CONCEPTS AND DEFINITIONS

DESCRIPTION OF THE ROWS OF THE ENERGY BALANCE

Production of primary energy (row 1): Primary energy refers to energy sources as found in their natural state (as opposed to derived or secondary energy, which is the result of the transformation of primary sources). Production of primary energy refers to the quantity of fuels which are extracted or produced, calculated after any operation for removal of inert matter. In general, production includes the quantities consumed by the producer in the production process (e.g. for heating or operation of equipment or auxiliaries) as well as supplies to other producers of energy for transformation or other uses. Data on the production of **hard coal and brown coal** refer to coal after washing and screening for the removal of inorganic matter. Production of **natural gas liquids, other hydrocarbons, and additives and oxygenates** is shown together with the production of **crude oil** Data for **natural gas** refer to dry marketable production measured after purification and extraction of natural gas liquids and sulphur. Extraction losses and the amounts that have been reinjected, flared, and vented are excluded. Production includes quantities used within the natural gas industry, in gas extraction, pipeline systems and processing plants. Production of primary **electricity** refers to gross production of electrical energy of nuclear, hydro (net of pumped hydro production), geothermal, wind, tide, wave, ocean and solar origin. Also included is electricity production from non-specified sources. Production of **Biomass** and **wastes** includes only that portion used for fuel purposes. Production of primary **heat** refers to gross production of heat from nuclear, geothermal, chemical, solar and non-specified sources, including direct use of geothermal and solar thermal heat.

Imports (row 2) and **exports** (row 3) refer to the amount of fuels, electricity and heat obtained from or supplied to other countries. Fuels in transit are excluded. In the energy balance format, imports are positive numbers, while exports are negative numbers and carry a negative sign (-).

Marine/aviation bunkers (row 4) refer to the amounts of fuels delivered to ocean-going ships or aircraft of all flags engaged in international traffic. Consumption by ships engaged in transport in inland and coastal waters, or by aircraft engaged in domestic flights, is not included. The minus sign is used for entries under this item.

Stock changes (row 5) (at producers, importers and industrial consumers) refer to the difference between the amounts of fuels in stocks at the beginning and end of the year. A positive number indicates a reduction in stocks and thus an increase in available energy; the negative sign (-) indicates a net increase in stocks and thus a decrease in energy available for consumption.

Total energy supply (row 6) is computed as: (6) = production (row 1) + imports (row 2) + exports (row 3) + bunkers (row 4) + stock changes (row 5).

Transformation (row 7) shows the net input of primary and secondary energy into the conversion or transformation process for the purpose of obtaining other derived products, and the net output of the secondary energy. Inputs carry a minus sign, and outputs, which relate to production, are shown as positive numbers. Row 7 represents the sum of items from row 8 to row 16.

Net transfers (row 17) comprise the net movements of energy products between processes in different sectors, for example, the diversion of products (feedstocks) for further processing in the refining industry or the transfer of products for blending. Transfers "out" carry a negative sign, and transfers "in" are shown as positive numbers.

Energy industries own use (row 18) comprises the consumption of fuels, electricity and heat used by the energy producing industries, e.g. for heating, lighting, operation of all equipment used in the extraction process, for traction and distribution. It includes the quantities consumed in compression stations and pumping stations of oil and gas pipelines, as well as the station use and loss of electric power plants (including the net electricity used by the pumped storage process). The minus sign is used for entries under this item.

Losses (row 19) refer to the losses of fuels and electrical energy, which occur outside the utilities or plants before reaching the final consumer. The losses carry a minus sign.

Consumption for non-energy uses (row 20) refers to the quantity of energy products consumed as raw materials in the chemical, petrochemical and other industries, not in order to produce energy. The minus sign is used for entries under this item.

CONCEPTS AND DEFINITIONS

Statistical differences (row 21) in the energy balance are calculated as follows: (21) = total energy supply (row 6) + transformation (row 7) + net transfers (row 17) +energy industries own use (row 18) + losses (row 19) + consumption for non-energy uses (row 20) – final energy consumption (row 22).

Final energy consumption (row 22) refers to the consumption of primary and secondary energy by industry and construction, by transport and by households, agriculture and other consumers.

Consumption by industry and construction (row 23) is broken down into the iron and steel industry, the chemical industry and other industries and construction. Consumption in the chemical industry refers to use as fuel only. Energy products consumed by the energy sector, and all inputs into energy transformation, such as fuels used by autoproducers of electricity or heat, are excluded.

Consumption by transport (row 27) includes all fuels consumed by road traffic, by ships engaged in transport in inland and coastal waters and aircraft engaged in domestic flights, and by railways, pipeline transport and non-specified transport. Fuels consumed by agricultural equipment are included in agricultural consumption.

Consumption by households and other consumers (row 33) covers households (including free issues to employees), agriculture (including hunting, forestry and fishing) and all other sectors not included elsewhere (for example trade, communications and services such as public lighting).

DESCRIPTION OF THE COLUMNS OF THE ENERGY BALANCE

HARD COAL, BROWN COAL AND PEAT (column 1)

Hard coal – Coal that has a high degree of coalification with a gross calorific value above 23,865 KJ/kg (5,700 kcal/kg) on an ash-free but moist basis, and a mean random reflectance of vitrinite of at least 0.6. Slurries, middlings and other low-grade coal products, which cannot be classified according to the type of coal from which they are obtained, are included under hard coal. There are two sub-categories of hard coal: (i) coking coal and (ii) other bituminous coal and anthracite (also known as steam coal). Coking coal is a hard coal with a quality that allows the production of coke suitable to support a blast furnace charge. Steam coal is coal used for steam raising and space heating purposes and includes all anthracite coals and bituminous coals not classified as coking coal.

Lignite – One of the two sub-categories of **brown coal**. Brown coal is coal with a low degree of coalification which retained the anatomical structure of the vegetable matter from which it was formed. It has a mean random reflectance of vitrinite of less than 0.6, provided that the gross calorific value (on a moist ash-free basis) is less than 23,865 KJ/kg (5,700 kcal/kg). Brown coal comprises: (i) lignite - non-agglomerating coals with a gross calorific value less than 17,435 KJ/kg (4,165 kcal/kg) and greater than 31 per cent volatile matter on a dry mineral matter free basis and (ii) sub-bituminous coal - non-agglomerating coals with a gross calorific value between 17,435 KJ/kg (4,165 kcal/kg) and 23,865 KJ/kg (5,700 kcal/kg) containing more than 31 per cent volatile matter on a dry mineral matter free basis.

Peat – A solid fuel formed from the partial decomposition of dead vegetation under conditions of high humidity and limited air access (initial stage of coalification). Only peat used as fuel is included. Its principal use is as a household fuel.

Also included in column 1 is **Oil shale**, which consists of sedimentary rock which contains organic matter in the form of kerogen. Oil shale may be burned directly or processed by heating to extract shale oil (the latter is classified as Other hydrocarbons).

COAL PRODUCTS AND PEAT PRODUCTS (column 2)

Patent fuel (hard coal briquettes) – A composition fuel manufactured from coal fines by shaping with the addition of a binding agent such as pitch.

Lignite briquettes – A composition fuel manufactured from lignite. The lignite is crushed, dried and molded under high pressure into an even-shaped briquette without the addition of binders.

Peat products – Includes products such as peat briquettes derived directly or indirectly from sod peat and milled peat, and other peat products not elsewhere specified, such as peat pellets. Peat briquettes are a fuel

comprising small blocks of dried, highly compressed peat made without a binding agent. It is used mainly as a household fuel.

Coal coke – The solid residue obtained from coal or lignite by heating it to a high temperature in the absence or near absence of air. It is high in carbon and low in moisture and volatile matter. Several categories are distinguished:

a) Coke-oven coke – The solid product obtained from carbonization of coal, principally coking coal, at high temperature. Coke-oven coke is also called metallurgical coke and is used mainly in the iron and steel industry. Semi-coke, the solid product obtained from carbonization of coal at low temperature, is included with coke-oven coke. It is used mainly as a domestic fuel.

b) Gas coke – A by-product of coal used for the production of gas works gas in gasworks. Gas coke is mainly used as a domestic fuel.

Coal tar – A liquid by-product of the carbonization of coal in coke ovens.

Other coal products – Other coal products which are not listed above, excluding Coke oven gas, Blast furnace gas, Gas works gas, or Other recovered gases (which are shown in column 9).

PRIMARY OIL (column 3)

Crude oil – A mineral oil of fossil origin extracted by conventional means from underground reservoirs, and comprises liquid or near-liquid hydrocarbons and associated impurities such as sulphur and metals. Crude oil includes condensate from condensate fields, and "field" or "lease" condensate extracted with the crude oil.

Natural gas liquids (NGL) – Liquid or liquefied hydrocarbons produced in the manufacture, purification and stabilization of natural gas. NGL's include, but are not limited to, ethane, propane, butane, pentane, natural gasoline and plant condensate. NGLs are either distilled with crude oil in refineries, blended with refined petroleum products or used directly depending on their characteristics.

Other hydrocarbons – Non-conventional oils and hydrogen. Non-conventional oils refer to oils obtained by non-conventional production techniques, that is, oils which are extracted from reservoirs containing extra heavy oils or oil sands which need heating or treatment (e.g., emulsification) in situ before they can be brought to the surface for refining/processing. They also include the oils extracted from oil sands, extra heavy oils, coal and oil shale which are at, or can be brought to, the surface without treatment and require processing after mining (ex situ processing). Non-conventional oils may also be produced from natural gas.

Additives and oxygenates – Compounds added to or blended with oil products to modify their properties (octane, cetane, cold properties, etc.). Examples are: (a) oxygenates such as alcohols (methanol, ethanol) and ethers [MTBE (methyl tertiary butyl ether), ETBE (ethyl tertiary butyl ether), TAME (tertiary amyl methyl ether)]; (b) esters (e.g., rapeseed or dimethylester, etc.); and (c) chemical compounds (such as TML, TEL and detergents). Some additives/oxygenates may be derived from biomass while others may be of fossil hydrocarbon origin.

LIGHT OIL PRODUCTS (column 4)

Light oil products are defined here as liquid products obtained by distillation of crude petroleum at temperatures between 30°C and 350°C, and/or which have a specific gravity between 0.625 and 0.830. They comprise:

Aviation gasoline – Motor spirit prepared especially for aviation piston engines, with an octane number varying from 80 to 145 RON and a freezing point of -60°C.

Motor gasoline – Light hydrocarbon oil for use in internal combustion engines such as motor vehicles, excluding aircraft. It distills between 35°C and 200°C, and is treated to reach a sufficiently high octane number of generally between 80 and 100 RON. Treatment may be by reforming, blending with an aromatic fraction, or the addition of benzole or other additives (such as tetraethyl lead).

Jet fuel – Consists of gasoline-type jet fuel and kerosene-type jet fuel.

a) Gasoline-type jet fuel – All light hydrocarbon oils for use in aviation gas-turbine engines. It distills between 100°C and 250°C with at least 20% of volume distilling at 143°C. It is obtained by blending kerosene and gasoline or naphtha in such a way that the aromatic

content does not exceed 25% in volume. Additives are included to reduce the freezing point to -58°C or lower, and to keep the Reid vapour pressure between 0.14 and 0.21 kg/cm^2.

b) Kerosene-type jet fuel – Medium oil for use in aviation gas-turbine engines with the same distillation characteristics and flash point as kerosene, with a maximum aromatic content of 20% in volume. It is treated to give a kinematic viscosity of less than 15 cSt at -34°C and a freezing point below -50°C.

Other kerosene – Medium oil distilling between 150°C and 300°C; at least 65% of volume distills at 250°C. Its specific gravity is roughly 0.80 and its flash point is above 38°C. It is used as an illuminant and as a fuel in certain types of spark-ignition engines, such as those used for agricultural tractors and stationary engines. Other names for this product are burning oil, vaporizing oil, power kerosene and illuminating oil.

Naphtha – Light or medium oil distilling between 30°C and 210°C, for which there is no official definition, but which does not meet the standards laid down for motor spirit. The properties depend upon consumer specification. The C:H ratio is usually 84:14 or 84:16, with a very low sulphur content. Naphtha may be further blended or mixed with other materials to make high-grade motor gasoline or jet fuel, or may be used as a raw material for manufactured gas. Naphtha is sometimes used as input to feedstocks to make various kinds of chemical products, or may be used as a solvent.

White spirit/industrial spirit – A highly refined distillate with a boiling point ranging from 135°C to 200°C, which is used as a paint solvent and for dry-cleaning purposes.

HEAVY OIL PRODUCTS (column 5)

Heavy oil products are defined here as products obtained by the distillation of crude petroleum at temperatures above 350°C, and which have a specific gravity higher than 0.83. Products which are not used for energy purposes, such as insulating oils, lubricants, paraffin wax, bitumen and petroleum coke, are excluded. Heavy products comprise:

Fuel oil – A heavy oil that makes up the distillation residue. It comprises all fuels (including those obtained by blending) with a kinematic viscosity above 27.5 cSt at 38°C. Its flash point is always above 50°C and its specific gravity is higher than 0.90. It is commonly used by ships and industrial large-scale heating installations as a fuel in furnaces or boilers.

Gas-diesel oil (distillate fuel oil) – Heavy oils distilling between 200°C and 380°C, but distilling less than 65% in volume at 250°C, including losses, and 85% or more at 350°C. Its flash point is always above 50°C and its specific gravity is higher than 0.82. Heavy oils obtained by blending are grouped together with gas oils on the condition that their kinematic viscosity does not exceed 27.5 cSt at 38°C. Also included are middle distillates intended for the petrochemical industry. Gas-diesel oils are used as a fuel for internal combustion in diesel engines, as a burner fuel in heating installations, such as furnaces, and for enriching water gas to increase its luminosity. Other names for this product are diesel fuel, diesel oil and gas oil.

OTHER OIL PRODUCTS (column 6)

Lubricants – Viscous, liquid hydrocarbons rich in paraffin waxes, distilling between 380°C and 500°C, obtained by vacuum distillation of oil residues from atmospheric distillation. Additives may be included to alter their characteristics. Their main characteristics are: a flash point greater than 125°C; a pour point between –25°C and +5°C depending on the grade; a strong acid number (normally 0.5 mg/g); an ash content less than or equal to 0.3%; and a water content less than or equal to 0.2%. Included are cutting oils, white oils, insulating oils, spindle oils and lubricating greases.

Feedstocks – Products or a combination of products derived from crude oil destined for further processing in the refining industry other than blending. They are transformed into one or more components and/or finished products. This definition covers naphtha imported for refinery intake and naphtha returned from the chemical industry to the refining industry.

Bitumen – Solid or viscous hydrocarbon with a colloidal structure, brown or black in color, which is obtained as a residue by vacuum distillation of oil residues from atmospheric distillation. It is sometimes soluble in carbon bisulphite, non-volatile, thermoplastic (generally between 150°C and 200°C), often with insulating and adhesive properties. It is used mainly in road construction. Natural asphalt is excluded.

Petroleum waxes – Saturated aliphatic hydrocarbons obtained as residues extracted when dewaxing lubricant oils, with a crystalline structure with C greater than 12. Their main characteristics are as

follows: they are colorless, in most cases odorless and translucent; they have a melting point above 45°C, a specific gravity of 0.76 to 0.78 at 80°C, and a kinematic viscosity between 3.7 and 5.5 cSt at 99°C. These waxes are used for candle manufacture, polishes and waterproofing of containers, wrappings, etc.

Petroleum coke – A shiny, black solid residue obtained by cracking and carbonization in furnaces. It consists mainly of carbon (90 to 95%) and generally burns without leaving any ash. It is used mainly in metallurgical processes. It excludes those solid residues obtained from carbonization of coal.

Other oil products, n.e.c. – Products of petroleum origin (including partially refined products) not otherwise specified.

LPG, REFINERY GAS, ETHANE (column 7)

Liquefied petroleum gas (LPG) – Hydrocarbons which are gaseous under conditions of normal temperature and pressure but are liquefied by compression or cooling to facilitate storage, handling and transportation. They are (i) extracted by stripping of natural gas at crude petroleum and natural gas sources; (ii) extracted by stripping of imported natural gas in installations of the importing country; and (iii) produced both in refineries and outside of refineries in the course of processing crude petroleum or its derivatives. It comprises propane (C_3H_8), butane (C_4H_{10}), or a combination of the two.

Ethane – A naturally gaseous straight-chain hydrocarbon (C_2H_6), ethane is obtained at gas separation plants or from the refining of crude oil. It is a valuable feedstock for petrochemical manufacture.

Refinery gas – 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, and is used principally as a refinery fuel. Refinery gas is also known as still gas.

NATURAL GAS (column 8)

Natural gas – Gases consisting mainly of methane occurring naturally in underground deposits. It includes both non-associated gas (originating from fields producing only hydrocarbons in gaseous form) and associated gas (originating from fields producing both liquid and gaseous hydrocarbons), as well as methane recovered from coal mines. Production of natural gas refers to dry marketable production, measured after purification and extraction of natural gas liquids and sulphur. Extraction losses and the amounts that have been reinjected, flared, and vented are excluded from the data on production.

MANUFACTURED GASES (column 9)

Gasworks gas – Gas produced by public utilities or private plants whose main activity is the production, transport and distribution of such gas. It includes gas produced by carbonization, by total gasification with or without enrichment with oil products, by cracking of natural gas, and by reforming or mixing gases.

Coke-oven gas – By-product of the carbonization process in the production of coke in coke ovens.

Blast furnace gas – By-product in blast furnaces recovered on leaving the furnace.

Other recovered gases – Combustible gases of solid carbonaceous origin recovered from manufacturing and chemical processes not elsewhere defined (for example, oxygen-steel furnace gas).

ELECTRICITY (column 10 and electricity profiles)

Production (electricity profiles) refers to gross production, which includes the consumption by station auxiliaries and any losses in the transformers that are considered integral parts of the station. Included also is total electric energy produced by pumping installations without deduction of electric energy absorbed by pumping.

Main activity producers (electricity profiles) **-** Undertakings whose essential purpose is the production, transmission and distribution of electric energy, primarily for use by the public. These may be private companies, co-operative organizations, local or regional authorities, nationalized undertakings or governmental organizations.

Autoproducers (electricity profiles) **-** Undertakings which, in addition to their main activities, themselves produce (individually or in combination) electric energy intended in whole or in part to meet their own needs. They may be privately or publicly owned.

CONCEPTS AND DEFINITIONS

Primary electricity refers to electrical energy of geothermal, hydro (net of pumped hydro), nuclear, tide, wind, wave/ocean and solar origin, as well as electricity from non-specified sources. Its production is assessed as the heat value of electricity (3.6 TJ/million kWh).

Secondary electricity is defined as thermal electricity, which comprises the output from conventional combustible fuels plants of all types, whether or not equipped for the combined generation of heat and electric energy, and electricity from chemical heat. Accordingly, they include steam-operated generating plants with condensation (with or without extraction) or with back-pressure turbines, and plants using internal combustion engines or gas turbines, whether or not these are equipped for heat recovery.

Own use in electricity, CHP and heat plants includes consumption by station auxiliaries and losses in transformers which are considered as integral parts of the electric energy or heat generating plants.

Net production is gross production minus own use in electricity, CHP and heat plants.

Imports and **exports** refer to the amounts of electric energy transferred to and from the country concerned, respectively, which are measured at the metering points on the lines crossing the frontiers. Included are imports and exports of electric energy made by means of high-voltage lines crossing frontiers as well as imports and exports made by means of low-voltage lines for use in the immediate vicinity of the frontier, if the quantities so transferred are known.

Net installed capacity (electricity profiles) is measured at the terminals of the stations, i.e., after deduction of the power absorbed by the auxiliary installations and the losses in the station transformers, if any. Data concerning capacity refer to 31 December of the year under consideration.

PRIMARY BIOMASS AND WASTE (column 11)

Fuelwood – All wood in the rough used for fuel purposes. Production data include the portion used for charcoal production.

Bagasse – The cellulosic residue left after sugar is extracted from sugar cane. It is often used as a fuel within the sugar milling industry.

Animal waste – Excreta of cattle, horses, pigs, poultry etc., and (in principle) excreta of humans, used as a fuel.

Other vegetal materials and residues – Mainly crop residues (cereal straw from maize, wheat, paddy rice, etc.) and food processing wastes (rice hulls, coconut husks, ground-nut shells, etc.) used for fuel. Bagasse is excluded.

Municipal waste – Consist of products that are combusted directly to produce heat and/or power and comprise wastes produced by the residential, commercial and public services sectors that are collected by local authorities for disposal in a central location. Hospital waste is included in this category.

Industrial waste – Consist of solid and liquid products other than solid biomass and animal products mentioned above (e.g. tires) combusted directly, usually in specialised plants, to produce heat and/or power.

Biogasoline – Liquid fuels derived from biomass and used in spark-ignition internal combustion engines. Common examples are: bioethanol (including both hydrous and anhydrous ethanol); biomethanol; biobutanol; bio ETBE (ethyl-tertio-butyl-ether); and bio MTBE (methyl-tertio-butyl-ether).

Biogases – By-product of the fermentation of biomass, principally animal wastes, by bacteria. It consists mainly of methane gas and carbon dioxide.

Biodiesel – Liquid biofuels derived from biomass and used in diesel engines.

Black liquor – The alkaline-spent liquor obtained from the digesters during the production of sulphate or soda pulp required for paper manufacture.

Other liquid biofuels - Liquid biofuels not elsewhere specified.

CHARCOAL (column 12)

Charcoal – Solid residue, consisting mainly of carbon, obtained by the destructive distillation of wood or other vegetal matter in the absence of air.

CONCEPTS AND DEFINITIONS

HEAT (column 13)

Heat – Heat is the energy obtained from the translational, rotational and vibrational motion of the constituents of matter, as well as changes in its physical state. Production of primary heat refers to gross production of heat from nuclear, geothermal, chemical, solar and non-specified sources, including direct use. Secondary production (output of transformation) includes heat from combustible fuels, electric boilers and heat pumps.

TOTAL ENERGY (column 14) - Summation of column 1 through column 13.