviation gasoline, motor gasoline, jet fuels, kerosene, gas/diesel oil, residual fuel, naphtha, white spirit, lubricants, bitumen, paraffin waxes, petroleum coke and other petroleum products.

Column 5:

Gas includes natural gas (excluding natural gas liquids).

Column 6:

Town Gas includes gas processing gas and gas works gas.

Column 7:

Hydro shows the energy content of the electricity produced in hydro power plants. Hydro output excludes output from pumped storage plants.

Column 8:

Nuclear shows the primary heat equivalent of the electricity produced by a nuclear power plant with an average thermal efficiency of 33 percent.

Column 9:

Geothermal, solar, etc shows the primary heat equivalent of the electricity produced in geothermal plants with an average thermal efficiency of 10 percent, and the energy content of electricity produced in non-thermal power plants such as photovoltaic, wind, tide wave etc.

Column 10:

Others includes wood, wood waste, black liquor, industrial and municipal waste and biomass (solar, wind energy used for purposes other than electricity generation is included here). But non-commercial ones are excluded.

Column 11:

Electricity shows final consumption and trade in electricity (which is accounted at the same heat value as electricity in final consumption; i.e. 1 GWh = 0.000086 MTOE).

Column 12:

Heat includes heat production from public Combined Heat Power plants (CHP), from autoproducer's heat that is sold to a third party (e.g. to a network).

Column 13:

TOTAL = the total of columns (1) to (12).

(2) Rows

The categories on the left hand side of the table have the following functions.

Row 1:

Indigenous production shows only production of primary energy, i.e. hard coal, lignite, crude oil, NGL's and natural LPG, natural gas, hydro and nuclear, geothermal etc. electricity and hers.

Row 2/3:

Imports and exports comprise amounts having crossed the boundaries of the economy whether or not customs clearance has taken place.

Row 4:

International marine bunkers cover those quantities delivered to sea-going ships of all flags. Consumption by ships and planes engaged in transport in inland and coastal waters is not included.

Row 5:

Stock changes are treated as follows: a decrease in stocks, shown in the table as a positive number, is added to supply and an increase in stocks, shown as a negative number, is deducted from supply. Producers', importers', energy transformation industries' and large users' stocks are included.

Row 6:

Total primary energy supply (TPES) are made up of indigenous production (Row1) + imports (Row2) – exports (Row3) – international marine bunkers (Row4) and \pm stock changes (Row5).

Row 7:

Public electricity, column 1 to 10 show primary and secondary fuel input to public utilities' plants as negative entries. Gross electricity produced (including power stations' own consumption) appears as a positive quantity in column 11, "Electricity". Transformation losses appear in the "Total", column 13, as a negative number.

Row 8:

Auto-producers of electricity, columns 1 to 10 show primary and secondary fuel input to electricity generation of auto-producers as negative entries. An auto-producer is an establishment which, in addition to its main activities, generates electricity wholly or partially for its own use, such as industries, railways, refineries etc. Total gross electricity produced appears as a positive quantity in column 12, "Electricity". Transformation losses appear

in the "Total", column 13 as a negative number.

Row 9:

Where there is a production of gas at Gas Processing the treatment is similar to that for electricity generation, with the quantity produced appearing as a positive figure in column 6 "Town Gas", input as negative entries in column 1(coal), 2(coal products), 4(petroleum products) and 5(natural gas input) and conversion losses appearing in the "Total" column.

Row 10:

The row Petroleum refineries shows the transformation of crude oil, NGL and condensate to petroleum products. The production of synthetic petrol from natural gas is also included.

Row 11:

Coal transformation shows the transformation of coal from primary to secondary fuels and from secondary to tertiary fuels (hard coal to coke, coke to blast furnace gas, brown coal to BKB, etc).

Row 12:

Own use & loss: Own use contains the primary and secondary energy consumed by transformation industries for heating, traction and lighting purposes. These are shown as negative figures. Included here are, for example, the coal mines' own use of energy, energy use in refineries, electricity plants' own consumption (which includes net electricity consumed for pumped storage), and energy used for oil and gas extraction (which also includes consumption for the pipeline system). Loss include losses in gas distribution, electricity transmission, and coal transport.

Row 13:

Discrepancy is a category which includes the sum of the unexplained statistical differences for individual fuels.

Row 14:

Total Final Consumption (TFC) is the sum of consumption by the different end-use sectors. In final consumption, petrochemical feedstocks as well as natural gas for producing fertilizer are shown under industry sector.

Row 15:

Consumption of the Industry sector (energy used for transport by industry is not included here but reported under transport).

Row 16:

The Transport sector includes all fuels for transport, except international marine bunkers. It includes transport in the industry sector and covers road, railway, internal and international air, internal navigation (including small craft, fishing vessels and coastal shipping not included under marine bunkers) and non-specified transport.

Row 17:

Other sectors cover agriculture, residential, commercial and public services and non-specified consumption.

Row 18:

Consumption of the Agriculture sector.

Row 19:

Consumption of the Residential and Commercial sectors. Public services also is included here.

Row 20:

Other shows non-specified use which may include military use.

Row 21:

Non-energy use covers use of other petroleum products such as white spirit, paraffin waxes, lubricants, bitumen and other products. Petroleum coke is shown as non-energy use only when there is evidence of such use, otherwise it is shown under energy use in industry or other sectors. Feedstocks for the petrochemical industry are accounted for in industry (row 15). This covers all oil including naphtha, except the other petroleum products listed above, and gas used as petrochemical feedstock. Gas used as raw material for chemical products such as methanol and ammonia/urea is also included.

Conversion Factors

A. Gas

To convert the gross heat content of a gas to its net heat content, the following multiplying factors may be used.

Natural gas	0.9
Gas processing gas	0.9
Coke oven gas	0.9
Blast furnace gas	1.0

B. Electricity

Figures for electricity production, trade, and final consumption are calculated using the energy content of the electricity, i.e. at a rate of 1 TWh = 0.086 MTOE. Hydro-electricity production (excluding pumped storage) and electricity produced by other non-thermal means, (wind, tide, photovoltaic etc) are accounted for similarly using 1 TWh = 0.086 MTOE. However, the primary energy value ascribed to nuclear power plants is calculated from the gross generation by assuming that only 33% of the primary energy content appears as electricity, i.e. 1 TWh = (0.086/0.33) MTOE. In the case of electricity produced from geothermal heat the primary value is calculated using 1 TWh = (0.086/0.1) MTOE.

C. Crude Oil Factors

The conversion factors of each economy are applied.

D. Petroleum Products

The conversion factors of each economy are applied.

E. Coal

Coal has separate factors for production, imports, exports, inputs to power plants, coal used in coke ovens, and coal used in industry. Each economy's individual conversion factors are applied.

F. Others

The following conversion factor is used for other energy, such as wood, wood waste, black liquor etc.

$$1 \text{ TJ (net)} = 0.00002388 \text{ MTOE}$$

G. Heat

Information on heat is supplied in net tera joules. 1 TJ = 0.00002388 MTOE.