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Fourth Revision

InterEnerStat definitions of Products

Preliminary draft of InterEnerStat definitions of products
still subject to final review by InteEnerStat

International Energy Agency
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InterEnerStat

Harmonisation of Definitions of Energy Products and Flows



FOURTH REVISION OF THE DEFINITIONS

Part 2: Products

revisions to definitions made since the document of 21 Dec. 2009 are in redline/strikeout

IEA, Paris, 28 October 2010

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Product Hierarchy

Solid fossil fuels and derived products

Coal and coal products

Hard coal

Anthracite

Bituminous coal

Coking coal

Other bituminous coal

Brown coal

Sub-bituminous coal

Lignite

Coal products

Coal coke

Coke oven coke

Gas coke

Coke breeze

Semi cokes

Brown coal coke

Other semi cokes

Patent fuel

Brown coal briquettes (BKB)

Coal tar

Coke oven gas

Gas works gas (and other ~~distributed-manufactured~~ gases for distribution)

Recovered gases

Blast furnace gas

Basic oxygen steel furnace gas

Other recovered gases

Peat and peat products

Peat

Sod peat

Milled peat

Peat products

Peat briquettes

Oil shale

Natural gas

Oil

Conventional crude oil

Natural gas liquids (NGL)

Refinery feedstocks

Additives and oxygenates

Other hydrocarbons

Oil products

Refinery gas

Ethane

Liquefied petroleum gases (LPG)

Naphtha

Gasolines

Aviation gasoline

Motor gasoline

Gasoline-type jet fuel

Comment [IEA1]: Should this be deleted if we add "and coal products" to the first level?

Comment [IEA2]: No definition

Comment [IEA3]: No definition

- Kerosenes
 - Kerosene-type jet fuel
 - Other kerosene
- Gas oil / diesel oil
 - Road diesel
 - Other transport diesel
 - Heating and other gas oil
- Heavy gas oil
- Fuel oil
- White spirit and special boiling point industrial spirits
- Lubricants
- Paraffin waxes
- Petroleum coke
- Bitumen
- Other oil products
- Biofuels
 - Solid biofuels
 - Fuelwood, wood residues and by-products
 - Solid agricultural fuels
 - Bagasse
 - Animal waste
 - Other vegetal materials and residues
 - Black liquor
 - Charcoal
 - Liquid biofuels
 - Biogasoline
 - Biodiesels
 - Bio jet kerosene
 - Other liquid biofuels
 - Biogases
 - Biogases from anaerobic fermentation
 - Landfill gas
 - Sewage sludge gas
 - Other ~~primary~~ biogases from anaerobic fermentation
 - Secondary biogases from thermal processes
- Waste
 - Industrial waste
 - Municipal waste
- Solar energy
 - Photovoltaic electricity
 - Non-concentratinged solar thermal energy
 - Concentratinged solar thermal energy
- Wind energy
- Hydro energy
- Wave energy
- Tidal energy
- Other marine energy
- Geothermal energy
- Nuclear energy
- Electricity
- Heat

Comment [IEA4]: No definition

Comment [IEA5]: Apparently this usually refers to 1st generation liquid biofuels which is why we suggest adding "solid".

SOLID FOSSIL FUELS AND DERIVED PRODUCTS

(no definition)

COAL AND COAL PRODUCTS

Comment [IEA6]: If we keep this we should add something on coal products in the definition?

Definition: A solid fossil fuel consisting of carbonised vegetal matter.

Explanation: There are two main categories of primary coal, hard coal (comprising medium- and high rank coals) and brown coal (low-rank coals) which can be identified by their gross calorific value - GCV and the vitrinite mean random reflectance per cent - Rr.

The relationship between the coal types defined below is illustrated here:

- Hard coal
 - Anthracite
 - Bituminous coal
 - Coking coal
 - Other bituminous coal
- Brown coal
 - Sub-bituminous coal
 - Lignite

Remark: Peat is not included in the coal group.

HARD COAL

Definition: Coals with a gross calorific value (moist, ash-free basis) which is not less than 24 MJ/kg or which is less than 24 MJ/kg provided that the coal has a vitrinite mean random reflectance greater than, or equal to 0.6 per cent.

Remark: Hard coal comprises anthracite and bituminous coals. Note that hard coal may include coals with a GCV greater than or equal to 24 MJ/kg and a mean Rr < 0.6 per cent.

ANTHRACITE

Definition: A high-rank, hard coal with a gross calorific value (moist, ash-free basis) greater than, or equal to, 24 MJ/kg and a vitrinite mean random reflectance greater than, or equal to 2.0 per cent.

Explanation: It usually has less than 10% volatile matter, a high carbon content (about 86-98% carbon) and is non-agglomerating.

Remark: It is mainly used for industrial and residential heat raising.

BITUMINOUS COAL

Definition: A medium-rank hard coal with either a gross calorific value (moist, ash-free basis) not less than 24 MJ/kg and with a vitrinite mean random reflectance less than 2.0 per cent, or ~~with~~ a gross calorific value (moist, ash-free basis) less than 24 MJ/kg provided that the vitrinite mean random reflectance is equal to, or greater than 0.6 per cent.

Remark: Bituminous coals are agglomerating and have a higher volatile matter and lower carbon content than anthracite. They are used for industrial coking and heat raising and residential heat raising.

COKING COAL

Definition: Bituminous coal that can be used in the production of a coke capable of supporting a blast furnace charge.

OTHER BITUMINOUS COAL

Definition: Bituminous coal not included under coking coal.

Remark: Sometimes referred to as ~~steam coal~~.

BROWN COAL

Definition: Coals with a gross calorific value (moist, ash-free basis) less than 24 MJ/ kg and a vitrinite mean random reflectance less than 0.6 per cent.

Remark: Brown coal comprises sub-bituminous coal and lignite.

SUB-BITUMINOUS COAL

Definition: Brown coal with a gross calorific value (moist, ash-free basis) equal to, or greater than 20 MJ/kg and less than 24 MJ/kg.

LIGNITE

Definition: Brown coal with a gross calorific value (moist, ash-free basis) ~~not greater~~less than 20 MJ/kg.

COAL PRODUCTS

Definition: Products derived directly or indirectly from the various classes of coal by carbonisation or pyrolysis processes, or by the aggregation of finely divided coal or by chemical reactions with oxidising agents, including water.

COAL COKE

Definition: The solid, cellular, infusible material remaining after the carbonisation of certain coals.

Remark: Various cokes are defined according to the type of coal carbonised and their conditions of carbonisation or use.

- Coke oven coke
- Gas coke
- Coke breeze
- Semi cokes

COKE OVEN COKE

Definition: The solid product obtained from carbonisation of coking coal at high temperature.

Remark: Coke oven coke is low in moisture and volatile matter and has the mechanical strength to support atthe blast furnace charge. It is used mainly in the iron and steel industry acting as heat source and chemical agent.

GAS COKE

Definition: A by-product from the carbonisation of bituminous coal for the manufacture of gas works gas.

Remark: Gas coke is used mainly for heating purposes.

COKE BREEZE

Definition: Coke breeze comprises particles of ~~coal~~-coke of sizes less than 10 mm.

Remark: It is the residue from screening coke. The coke which is screened may be made from bituminous or brown coals.

SEMI COKES

Definition: Cokes produced by low temperature carbonisation.

Remark: Note that semi cokes may be made from bituminous and brown coals and are used as a heating fuel.

BROWN COAL COKE

Definition: A solid product obtained from low temperature carbonisation of brown coal.

OTHER SEMI COKES

Definition: Semi cokes not elsewhere specified.

PATENT FUEL

Definition: A composition fuel made by moulding hard coal fines into briquette shapes with the addition of a binding agent.

Remark: Sometimes referred to as ²hard coal briquettes².

BROWN COAL BRIQUETTES (BKB)

Definition: A composition fuel made of brown coal produced by briquetting under high pressure with or without the addition of a binding agent.

Remark: Either sub-bituminous coal or lignite may be used including dried lignite fines and dust.

COAL TAR

Definition: TheA liquid by-product of the carbonisation of coal in coke ovens.

Remark: Coal tar may be separated by distillation into several liquid products which may be used for pharmaceutical or wood preservative purposes.

COKE OVEN GAS

Definition: A gas produced from coke ovens during the manufacture of coke oven coke.

GAS WORKS GAS (AND OTHER ~~DISTRIBUTED~~ MANUFACTURED GASES FOR DISTRIBUTION)

Definition: Gases obtained from the carbonisation or gasification of carbonaceous material of fossil or biomass origins in gas works.

Explanation: The gases comprise:

- gases obtained from carbonisation or gasification of coals, ~~and cokes,~~ biomass or waste (for example, carburetted water gas).
- substitute natural gas (a methane-rich gas) made from synthesis gas.

Remark: Synthesis gas is a mixture of mainly hydrogen and carbon monoxide obtained by cracking hydrocarbons with high temperature steam. The hydrocarbons may be taken from fossil fuels, biofuels or wastes.

RECOVERED GASES

Definition: Combustible gases of solid carbonaceous origin recovered from manufacturing and chemical processes of which the principal purpose is other than the production of fuel.

Explanation: Gases containing carbon monoxide resulting from the partial oxidation of

- carbon present as coke acting as a reductant in the process, or
- carbon anodes, or
- carbon dissolved in iron.

Remark: They may also be referred to as waste or off gases.

BLAST FURNACE GAS

Definition: ~~The~~A by-product gas of blast furnace operation consisting mainly of nitrogen, carbon dioxide and carbon monoxide.

Explanation: The gas is recovered as it leaves the furnace. Its calorific value arises mainly from the carbon monoxide produced by the partial combustion of coke and other carbon bearing products in the blast furnace.

Remark: It is used to heat blast air and as a fuel in the iron and steel industry. It may also be used by other nearby industrial plants. Note that where carbonised biomass (for example, charcoal or animal meal) is used in blast furnaces, part of the carbon supply may be considered renewable.

BASIC OXYGEN STEEL FURNACE GAS

Definition: TheA by-product gas of the production of steel in a basic oxygen furnace. The gas is recovered as it leaves the furnace.

Remark: The concentration of carbon monoxide in this gas is higher thant that in blast furnace gas. The gas is also known as converter gas, LD gas or BOSF gas.

OTHER RECOVERED GASES

Definition: Combustible gases of solid carbonaceous origin recovered from manufacturing and chemical processes not elsewhere defined.

Remark: Examples of fuel gas production from metals and chemicals processing are in the production of zinc, tin, lead, ferroalloys, phosphorus and silicon carbide.

PEAT AND PEAT PRODUCTS

(no definition)

PEAT

Definition: A solid formed from the partial decomposition of dead vegetation under conditions of high humidity and limited air access (initial stage of coalification).

Explanation: It is available in two forms *for use as a fuel*, sod peat and milled peat.

Remark: Milled peat is also made into briquettes for fuel use.

Peat is not considered a renewable resource as its regeneration period is long.

SOD PEAT

Definition: Slabs of peat, cut by hand or machine, and dried in the air.

MILLED PEAT

Definition: Granulated peat produced by special machines.

Remark: Used in power stations or for briquette manufacture.

PEAT PRODUCTS

(no definition)

PEAT BRIQUETTES

Definition: A fuel comprising of small blocks of dried, highly compressed peat made without a binding agent.

Remark: Used mainly as a household fuel.

OIL SHALE

Definition: A sedimentary rock which contains organic matter in the form of kerogen.

Explanation: Kerogen is a waxy hydrocarbon-rich material regarded as a precursor of petroleum. Oil shale may be burned directly or processed by heating to extract shale oil.

NATURAL GAS

Definition: A mixture of gaseous hydrocarbons, primarily methane, but generally also including ethane, propane and higher hydrocarbons in much smaller amounts and some non combustible gases such as nitrogen and carbon dioxide.

Explanation: **The majority of natural gas** is separated from both "non-associated" gas originating from fields producing hydrocarbons only in gaseous form, and "associated" gas produced in association with crude oil.

The separation process produces natural gas by removing or reducing the hydrocarbons other than methane to levels which are acceptable in the marketable gas. The natural gas liquids (NGL) removed in the process are distributed separately.

Natural gas also includes methane recovered from coal mines (colliery gas) or from coal seams (coal seam gas). When distributed it may also contain methane from anaerobic fermentation or the methanation of biomass.

Remark: Natural gas may be liquefied (LNG) by reducing its temperature in order to simplify storage and transportation when production sites are remote from centres of consumption and pipeline transportation is not economically practicable.

OIL

Definition: Liquid hydrocarbons of fossil origins comprising (i) crude oil; (ii) liquids extracted from natural gas (NGL); (iii) ~~and~~ fully or partly processed products from the refining of crude oil; and (iv) functionally similar liquid hydrocarbons and organic chemicals from vegetal or animal origins.

CONVENTIONAL CRUDE OIL

Definition: A mineral oil of fossil origin extracted by conventional means from underground reservoirs and which comprises liquid or near-liquid hydrocarbons and associated impurities, such as sulphur and metals.

Explanation Conventional crude oil exists in the liquid phase under normal surface temperature and pressure and usually flows to the surface under the pressure of the reservoir. This is termed 'conventional' extraction. Crude oil includes condensate from condensate fields, and 'field' or 'lease' condensate extracted with the crude oil.

Remark: The various crude oils may be classified according to their sulphur content ('sweet' or 'sour') and API gravity ('heavy' or 'light'). There are no rigorous specifications for the classifications but a heavy crude oil may be assumed to have an API gravity of less than 20° and a sweet crude oil may be assumed to have less than 0.5% sulphur content.

NON-CONVENTIONAL OILS (not in product classification)

Comment [IEA7]: IRES has this added to other hydrocarbons. This may make for some double counting since not everything that is considered "non-conventional" should actually be in other hydrocarbons.

Definition: 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 (for example, 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.

Explanation: The oils may be divided into two groups.

- Oils for transformation.

Examples are synthetic crudes extracted from:

Extra heavy oils

Oil sands

Coal

Oil shale

- Oils for direct use.

Examples are:

Emulsified oils (for example, orimulsion)

Liquids from GTL plants and coal liquefaction plants ~~GTL liquids~~

Remark: Oil sands are also known as tar sands. Extra heavy oils are also known as bitumen. This is not the oil product of the same name which is made from vacuum distillation residue.

NATURAL GAS LIQUIDS (NGL)

Definition: Natural gas liquids are a mixture of ethane, propane, butane (normal and iso), (iso) pentane and a few higher alkanes collectively referred to as pentanes plus.

Explanation: NGL are ~~removed from associated and non-associated natural gas produced in association with oil or natural gas. They are removed~~ in field facilities or gas separation plants before sale of the gas. All of the components of NGL except ethane are either liquid at the surface or are liquefied for disposal.

Remark: The definition given above is the most commonly used. However, there is some use of terms based on the vapour pressure of the components which are liquid at the surface or can be easily liquefied. The three resulting groups are, in order of increasing vapour pressure: condensates, natural gasoline and liquefied petroleum gas.

NGL may be distilled with crude oil in refineries, blended with refined oil products or used directly. NGL differs from LNG (liquefied natural gas) which is obtained by liquefying natural gas from which the NGL has been removed.

REFINERY FEEDSTOCKS

Definition: Oils or gases from crude oil refining or the processing of hydrocarbons in the petrochemical industry which are destined for further processing in the refinery excluding blending.

Explanation: Typical feedstocks include naphthas, middle distillates, pyrolysis gasoline and heavy oils from vacuum distillation and petrochemical plants.

ADDITIVES AND OXYGENATES

Definition: Compounds added to or blended with oil products to modify their properties (octane, cetane, cold properties, etc.).

Remark: Examples are:

- oxygenates, such as alcohols (methanol, ethanol), ethers (such as MTBE (methyl tertiary butyl ether), ETBE (ethyl tertiary butyl ether), TAME (tertiary amyl methyl ether);
- esters (e.g. rapeseed or dimethylester, etc.);
- chemical compounds (such as TML, TEL and detergents).

Some additives/oxygenates may be derived from biomass, others may be of **fossil** hydrocarbon origin.

OTHER HYDROCARBONS

Definition: Non-conventional oils and hydrogen.

Remark: Although not a hydrocarbon, hydrogen is included unless it is a component of another gas.

OIL PRODUCTS

Definition: Products obtained from crude oil, non-conventional oils or gases from oil and gas fields.

Explanation: They may be produced through the refining of conventional crude and non-conventional oils or during the separation of natural gas from gases extracted from oil or gas fields.

REFINERY GAS

Definition: Refinery gas includes a mixture of non-condensable gases mainly consisting of hydrogen, methane, ethane and olefins obtained during distillation of crude oil or treatment of oil products (e.g. cracking) in refineries or from nearby petrochemical plants.

Remark: It is used mainly as a fuel within the refinery.

ETHANE

Definition: A naturally gaseous straight-chain hydrocarbon (C_2H_6).

Remark: Ethane is obtained at gas separation plants or from the refining of crude oil. It is a valuable feedstock for petrochemical manufacture.

LIQUEFIED PETROLEUM GASES (LPG)

Definition: LPG refers to liquefied propane (C_3H_8) and butane (C_4H_{10}) or mixtures of both. Commercial grades are usually mixtures of the gases with small amounts of propylene, butylene, isobutene and isobutylene stored under pressure in containers.

Remark: The mixture of propane and butane used varies according to purpose and season of the year. The gases may be extracted from natural gas at gas separation plants or at plants regasifying imported liquefied natural gas. They are also obtained during the refining of crude oil. LPG may be used for heating and as a vehicle fuel.

See also the definition for natural gas liquids. Certain oil field practices also use the term LPG to describe the high vapour pressure components of natural gas liquids.

NAPHTHA

Definition: Light or medium oils distilling between 30°C and 210°C which do not meet the specification for motor gasoline.

Remark: Different naphthas are distinguished by their density and the content of paraffins, isoparaffins, olefins, naphthenes and aromatics. The main uses for naphthas are as feedstock for high octane gasolines and the manufacture of olefins in the petrochemical industry.

GASOLINES

Definition: Gasolines are complex mixtures of volatile hydrocarbons distilling between approximately 25°C and 220°C and consisting of compounds in the C₄ to C₁₂ range.

Remark: Gasolines may contain blending components of biomass origin, especially oxygenates (mainly ethers and alcohols), and additives may be used to boost certain performance features.

AVIATION GASOLINE

Definition: Gasoline prepared especially for aviation piston engines with additives which assure performance under flight conditions. Aviation gasolines are predominantly alkylates (obtained by combining C₄ and C₅ isoparaffins with C₃, C₄ and C₅ olefins) with the possible addition of more aromatic components including toluene. The distillationboiling range is 25°C to 170°C.

MOTOR GASOLINE

Definition: A mixture of some aromatics (for example, benzene and toluene) and aliphatic hydrocarbons in the C₅ to C₁₂ range. The distillationboiling range is **between** 25°C to 220°C.

Remark: Additives are blended to

- improve octane rating,
- improve combustion performance,
- reduce oxidation during storage,
- maintain cleanliness of the engine and
- improve capture of pollutants by catalytic converters in the exhaust system.

Motor gasoline may also contain biogasoline products.

GASOLINE-TYPE JET FUEL

Definition: Light hydrocarbons for use in aviation turbine power units, distilling between 100°C and 250°C. They are obtained by blending kerosenes and gasoline or naphtha 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.

Remark: ~~J~~Gasoline-type jet fuel is also known as aviation turbine fuel.

KEROSENES

Definition: Mixtures of hydrocarbons in the range C₉ to C₁₆ ~~and distillingboiling~~ over the temperature interval 145°C to 300°C, but not usually above 250°C, and with a flash point above 38°C.

Explanation: The chemical composition of kerosenes depends on the nature of the crude oils from which they are derived and the refinery processes that they have undergone. Kerosenes obtained from crude oil by atmospheric distillation are known as straight-run kerosenes. Such streams may be treated by a variety of processes to produce kerosenes that are acceptable for blending as jet fuels.

Remark: Kerosenes are primarily used as jet fuels. They are also used as domestic heating and cooking fuels, and as solvents. Kerosenes may include components or additives derived from biomass.

KEROSENE-TYPE JET FUEL

Definition: A blend of kerosenes suited to flight conditions with particular specifications, such as freezing point.

Remark: The specifications are set down by a small number of national standards committees, most notably, ASTM (U.S.), MOD (UK), GOST (Russia).

OTHER KEROSENE

Definition: Kerosene which is used for heating, cooking, lighting, solvents and internal combustion engines.

Remark: Other names for this product are burning oil, vaporising oil, power kerosene and illuminating oil.

GAS OIL/DIESEL OIL

Definition: Gas oils are middle distillates, predominantly of carbon number range C₁₁ to C₂₅ and with a distillation range of 160°C to 420°C.

Explanation: The principal marketed products are:

- Automotive fuels for diesel engines
- Heating oils
- Marine fuel

Remark: Gas oils are also used as middle distillate feedstock for the petrochemical industry and as solvents.

ROAD DIESEL

Definition: Gas (diesel) oil (usually of low sulphur content) for fuel use in compression ignition (diesel) engines fitted in road vehicles. Distillation range is 160°C to 390°C.

Remark: Additives are used to ensure a suitable cetane number and cleanliness of the engine. The cetane number describes the combustion quality of diesel fuel during compression ignition. The product may contain components or additives derived from biomass.

HEATING AND OTHER GAS OIL

Definition: Gas oils/~~Diesel Oil~~ used as a light heating oil for industrial and commercial uses, in marine and rail locomotive diesel engines and as a petrochemical feedstock. The distillation range is 160°C to 420°C.

Comment [IEA8]: Should we add "other transport diesel" above. What would the definition be? Right now we have marine and rail locomotive diesel in this category.

HEAVY GAS OIL

Definition: A mixture of predominantly gas oil and ~~Residual~~ fuel oil which distills in the range of approximately 380°C to 540°C.

FUEL OIL

Definition: Comprises residual fuel oil and heavy fuel oil. ~~which is usually a blended product based on the residues from various refinery, distillation and cracking processes.~~ Residual fuel oils have a distillation range of 350°C to 650°C and a kinematic viscosity in the range 6 to 55 cSt at 100°C. Their flash point is always above 60°C and their specific gravity is above 0.95. Heavy fuel oil is a general term describing a blended product based on the residues from various refinery processes.

Explanation: ~~Heavy fuel oil is a general term and o~~Other names commonly used to describe fuel oil ~~this range of products~~ include: bunker fuel, bunker C, fuel oil No. 6, industrial fuel oil, marine fuel oil and black oil.

Remark: Residual and heavy fuel oil are used in medium to large industrial plants, marine applications and power stations in combustion equipment such as boilers, furnaces and diesel engines. Residual fuel oil is also used as fuel within the refinery.

WHITE SPIRIT AND SPECIAL BOILING POINT INDUSTRIAL SPIRITS

Definition: White spirit and SBP (special boiling point industrial spirits) are refined distillate intermediates with a distillation in the naphtha/kerosene range. They are mainly used for non-fuel purposes and sub-divided as:

- White spirit: ~~An industrial spirit with a flash point above 30°C. The distillation range of white spirit is 135°C to 200°C.~~
- Industrial spirits (SBP): Light oils distilling between 30°C and 200°C.

Explanation: There are 7 or 8 grades of industrial spirits, depending on the position of the cut in the distillation range. The grades are defined according to the temperature difference between the 5% volume and 90% volume distillation points (which is not more than 60°C).

- ~~White Spirit: Industrial spirit with a flash point above 30°C. The distillation range of white spirit is 135°C to 200°C.~~

Remark: White spirit and industrial spirits are mostly used as thinners and solvents.

LUBRICANTS

Definition: Oils, produced from crude oil, for which the principal use is to reduce friction between sliding surfaces and during metal cutting operations.

Explanation: Lubricant base stocks are obtained from vacuum distillates which result from further distillation of the residue from atmospheric distillation of crude oil. The lubricant base stocks are then further processed to produce lubricants with the desired properties.

PARAFFIN WAXES

Definition: Residues extracted when dewaxing lubricant oils ~~that-~~They have a crystalline structure which varies in fineness according to the grade and are colourless, odourless and translucent, with a melting point above 45°C.

Remark: Paraffin waxes are also known as petroleum waxes.

PETROLEUM COKE

Definition: Petroleum coke is a black solid obtained mainly by cracking and carbonising heavy hydrocarbon oils and tars and pitches. It consists mainly of carbon (90 to 95%) and has a low ash content.

Explanation: The two most important categories are "green coke" and "calcined coke".

- Green coke (raw coke) is the primary solid carbonisation product from high boiling hydrocarbon fractions obtained at temperatures below 630°C. It contains 4 -15 per cent by weight of matter that can be released as volatiles during subsequent heat treatment at temperatures up to approximately 1330°C.
- Calcined coke is a petroleum coke or coal-derived pitch coke obtained by heat treatment of green coke to about 1330°C. It will normally have a hydrogen content of less than 0.1 ~~per cent by weight,wt.-%~~.

Remark: In many catalytic operations (e.g., catalytic cracking) carbon or catalytic coke is deposited on the catalyst, thus deactivating it. The catalyst is reactivated by burning off the coke which is used as a fuel in the refining process. The coke is not recoverable in a concentrated form.

BITUMEN

Definition: Bitumen is a solid, semi-solid or viscous hydrocarbon with a colloidal structure, being brown to black in colour.

Remark: It is obtained as a residue in the distillation of crude oil and by vacuum distillation of oil residues from atmospheric distillation. It should not be confused with the ~~unconventional~~non-conventional primary extra heavy oils which may also be referred to as bitumen.

In addition to its major use for road pavements, bitumen is also used as an adhesive, a waterproofing agent for roof coverings and as a binder in the manufacture of patent fuel. It may also be used for electricity generation in specially designed power plants.

Bitumen is also known in some countries as asphalt but in others asphalt describes the mixture of bitumen and stone aggregate used for road pavements.

OTHER OIL PRODUCTS

Definition: Products (including partly refined products) from the refining of crude oil and feedstocks which are not specified above.

Explanation: They will include basic chemicals and organic chemicals destined for use within the refinery or for sale to or processing in the chemical industry such as propylene, benzene, toluene, ~~and xylene~~ and hydrogen.

RENEWABLES (not in product classification)

Definition: Fuels and energy obtained,

- directly from solar radiation or
- indirectly from its effects on the biosphere and the life within it,
- from geothermal energy and
- from gravitational forces.

Explanation: These are sources of energy which are naturally replenished as they are used. Their indirect use is through the exploitation of wind, tides, hydro and biomass.

BIOMASS (not in product classification)

Definition: Material obtained from living or recently living organisms. It excludes fossilised or partly fossilised material.

Remark: The material may be in the solid, liquid or gaseous state. It includes animal by-products and residues and excludes peat.

BIOFUELS

Definition: Fuels derived directly or indirectly from biomass.

Remark: Fuels produced from animal fats, by-products and residues obtain their calorific value indirectly from the plants eaten by the animals.

SOLID BIOFUELS

Definition: Solid fuels derived from biomass.

FUELWOOD, WOOD RESIDUES AND BY-PRODUCTS

Definition: Fuelwood or firewood (in log, brushwood, pellet or chip form) obtained from natural or managed forests or isolated trees. Also included are wood residues used as fuel and in which the original composition of wood is retained.

Remark: Charcoal and black liquor are excluded.

SOLID AGROFUELS

Definition: Solid biofuels obtained from crops, and residues from crops and other agricultural products.

Remark: Residues from agricultural production include animal solid excreta, meat and fish residues. Solid agrofuels ~~is~~are sub divided into bagasse, animal wastes, and other vegetal material and residues.

BAGASSE

Definition: The fuel obtained from the fibre which remains after juice extraction in sugar cane processing.

ANIMAL WASTE

Definition: Excreta of animals, meat and fish residues which, when dry, are used directly as a fuel.

Remark: This excludes waste used in anaerobic fermentation plants. Fuel gases from these plants are included under biogases.

OTHER VEGETAL MATERIAL AND RESIDUES

Definition: Biofuels not specified elsewhere and including straw, vegetable husks, ground nut shells, pruning brushwood, olive pomace and other wastes arising from the maintenance, cropping and processing of plants.

BLACK LIQUOR

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

Explanation: The lignin contained in the liquor burns to release heat when the concentrated liquor is sprayed into a recovery furnace and heated with hot gases at 900°C.

Remark: Black liquor is used as a fuel in the pulping process.

CHARCOAL

Definition: The solid residue from the carbonisation of wood or other vegetal matter through slow pyrolysis.

LIQUID BIOFUELS

Definition: Liquids derived from biomass and generally used as fuels.

Remark: Liquid biofuels comprise biogasoline, biodiesels, biokerosene and other liquid biofuels. They are used for transport, electricity generation and stationary engines.

BIOGASOLINE

Definition: Liquid fuels derived from biomass and used in spark-ignition internal combustion engines.

Remark: Common examples are:

- bioethanol (including both hydrous and anhydrous ethanol)
- biomethanol
- biobutanol
- bio ETBE (ethyl-tertio-butyl-ether)
- bio MTBE (methyl-tertio-butyl-ether)

Biogasoline may be blended with petroleum gasoline or used directly in engines.

The blending may take place in refineries or at or near the point of sale.

BIODIESELS

Definition: Liquid biofuels derived from biomass and used in diesel engines, which are usually modified chemically so that they can be used as fuel in diesel engines either directly or after blending with petroleum diesel.

Explanation: Biodiesels obtained by chemical modification are a linear alkyl ester made by transesterification of vegetable oils or animal fats with methanol. The transesterification distinguishes biodiesel from straight vegetable and waste oils. Biodiesel has a flash point of around 150°C and a density of about 0.88 kg/litre. Biological sources of biodiesel include, but are not limited to, vegetable oils made from canola (rapeseed), soybeans, corn, oil palm, peanut, or sunflower. Some liquid biofuels (straight vegetable oils) may be used without chemical modification and their use usually requires modification of the engine.

A further category of diesel fuels can be produced by a range of thermal processes (including for example gasification followed by Fischer Tropsch synthesis, pyrolysis followed by hydrogenation, or conversion of sugar to hydrocarbons using microorganisms (e.g. yeast)). A wide range of biomass feedstocks, including cellulosic materials and algal biomass could be used in such processes.

Biodiesel may be blended with petroleum diesel or used directly in diesel engines.

BIO JET KEROSENE

Definition: Liquid biofuels derived from biomass and blended with or replacing jet kerosene.

Explanation: Bio jet kerosene can be produced by a range of thermal processes (including for example gasification followed by Fischer Tropsch synthesis, pyrolysis followed by hydrogenation, or conversion of sugar to hydrocarbons using microorganisms (e.g. yeast). A wide range of biomass feedstocks, including cellulosic materials and algal biomass could be used in such processes.

OTHER LIQUID BIOFUELS

Definition: Liquid biofuels not elsewhere specified.

BIOGASES

Definition: Gases arising from the anaerobic fermentation of biomass and the gasification of solid biomass (including biomass in wastes).

Explanation: The gases from anaerobic fermentation are composed principally of methane and carbon dioxide and comprise landfill gas, sewage sludge gas and other biogases from anaerobic fermentation.

Biogases can also be produced from thermal processes (by gasification or pyrolysis) of biomass and are mixtures containing hydrogen and carbon monoxide (usually known as syngas) along with other components. These gases may be further processed to modify their composition and can be further processed to produce substitute natural gas.

Remark: The gases are divided into two groups according to their production: biogases from anaerobic fermentation and biogases from thermal processes. These gases are composed principally of methane and carbon dioxide and comprise Landfill gas, Sewage sludge gas and other biogases.

They are used mainly as a fuel but can be used as a chemical feedstock.

BIOGASES FROM ANAEROBIC FERMENTATION

Definition: The biogases from anaerobic fermentation are composed principally of methane and carbon dioxide and comprise landfill gas, sewage sludge gas and other biogases from anaerobic fermentation.

Explanation: The biogases from anaerobic fermentation are composed principally of methane and carbon dioxide and include gas produced from a range of wastes and other biomass materials including energy crops in anaerobic digesters (including sewage sludge gas) and landfill gas. The gases may be processed to remove the carbon dioxide and other constituents to produce a methane fuel.

LANDFILL GAS

Definition: Biogas from the anaerobic fermentation of organic matter in landfills.

SEWAGE SLUDGE GAS

Definition: Biogas from the anaerobic fermentation of waste matter in sewage plants.

OTHER ~~PRIMARY~~ BIOGASES FROM ANAEROBIC FERMENTATION

Definition: Other biogases from anaerobic fermentation not elsewhere specified.

Explanation: Two of the largest sources of these biogases are the fermentation of energy crops and the fermentation of manure on farms. ~~Biogases not elsewhere specified including synthesis gas produced from biomass.~~

~~SECONDARY~~ BIOGASES FROM THERMAL PROCESSES

Definition: Biogases from thermal processes (by gasification or pyrolysis) of biomass.

Explanation: Biogases from thermal processes are a mixture containing hydrogen and carbon monoxide (usually known as syngas) along with other components. These gases may be further processed to modify their composition and can be further processed to produce substitute natural gas.

WASTE

Definition: For the purposes of energy statistics, wastes are materials no longer required by their holders and which are used as fuels. They are incinerated with heat recovery at installations designed for mixed wastes or co-fired with other fuels.

Remark: The heat may be used for heating or electricity generation. Certain wastes are mixtures of materials of fossil and biomass origin.

INDUSTRIAL WASTE

Definition: Non-renewable waste which is combusted with heat recovery in plants other than those used for the incineration of municipal waste.

Remark: Examples are, used tyres, specific residues from the chemical industry and hazardous wastes from health care. Combustion includes co-firing with other fuels.

The renewable portions of industrial waste combusted with heat recovery are classified according to the biofuels which best describe them.

MUNICIPAL WASTE

Definition: Household waste and waste from companies and public services that resembles household waste and which is collected at installations specifically designed for the disposal of mixed wastes with recovery of combustible liquids, gases or heat.

Remark: Municipal wastes can be divided into renewable and non-renewable fractions.

SOLAR ENERGY

Definition: Energy captured from solar radiation. For the purposes of energy statistics, solar energy is subdivided into three major technologies used to capture the solar radiation and produce a useful energy output, by devices which use the following technologies.

Solar photovoltaics:

Definition: Electricity produced by the direct conversion of solar radiation through photovoltaic processes in semiconductor devices (solar cells), including concentrating photovoltaic systems.

Remark: ~~Photovoltaic cells receiving concentrated solar radiation are included.~~

~~Concentrated Solar Thermal:~~

Definition: ~~High temperature heat obtained by focussing solar radiation onto a collector/receiver.~~

Remark: ~~The high temperature heat captured may be used for electricity generation and chemical processes or for use away from the concentrating system.~~

Non-concentrating solar thermal:

Definition: Low temperature heat produced from solar radiation captured by non-concentrating solar thermal systems. ~~Heat taken from a fluid which is circulated through a collector heated by incident solar radiation *without* augmentation.~~

Remark: The heat can be used for applications such as space heating, cooling, water heating, district heating and industrial processes. ~~The heat is not capable of generating steam.~~

Concentrating solar thermal:

Definition: High temperature heat produced from solar radiation captured by concentrating solar thermal systems.

Remark: The high temperature heat can be transformed to generate electricity, drive chemical reactions, or be used directly in industrial processes.

WIND ENERGY

Definition: For the purposes of energy statistics, electricity produced from devices driven by wind.

HYDRO ENERGY

Definition: For the purposes of energy statistics, electricity produced from devices driven by fresh, flowing water.

WAVE ENERGY

Definition: For the purposes of energy statistics, electricity produced from devices driven by the motion of waves.

TIDAL ENERGY

Definition: For the purposes of energy statistics, electricity generated from devices driven by tidal currents or the differences of water level caused by tides.

OTHER MARINE ENERGY

Definition: For the purposes of energy statistics, electricity generated from devices which exploit sources of marine energy not elsewhere specified, non-tidal currents, temperature differences and salinity gradients in seas and between sea and fresh water.

Explanation: Examples of sources are non-tidal currents, temperature differences and salinity gradients in seas or salinity differences between sea and fresh water.

GEOTHERMAL ENERGY

Definition: Heat extracted from the earth.

Explanation: The sources of the heat are radioactive decay in the crust and mantle and heat from the core of the earth.

Heat from shallow geothermal sources will include heat gained by the earth from direct sunlight and rain.

Remark: The heat is usually extracted from the earth in the form of heated water or steam.

NUCLEAR ENERGY

Definition: For the purposes of energy statistics, nuclear energy is the heat obtained from the steam (or other working fluid) produced by the nuclear reactor.

Explanation: A working fluid is the substance circulated in a closed system to convey heat from the source of heat to its point(s) of use.

ELECTRICITY

Definition: The transfer of energy through the physical phenomena involving electric charges and their effects when at rest and in motion.

HEAT

Definition: For the purposes of energy statistics, 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.