



ELECTRICITY AND HEAT ANNUAL QUESTIONNAIRE 2009 AND HISTORICAL REVISIONS

drafted: July 2010

Attached is the annual questionnaire for electricity and heat which provides for the submission of 2009 data and historical revisions where applicable. Administrations are requested to complete the questionnaire at the latest the **30th of September 2010**. Earlier submissions are welcome.

Please send your questionnaire to:

- International Energy Agency (IEA/OECD), Energy Statistics Division
(the IEA will forward the data to the United Nations Economic Commission for Europe in Geneva).
- Commission of the European Communities, Eurostat, Energy and Transport Statistics
(for Member States of the European Union, EU Candidate Countries and EFTA Countries)
- United Nations Statistics Division, Energy Statistics Section

Transmission details are provided in the “Data Communication Procedures” section.

REPORTING INSTRUCTIONS

Data should be reported for calendar years. If fiscal year data have to be used, please state this clearly with the specification of period covered.

For consistency between administrations and to conform with computer software, the data reported in this questionnaire should be in whole numbers (i.e. no decimals or fractions) in the unit shown for each table.

The definitions and reporting conventions used in this Questionnaire are the same as those used in the other annual questionnaires, (Coal, Oil, Gas, and Renewables). Please ensure that data on fuel used for electricity and heat production reported in the other annual questionnaires are consistent with those reported for the same categories in the Electricity and Heat Questionnaire.

Where data are not available, estimates should be given and identified as such in the “Remarks page”.

INTERNATIONAL STANDARD INDUSTRIAL CLASSIFICATION

In 2008, the United Nations and the European Commission have published in parallel their revised classification codes.

- United Nations:

International Standard Industrial Classification of all Economic Activities – ISIC, Rev.4

- European Commission:

Statistical classification of economic activities in the European Community NACE, Rev.2

Eurostat and the International Energy Agency jointly produced a correspondence table aimed at providing continuity of time series and have updated the references in the Joint Questionnaires accordingly.

Directive 2004/8/EC of the European Parliament and of the Council

The supplementary reporting section on “Combined Heat and Power” under the Directive 2004/8/EC of the European Parliament and of the Council applies **only** to European Union Member States, Candidate Countries, and EFTA Countries.

DEFINITIONS FOR ELECTRICITY AND HEAT

The questionnaires seek information on the fuel requirements for, and the generation of electricity and heat according to producer and generating plant types.

Types of Producer:

Producers are classified according to the purpose of production:

- **Main Activity Producer** (formerly known as public) undertakings generate electricity and/or heat for sale to third parties, *as their primary activity*. They may be privately or publicly owned. Note that the sale need not take place through the public grid.
- **Autoproducer** undertakings generate electricity and/or heat, wholly or partly for their own use as an activity which supports their primary activity. They may be privately or publicly owned.

For more information on Autoproducers, see the definition for Table 9.

Types of Plant:

The separation of fuel use and electricity/heat generation statistics according to the type of plant (i.e. electricity (only), heat (only) or combined electricity and heat) will normally be conducted using statistics collected at the plant level, i.e. generating stations comprising one or more generating sets or units. The definitions given below have been prepared on this assumption. However, when a country has data for the

electricity and heat output, and fuel inputs, for *each of the generating units* within a plant, these data should be used to prepare the report. In this case the definitions set out below will need to be interpreted on the unit basis rather than on the plant basis.

- **Electricity Only** refers to a plant which is designed to produce electricity only. If one or more units of the plant is a CHP unit (*see below*) then the whole plant is designated as a CHP plant.
- **Combined Heat and Power (CHP)** refers to a plant which is designed to produce both heat and electricity. It is sometimes referred to as co-generation power stations. If possible, fuel inputs and electricity/heat outputs should be reported on a unit basis rather than on a plant basis. However, if data are not available on a unit basis, the convention for defining a CHP plant noted above should be adopted.
- **Heat Only** refers to a plant which is designed to produce heat only. Heat delivered from CHP or Heat Only plants may be used for process or space heating purposes in any sector of economic activity including the Residential Sector.

It should be noted that:

- **Electricity** production reported for *Autoproducer Electricity* or *Autoproducer CHP* should be the total quantity of electricity generated.
- All **heat** production from *Main Activity Producer CHP* and *Main Activity Producer Heat Plants* should be reported. However, other heat production reported for *Autoproducer CHP* and *Autoproducer Heat* plants should comprise only the heat sold to third parties (Heat consumed by autoproducers should not be included). In all cases Heat from Chemical Processes (as a primary energy form) should be reported.
- Report in the transformation sector only those quantities of fuels used to generate the amounts of electricity and heat reported in the questionnaire. The quantities of fuel consumed for the production of heat which is not sold will remain in the figures for the final consumption of fuels by the relevant sector of economic activity.

The reporting requirements for *transformation sector* activities can be summarised schematically as follows:

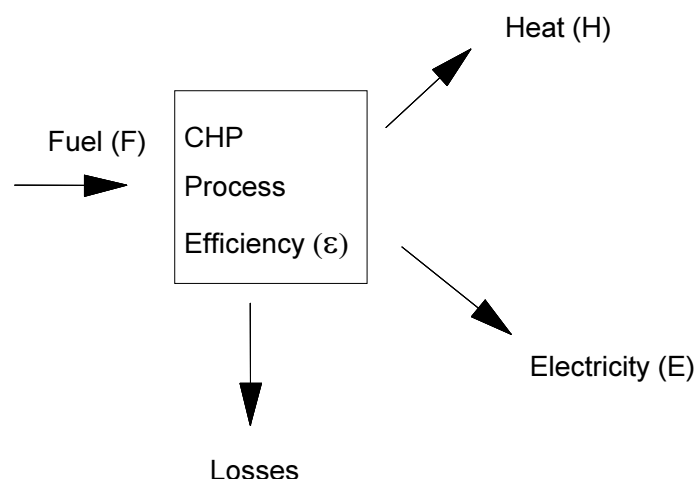
	Electricity Only	CHP	Heat Only
Main Activity Producer	Report all production and all fuel used	Report all electricity and heat produced and all fuel used	Report all heat produced and all fuel used
Autoproducer		Report all electricity produced and heat sold with corresponding fuel used	Report heat sold and corresponding fuel used

In this questionnaire the term **Combustible fuels** refers to fuels that are capable of igniting or burning, i.e. reacting with oxygen to produce a significant rise in temperature.

METHODOLOGY FOR APPORTIONING FUEL INPUT IN A CHP PLANT

In cases where national administrations have not adopted a methodology for this purpose, the following approach is proposed where the fuel input is divided between electricity and heat in proportion to their shares of the CHP useful energy output.

In CHP units the relationship between the fuel input and the output electricity and heat, without regard to the type of thermodynamic process, may be modeled simply in the diagram below.



The following relationship defining overall efficiency (ϵ) is:

$$\epsilon = (H + E) / F$$

The definition given proposes that the imputed fuel use for electricity, F_e , and (as a consequence) that for heat, F_h , are:

$$F_e = F - H / \epsilon = F (E / (E + H))$$

$$F_h = F - E / \epsilon = F (H / (E + H))$$

The formula should be used only where national administrations have not already adopted a methodology for the purpose of reporting CHP on a unit basis.

Note to EU Member States, Candidate Countries, and EFTA Countries.

Under the Directive 2004/8/EC of the European Parliament and of the Council, EU Member States, Candidate Countries, and EFTA Countries are required to also report CHP data on the basis of Table EU-1 and Table EU-2 definitions and specifications as defined in the “Reporting Instructions” of the supplementary reporting section.

GEOGRAPHICAL NOTES

Australia excludes the overseas territories;

Denmark excludes the Danish Faroes and Greenland;

France includes Monaco and excludes the French overseas territories Guadeloupe, Martinique, Guyane, Reunion, St.-Pierre and Miquelon, New Caledonia and French Polynesia;

Italy includes San Marino and the Vatican;

Japan includes Okinawa;

The Netherlands excludes Suriname and the Netherlands Antilles;

Portugal includes the Açores and Madeira;

Spain includes the Canary Islands, the Balearic Islands, and Ceuta and Melilla;

Switzerland does not include Liechtenstein;

United States: includes 50 States and District of Columbia.

INSTRUCTIONS FOR COMPLETING INDIVIDUAL TABLES IN THE QUESTIONNAIRE

TABLES 1 AND 2 ANNUAL GROSS AND NET ELECTRICITY AND HEAT PRODUCTION

For a proper understanding of the definitions of categories in the table, respondents are urged to read the note 'Definitions for Electricity and Heat', reproduced on page 3.

Table 1 refers to **gross** electricity and heat production:

Gross Electricity Production is the sum of the electrical energy production by all the generating sets concerned (including pumped storage) measured at the output terminals of the main generators.

Gross Heat Production is the total heat produced by the installation and includes the heat used by the installation's auxiliaries which use a hot fluid (space heating, liquid fuel heating etc) and losses in the installation/network heat exchanges, as well as heat from chemical processes used as a primary energy form.

Note that for **autoproducers**, heat used by the undertaking for its own processes is not included here; only heat sold to third parties should be reported. As only heat sold to third parties is reported, gross heat production for autoproducers will be equal to net heat production.

Table 2 refers to **net** electricity and heat production:

Net Electricity Production is equal to the gross electricity production less the electrical energy absorbed by the generating auxiliaries and the losses in the main generator transformers.

Net Heat Production is the heat supplied to the distribution system as determined from measurements of the outgoing and return flows.

Tables 1 and 2 electricity and heat production are divided as follows:

1. Nuclear

Energy released by nuclear fission or nuclear fusion.

2. Hydro-power

Potential and kinetic energy of water converted into electricity in hydroelectric plants. Pumped storage should be included.

3. Geothermal

Energy available as heat emitted from within the earth's crust, usually in the form of hot water or steam. It is exploited at suitable sites:

- for electricity generation using dry steam or high enthalpy brine after flashing
- directly as heat for district heating, agriculture etc.

4. Solar Energy

Solar radiation exploited for electricity generation.

- **Solar Photovoltaic**
- **Solar** Thermal-electric plants

5. Tide/Wave/Ocean

Mechanical energy derived from tidal movement, wave motion or ocean current and exploited for electricity generation.

6. Wind

Kinetic energy of wind exploited for electricity generation in wind turbines.

7. Combustible Fuels

Refers to fuels that are capable of igniting or burning, i.e. reacting with oxygen to produce a significant rise in temperature. They are combusted directly for the production of electricity and/or heat.

8. Heat from chemical processes

Report only the heat originating from processes without input energy, such as a chemical reaction (e.g. the treatment of zinc oxide ore with hydrochloric acid). Note that waste heat originating from energy driven processes is not considered as a primary energy source. Therefore, it should be reported as heat produced from the corresponding fuel.

9. Other Sources - Electricity

Report electricity production from sources other than those listed, e.g. from fuel cells. Please provide details of the Sources included on the Remarks page.

10. Heat Pumps

Report the heat output from heat pumps only where the heat is sold to third parties (i.e. in cases where production occurs in the Transformation Sector).

11. Electric Boilers

Report the heat from electric boilers where the output is sold to third parties. Report the electricity used in such boilers in Table 3.

12. Other Sources – Heat

Report here the heat from other sources; for example, recovered waste heat from industry sold to third parties. Please provide details of the Sources included on the Remarks page.

TABLE 3
ELECTRICITY AND HEAT SUPPLY AND CONSUMPTION

1. Gross Electricity Production

See definition in “Tables 1 and 2” section.

2. Gross Heat Production

See definition in “Tables 1 and 2” section.

3. Own Use by Power Plants

This is the difference between Gross and Net electricity production.

4. Net Electricity Production

See definition on in “Tables 1 and 2” section.

5. Net Heat Production

See definition in “Tables 1 and 2” section.

6. Imports and Exports

Amounts of electricity are considered as imported or exported when they have crossed the political boundaries of the country, whether customs clearance has taken place or not. If electricity is “wheeled” or transited through a country, the amount should be reported as both an import and an export (see notes on Tables 8A,B,C).

7. Used for Heat Pumps

Report the electricity used in heat pumps for which the heat output is reported in Tables 1 and 2.

8. Used for Electric Boilers

Report the electricity used in electric boilers for which the heat output is reported in Tables 1 and 2.

9. Used for Pumped Storage

Report the electricity consumed by pumping in hydro-electric power plants.

10. Used for Electricity Production

Report heat from chemical processes used as a primary energy form, and purchased secondary waste heat consumed as input to electricity generation.

11. Energy Supplied

For *electricity*, this is the electrical energy supplied from the plant. In the case of a national network this is equal to the sum of the net electrical energy production supplied by all power stations within the country, reduced by the amount used simultaneously for pumping as well as the amount used for heat sold using heat pumps and electric boilers. It is then reduced or increased by exports to or imports from abroad. For *heat*, this is equal to the sum of the net heat production for sale by all plants within a country reduced or increased by exports or imports from abroad.

12. Transmission and Distribution Losses

All losses due to transport and distribution of electrical energy and heat. For electricity, losses in transformers which are not considered as integral parts of the power plants are also included.

13. Total Consumption (calculated)

This equals the Energy Supplied minus Transmission and Distribution Losses.

14. Statistical difference

This equals the Total Consumption (calculated) – Total Consumption (observed).

15. Total Consumption (observed)

This is the amount actually recorded in surveys of end-use sectors. It should, in principle, correspond to the total consumption (calculated).

16. Energy Sector

Report all electricity and purchased heat consumed by the energy industry to support the extraction (mining, oil and gas production) and plant operation of transformation activities. It should exclude Own Use by Plant, Used for Pumped Storage, Used by Heat Pumps and Used for Electric Boilers, which are reported elsewhere. Heat consumed by *autoproducers* for their own use should not be included. Consumption in support of the operation of pipelines (e.g. oil, gas, and coal slurry) should be reported in the Transport Sector.

The Energy Sector covers ISIC¹ Divisions 05, 06, 19 and 35 + Group 091 + Classes 0892 and 0721 (NACE² Divisions 05, 06 19, and 35 + Group 09.1 + Classes 08.92 and 07.21). The Energy sector includes the manufacture of chemical materials for atomic fission and fusion and the products of these processes. Electricity and heat used in the manufacture of fuel briquettes and packaged fuel from coal or lignite and consumption in coke ovens, gas works, blast furnaces, liquefaction plants, gasification plants, charcoal production plants and other transformation industries should also be reported here.

17. Industry Sector

Report the total of the Industry sub-sectors listed under item 2 in the Table 4 instructions.

18. Transport Sector

Include all electricity and purchased heat consumed in transport activity irrespective of the economic sector in which the activity occurs. Report consumption in the following ISIC and NACE categories: Divisions 49, 50 and 51. The transport sector is divided into the following sub-sectors:

- ***Rail*** – Report all consumption for use in rail traffic, including industrial railways. Consumption for use in rail transport as part of urban or suburban transport systems should be reported in non-specified transport.
- ***Pipeline transport*** – Report consumption in support of the operations of both submarine and overland oil, gas and coal slurry pipelines up to the distributors network. Use for pipeline distribution of natural or manufactured gas, water or steam from the distributor to the final users should be reported in the energy sector or the commercial/public services sector.
- ***Non-specified (transport)*** – Report all consumption in transport activities not included elsewhere. Please state on the remarks page what is included under this heading.

19. Residential Sector

Report consumption by all households. Households with employed persons, a small part of the total Residential Sector, are included. This sector covers ISIC and NACE Divisions 97 and 98.

1. International Standard Industrial Classification of all Economic Activity, Series M., No. 4/Rev. 4, United Nations, New York, 2008.

2. Statistical classification of the economic activities in the European Community (NACE Rev.2) EC-Eurostat 2008.

20. Commercial and Public Services

Report consumption by businesses and offices in the public and private sectors. These activities are covered by ISIC and NACE Divisions 33, 36, 37, 38, 39, 45, 46, 47, 52, 53, 55, 56, 58, 59, 60, 61, 62, 63, 64, 65, 66, 68, 69, 70, 71, 72, 73, 74, 75, 77, 78, 79, 80, 81, 82, 84, 85, 86, 87, 88, 90, 91, 92, 93, 94, 95, 96 and 99. Note that consumption at railway and bus stations and airports should be reported in this category and not shown in the Transport Sector.

21. Agriculture/Forestry

Report energy consumed by users classified as agriculture, hunting and forestry by ISIC and NACE Divisions 01 and 02.

22. Fishing

Report energy used in the fishing industry as specified in ISIC and NACE Division 03.

23. Not elsewhere specified – Consumption

Report activities not included elsewhere. Please provide details on the Remarks page. This category should include military use within the country regardless of whether the use is by the military of that country or by the military of another country.

TABLE 4
ELECTRICITY AND HEAT CONSUMPTION IN THE INDUSTRY AND ENERGY SECTORS

1. Energy Sector

As defined under item 16 in Table 3 instructions, report all electricity and purchased heat energy consumed by the energy industry to support the extraction (mining, oil and gas production) and plant operation of transformation activities.

The energy sector is divided into the following sub-sectors:

- **Coal Mines** - Report electricity and purchased heat consumed to support the extraction and preparation of coal within the coal mining industry.
- **Oil and Gas Extraction** - Report electricity and purchased heat consumed to support the operation of oil and gas extraction facilities.
- **Patent Fuel Plants** - Report electricity and purchased heat consumed at patent fuel plants.
- **Coke Ovens** - Report electricity and purchased heat consumed at coking plants.
- **BKB / PB Plants** - Report electricity and purchased heat consumed at briquetting plants.
- **Gas Works** - Report electricity and purchased heat consumed at gas works plants.
- **Blast Furnaces** - Report electricity and purchased heat consumed in blast furnaces operations.
- **Petroleum Refineries** - Report electricity and purchased heat consumed at petroleum refineries.
- **Nuclear Industry** - Report electricity and purchased heat consumed at nuclear power plants.
- **Coal Liquefaction** - Report electricity and purchased heat consumed at liquefaction plants.
- **Liquefaction (LNG) / Regasification** - Report electricity and purchased heat consumed at natural gas liquefaction and regasification plants.
- **Gasification Plants (biogas)** - Report electricity and purchased heat consumed at gasification plants.
- **Gas-to-Liquid** - Report electricity and purchased heat consumed at the Gas-to-Liquid conversion plants.
- **Charcoal Production Plants** - Report electricity and purchased heat consumed at charcoal production plants.
- **Not Elsewhere Specified - Energy** - Report electricity and purchased heat consumed for other purposes not reported above.

2. Industry Sector

Report consumption by the industrial undertaking in support of its primary activities in the appropriate sub-sectors:

- **Iron and Steel Industry:** ISIC Group 241 + Class 2431 (NACE Groups 24.1, 24.2, 24.3 + Classes 24.51 and 24.52). To avoid double counting, electricity used in blast furnaces should be reported in the Energy sector.
- **Chemical (including petrochemical):** ISIC and NACE Divisions 20 and 21.
- **Non-Ferrous Metals :** ISIC Group 242 + Class 2432 (NACE Group 24.4 + Classes 24.53 and 24.54).
- **Non-Metallic Minerals:** ISIC and NACE Division 23. Report glass, ceramic, cement, and other building materials industries.
- **Transport Equipment:** ISIC and NACE Divisions 29 and 30.
- **Machinery:** Report fabricated metal products, machinery and equipment other than transportation equipment. ISIC and NACE Divisions 25, 26, 27 and 28
- **Mining and Quarrying:** (except coal mines and oil and gas extraction). ISIC Divisions 07 and 08 + Group 099 (NACE Divisions 07 and 08 + Group 09.9).

- **Food Processing, Beverages and Tobacco:** ISIC and NACE Divisions 10, 11 and 12.
- **Pulp, Paper and Printing:** ISIC and NACE Divisions 17 and 18. Includes reproduction of recorded media.
- **Wood and Wood Products (other than pulp and paper):** ISIC and NACE Division 16.
- **Construction :** ISIC and NACE Divisions 41, 42 and 43.
- **Textile and Leather:** ISIC and NACE Divisions 13, 14 and 15.
- **Not Elsewhere Specified – Industry:** If your country's industrial classification of electricity and heat consumption does not correspond to the above ISIC codes, please estimate the breakdown by industry and include in "Not Elsewhere Specified" only consumption in sectors which is not covered above. ISIC and NACE Divisions 22, 31 and 32.

TABLE 5
NET ELECTRICITY AND HEAT PRODUCTION BY AUTOPRODUCERS

For a proper understanding of the definitions below respondents are urged to read the note 'Definitions for Electricity and Heat' reproduced on page 3.

For a description of individual industry classifications, please refer to the reporting instructions for Table 3 and 4.

TABLES 6 A, B, C, D
GROSS ELECTRICITY AND HEAT PRODUCTION FROM COMBUSTIBLE FUELS

For a proper understanding of the definitions of categories in the table respondents are urged to read the note 'Definitions for Electricity and Heat', reproduced on page 3.

The reported quantity of heat produced at autoproducer CHP plants should be only that sold (see definitions on page 3). Accordingly, the quantity of fuel required for this heat will be the proportional part of the fuel attributed to the total heat production at the plant. A methodology for the division of the total fuel used at the plant between heat and electricity is given on page 5.

Data reported in this Table and in Table 1 should be consistent. Fuels used for 'starting up' a plant should be included with other fuels used in the plant. The quantity of fuels used to drive heat pumps should not be included in data reported in this table but noted separately, if available, on the Remarks page. Heat output (that is sold) from heat pumps should be reported in Tables 1 and 2.

Classification of Combustible Fuels:

1. Anthracite

High rank coal normally used for industrial and residential applications. It has generally less than 10% volatile matter and a high carbon content (about 90% fixed carbon). Its gross calorific value is greater than 23 865 kJ/kg (5 700 kcal/kg) on an ash-free but moist basis.

2. Coking Coal

Bituminous 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 (5 700 kcal/kg) on an ash-free but moist basis.

3. Other Bituminous Coal (Steam coal)

Coal used for steam raising purposes and includes all bituminous coal that is not included under coking coal nor anthracite. Its gross calorific value is greater than 23 865 kJ/kg (5 700 kcal/kg) on an ash-free but moist basis.

4. Sub-Bituminous Coal

Non-agglomerating coal 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% volatile matter on a dry mineral matter free basis.

5. Lignite/Brown Coal

Non-agglomerating coal with a gross calorific value less than 17 435 kJ/kg (4 165 kcal/kg) and greater than 31% volatile matter on a dry mineral matter free basis. Oil shale and tar sands consumed directly for electricity and for heat production should be reported in this category.

6. Peat

A combustible soft, porous or compressed, fossil sedimentary deposit of plant origin with high water content (up to 90 per cent in the raw state), easily cut, of light to dark brown colour. Peat used for non-energy purposes is not included.

7. Patent Fuel

A composition fuel manufactured from hard coal fines with the addition of a binding agent.

8. Coke Oven Coke

The solid product obtained from carbonization of coal, principally coking coal, at high temperature, it is low in moisture and volatile matter. Coke breeze and foundry coke are included in this category. Semi-coke (a solid product obtained from carbonization of coal at low temperature) should be included in this category.

9. Gas Coke

By-product of hard coal (e.g. bituminous coal) used for production of town gas in gas works.

10. Coal Tar

A liquid by-product resulting from the destructive distillation of bituminous coal to make coke in the coke oven process, or from the low-temperature carbonisation of brown coal.

11. BKB (Brown Coal Briquettes)

BKB is a composition fuel manufactured from lignite/brown coal, produced by briquetting under high pressure without the addition of a binding agent. These figures include peat briquettes, dried lignite fines and dust.

12. Gas Works Gas

Covers all types of gases produced in public utility or private plants, whose main purpose is manufacture, transport and distribution of gas. It includes gas produced by carbonization (including gas produced by coke ovens and transferred to gas works gas), by total gasification with or without enrichment with oil products (LPG, residual fuel oil, etc.), and by reforming and simple mixing of gases and/or air. The quantity of fuel should be reported on a **gross** calorific value basis.

13. Coke Oven Gas

Obtained as a by-product of the manufacture of coke oven coke for the production of iron and steel. The quantity of fuel should be reported on a **gross** calorific value basis.

14. Blast Furnace Gas

Produced during the combustion of coke in blast furnaces in the iron and steel industry. It is recovered and used as a fuel partly within the plant and partly in other steel industry processes or in power stations equipped to burn it. The quantity of fuel should be reported on a **gross** calorific value basis.

15. Oxygen Steel Furnace Gas

By-product of the production of steel in an oxygen furnace, recovered on leaving the furnace. The gas is also known as converter gas, LD gas or BOS gas. The quantity of recuperated fuel should be reported on a **gross** calorific value basis. Also covers non-specified manufactured gases not mentioned above, such as phosphor oven gas.

16. Crude Oil

A mineral oil of natural origin comprising a mixture of hydrocarbons and associated impurities, such as sulphur. It exists in the liquid phase under normal surface temperature and pressure and its physical characteristics (density, viscosity, etc.) are highly variable. This category includes field or lease condensate recovered from associated and non-associated gas where it is commingled with the commercial crude oil stream.

17. Natural Gas Liquids (NGL)

Liquid or liquefied hydrocarbons recovered from natural gas in separation facilities or gas processing plants. Natural gas liquids include ethane, propane, butane (normal and iso-), (iso) pentane and pentanes.

18. Refinery Gas (not liquefied)

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. This also includes gases which are returned from the petrochemical industry.

19. Liquefied Petroleum Gases (LPG's)

LPG's are light paraffinic hydrocarbons derived from the refinery processes, crude oil stabilisation and natural gas processing plants. They consist mainly of propane (C₃H₈) and butane (C₄H₁₀) or a combination of the two. They could also include propylene, butylene, isobutene and isobutylene.

20. Naphtha

Generally a feedstock destined for the petrochemical industry, naphtha comprises material in the 30°C and 210°C distillation range or part of this range.

21. Kerosene Type Jet Fuel

A distillate used for aviation turbine power units. It has the same distillation characteristics between 150°C and 300°C (generally not above 250°C) and flash point as kerosene. In addition, it has particular specifications (such as freezing point) which are established by the International Air Transport Association (IATA).

22. Other Kerosene

Comprises refined petroleum distillate and is used in sectors other than aircraft transport. It distils between 150°C and 300°C.

23. Gas/Diesel (Distillate Fuel Oil)

A gas/diesel oil which is primarily a medium distillate distilling between 180 °C and 380 °C. It is comprised of transport diesel, heating diesel and other gasoil.

24. Heavy Fuel Oil

This covers all residual (heavy) fuel oils (including those obtained by blending). Kinematic viscosity is above 10 cSt at 80 °C. The flash point is always above 50 °C and density is always more than 0.90 kg/l.

25. Bitumen (including Orimulsion)

Bitumen is a solid, semi-solid or viscous hydrocarbon with a colloidal structure, being brown to black in colour, obtained as a residue in the distillation of crude oil, by vacuum distillation of oil residues from atmospheric distillation. Bitumen is often referred to as asphalt and is primarily used for construction of roads and for roofing material. This category includes fluidized and cut back bitumen as well as Orimulsion.

26. Petroleum Coke

Petroleum coke is a black solid by-product, obtained mainly by cracking and carbonising petroleum derived feedstock, vacuum bottoms, tar and pitches in processes such as delayed coking or fluid coking. It consists mainly of carbon (90 to 95%) and has a low ash content.

27. Other Oil Products

Report oil products not specifically mentioned above, and identify such product in the “Remarks page”.

28. Natural gas

Natural gas consists mainly of methane occurring naturally in underground deposits. This includes colliery gas. The quantity of fuel used should be reported on a **gross** calorific value basis.

29. Industrial waste (non-renewable)

Wastes of industrial non-renewable origin (solids or liquids) combusted directly for the production of electricity and/or heat. Renewable industrial waste should be reported in the Wood/Wood Waste/Other Solid Waste, Biogas and/or Liquid Biofuels categories. The quantity of fuel used should be reported on a **net** calorific value basis.

30. Municipal waste (renewable)

Wastes produced by households, industry, hospitals and the tertiary sector which are biodegradable materials incinerated at specific installations. The quantity of fuel used should be reported on a **net** calorific value basis

31. Municipal waste (non-renewable)

Wastes produced by households, industry, hospitals and the tertiary sector which are **non-biodegradable** materials incinerated at specific installations. The quantity of fuel used should be reported on a **net** calorific value basis.

32. Wood/Wood Waste/Other Solid Waste

Covers organic, non-fossil material of biological origin which may be used as fuel for heat production or electricity generation. It covers purpose-grown energy crops (poplar, willow etc.), a multitude of woody materials generated by an industrial process (wood/paper industry in particular) or provided directly by forestry and agriculture (firewood, wood chips, bark, sawdust, shavings, chips, black liquor etc.) as well as wastes such as straw, rice husks, nut shells, poultry litter, crushed grape dregs etc. The quantity of fuel used should be reported on a **net** calorific value basis.

33. Biogas

A gas composed principally of methane and carbon dioxide produced by anaerobic digestion of biomass, comprising:

- **Landfill gas**, formed by the digestion of landfilled wastes
- **Sewage sludge gas**, produced from the anaerobic fermentation of sewage sludge
- **Other biogas**, such as biogas produced from the anaerobic fermentation of animal slurries and of wastes in abattoirs, breweries and other agro-food industries.

34. Liquid Biofuels

Liquid fuels produced from biomass, biodegradable organic waste, used frying oils, or other organic material. Please note that the quantities of liquid biofuels reported in this category should relate to the quantities of biofuel and not to the total volume of liquids into which the biofuels are blended.

TABLE 7A
NET MAXIMUM ELECTRICAL CAPACITY AND PEAK LOAD

Net electrical capacity, peak load and date of peak load occurrence are monitored to measure energy security-related factors such as reserve margin, and capacity available during load peaking periods.

Net Maximum Electrical Capacity

The net maximum capacity is the maximum active power that can be supplied, continuously, with all plant running, at the point of outlet (i.e. after taking the power supplies for the station auxiliaries and allowing for the losses in those transformers considered integral to the station). This assumes no restriction of interconnection to the network. Does not include overload capacity that can only be sustained for a short period of time (e.g. internal combustion engines momentarily running above their rated capacity). The net maximum electricity-generating capacity represents the sum of all individual plants' maximum capacities available to run continuously throughout a prolonged period of operation in a day.

1. Classification by Sources

The reported figures should relate to the maximum capacities on 31st of December and be expressed in megawatts (MW). The reported electrical capacity should include both electricity (only) and CHP plants. Data for fuel cells should be reported in the row *Other Energy Sources*.

If, for some reason, only gross capacity data can be provided, please state this clearly. It is assumed that all equipment is in full working order, that the power produced can be disposed of without any restrictions and that optimum conditions prevail as regards primary sources (i.e. flow and head in the case of hydro plant; grade and quantity of fuel in hand and water supply, temperature, and purity in the case of thermal plant, and assuming that the output and method of production in CHP plant are those which lead to maximum electricity production).

The capacity reported under *Combustible Fuels* is further divided according to the technology of the generating plant.

2. Combustible Fuels: type of generation.

Data on fuel firing capability are important inputs into planning responses to national and international fuel disruptions.

- **Steam:** steam turbines are of two main types -- non-condensing (or open cycle), also called backpressure turbines, and condensing turbines (or closed cycle). In non-condensing turbines, the exhaust steam leaving the turbine is used either as co-generated process steam or, more rarely, released into the atmosphere. In a condensing turbine, the exhaust steam is condensed and the water thus formed supplies the feed water for the generator. The boilers supplying steam turbines can be fuelled by all forms of fossil fuels;

- **Internal Combustion:** the internal combustion engines referred to in this heading are the engine based on the gasoline or diesel cycle, which work on the spark ignition or the compression ignition principle. Diesel-type engines can use a variety of fuels ranging from natural gas to liquid fuels;

- **Gas Turbines:** the gas turbine uses high temperature, high pressure gas as fuel, in which part of the heat supplied by the gas is converted into rotational energy. Fuel can be natural gas, coal gases or liquid fuels;

- **Combined Cycle:** the combined cycle system refers to electricity produced by coupling two heat engines in a sequence to drive generators. The heat discharged from one heat engine serves as the energy source for the next engine. The gas turbine is generally used as the first heat engine, and a conventional condensing steam turbine at the second stage.

- **Other** (please specify)

Peak Load

The highest value of the power absorbed or supplied by a network or combination of networks within the country.

1. Peak Load Demand

The peak load demand is the highest simultaneous demand for electricity satisfied during the year. Note that the electricity supply at the time of peak demand may include demand satisfied by imported electricity or alternatively the demand may include exports of electricity. Total peak load on the national grid is not the sum of the peak loads during the year on every power station as they may occur at different times.

2. Available Capacity at time of peak

The available capacity of an installation at peak period is the maximum power at which it can be operated under the prevailing conditions at the time, assuming no external constraints. It depends on the technical state of the equipment and its ability to operate, and may differ from the *Net Maximum Capacity* due to lack of water for hydro capacity, plant maintenance, unanticipated shutdown, or other outages at the time of peak load.

3. Date of peak load occurrence

Report the date on which the peak load was reached.

4. Time of peak load occurrence

Report the hour that peak load was reached

TABLE 7B NET MAXIMUM ELECTRICAL CAPACITY OF COMBUSTIBLE FUELS

The total net maximum capacity reported under *Combustible Fuels* in Table 7a, subdivided by public/autoproducer, is further subdivided by fuel firing capability in Table 7b. Firing capability is separated into "single" fuel and "multiple" fuel categories.

1. Single-fired Capacity

Refers to units equipped to burn only one fuel type on a continuous basis. Power stations consisting of several units burning different types of fuel but with each individual unit capable of burning only one fuel should be considered as single-fired and have their capacity divided accordingly among the following conventional fuel types:

- **Coal and Coal Products** - including all types of coal, primary and secondary, blast furnace gas and coke oven gas;
- **Liquid Fuels** - covers crude oil and all oil products, including refinery gas and petroleum coke;
- **Natural Gas** - covers natural gas and gas works gas;
- **Peat**
- **Combustible Renewables and Wastes** - covers solid, liquid and gaseous; municipal waste and industrial waste.

2. Multi-fired Capacity

Refers to units with supply access to more than one nominated type of fuel and capable of generating electricity using these fuel types either in alternation or in combination on a continuous basis. These units should be capable of generating their maximum capacity, or a large proportion thereof, using any one of the fuels nominated. A multi-fired unit can have either one boiler capable of using more than one fuel or two boilers, each using a single fuel but feeding the same generator in alternation or simultaneously.

Generally, multi-fired capacity will fall into dual-fired or tri-fired groups. This includes solids and liquids, solids and natural gas, liquids and natural gas, and solids, liquids and natural gas. In the section for reporting the multi-fired capacity, please list the primary fuel using the fuel classifications provided for single-fired capacity. Also, list the alternate fuel(s) in the column indicated using the fuel classifications provided for single-fired capacity. This is determined by the fuels used to operate the unit or plants for the year which is reported.

TABLE 8
IMPORTS BY ORIGIN AND EXPORTS BY DESTINATION OF ELECTRICITY

Report the gross trade in electricity between all countries including quantities in transit. The countries of origin for imports and destination for exports are neighbouring countries from which the electricity has been received (imports) and to which it has been sent (exports). See Geographical Notes for country definitions.

Physical quantities should be given. If only contracted quantities are available, please indicate clearly on the Remarks page.

Amounts are considered as imported or exported when they have crossed the political boundaries of the countries, whether customs clearance has taken place or not. Where no origin or destination can be reported or where the country is not specified in the table, the category "Other" may be used.

Statistical differences may exist if only total imports and exports are available on the above basis, while the geographical breakdown is based on a different survey, source or concept. In this case the figures by origin/destination should be adjusted proportionally to the correct total.

REMARKS PAGE

Report on this page comments or additional data, if available, as follows:

- the quantity of combustible fuels (in appropriate physical units and in TJ) used to drive heat pumps (used in the Transformation Sector). These data should not be included in Table 6.
- the quantity of waste heat (TJ) used in heat pumps (used in the Transformation Sector). These data will not have been reported elsewhere in the Questionnaire.

SUPPLEMENTARY REPORTING SECTION

ON

COMBINED HEAT AND POWER

DIRECTIVE 2004/8/EC

of the

EUROPEAN PARLIAMENT AND OF THE COUNCIL

This section only applies to:

European Union Member States

Candidate Countries

EFTA Countries

COMBINED HEAT AND POWER SUPPLEMENTARY REPORTING SECTION

REPORTING INSTRUCTION

These specifications and definitions concern CHP plants statistics according to Directive 2004/8/EC of the European Parliament and of the Council on the promotion of cogeneration.

The definitions are somewhat different compared with the other tables in this questionnaire.

The statistics will be collected on a CHP unit basis. Should a plant have more units, data should be collected on a unit basis. If a plant comprises non-CHP units, the non-CHP units data should be excluded from the present report.

In case of units in which both CHP and non-CHP electricity can be produced the CHP electricity is separated from the total electricity generation of the unit according to method given below.

The following CHP units data will be reported

- Information on fuel input, gross electricity generation, CHP electricity generation, heat production, electrical and heat installed capacities as well as the number of units, by type of cycle for operational CHP units (**Table EU-1**).
- Aggregate information (for all units) on fuel input by type of fuel for operational CHP units (**Table EU-2**).

According to the Directive 2004/8/EC the deadline for submitting the statistics is by the end of November 2010. However, the EU Member States, Candidate Countries and EFTA Countries are encouraged to submit the data at the same time as the other parts of the questionnaire.

These instructions to complete Tables EU-1 and EU-2 may be amended / modified as a result of the outcome from the work to create implementation guidelines for the Directive 2004/8/EC. The amendments / modifications will be communicated to countries in a due course.

TABLE: EU-1
ELECTRICITY AND HEAT PRODUCTION BY CHP UNIT

The statistics are reported separately for those units in which the overall annual efficiency is above threshold set by the Member States at a level at least 75% (80% for combined cycle units and steam condensing turbines).

The main differences between the reporting in this table and in other tables in this questionnaire refer to the useful heat production and electricity generation. In this table the total useful heat will be reported even if it is used by the autoproducers and not sold to third parties. Furthermore, the electricity generation is reported as CHP electricity generation which is often not the same as the gross electricity generation in the CHP unit.

1. **Cogeneration cycle type** refers to the different types of CHP units, namely:
 - **Combined cycle** power units where the plant comprises one or more gas turbines whose exhaust gases are fed to a waste-heat boiler, with simultaneous heat recovery
 - **Steam plant with backpressure turbine**, which includes backpressure turbines with steam extraction
 - **Steam plant with condensing turbine** where steam is extracted from the turbine (passout)
 - **Gas turbine with heat recovery** at the exhaust or at another point in the cycle
 - **Internal combustion** engine with heat recovery
 - **Other** (to be specified).

2. **Maximum electrical capacity** of a cogeneration unit is the maximum capacity, assumed to be active power that could be generated continuously throughout a prolonged period of operation, with the additional assumption that the magnitude and method of production of the heat supply are, under all conceivable circumstances, those which lead to maximum electrical capacity. This capacity must be related to reference climatic conditions representative of the assumed mean ambient conditions for the unit.

As regards the distinction between gross and net capacity, all the auxiliary services of the installation should be taken into account. These include the auxiliaries relating to the electrical energy and heat production circuits. However, they do not include the auxiliaries corresponding to the heat transport and distribution network (e.g., hot water circulation pumps).

In units where the mechanical energy is used directly without converting it first into electrical energy, the electrical capacity is equal to the capacity, which could be generated by the corresponding mechanical capacity of the unit.

3. **Maximum useful heating capacity** of a cogeneration unit is the net heat transfer capacity from the installation to the heating network. It is the heat in the hot fluid supplied to the heating network less, where appropriate, the heat returned to the installation by the fluid returning from the network.

This capacity is **net**, meaning that it is related to the point of entry to the heating network, and excluded are the heat consumed by the installation's auxiliaries, which use a hot fluid (space heating, liquid fuel heating, etc. ...), and losses in the installation/network heat exchangers.

This useful heating capacity is said to be the maximum achievable, meaning that it assumes that the output and method of production of electrical energy supply are, under all conceivable circumstances, those which lead to the maximum heat production.

Possible separate heat generation capacity in cogeneration unit is not included in the useful heating capacity. For example post firing in gas turbines or any generation of thermal energy not used for simultaneous production of electricity *and* heat is excluded.

4. **CHP capacity of a unit** is normally the maximum gross electrical capacity of the unit.

However, the CHP capacity is calculated for units, where the overall efficiency of the unit is below the value set by the Member States at a level of at least 75% (80% for combined cycle units and steam condensing turbines) and where the heat capacity is low compared to electrical capacity. The overall efficiency of the unit, η_{overall} , is

$$\eta_{\text{overall}} = \frac{E + Q_{\text{net}}}{F}$$

where E is the gross annual electricity output of the unit, Q_{net} the annual CHP heat production of the unit and F is the fuel consumed for producing the CHP heat and electricity:

$$\begin{aligned} Q_{\text{net}} &= Q_{\text{tot}} - Q_{\text{suppl}} \\ F &= F_{\text{tot}} - F_{\text{suppl}} \end{aligned}$$

Q_{tot} is the total heat production of the unit, Q_{suppl} the supplementary heat production, F_{tot} the total fuel used in the unit and F_{suppl} is the fuel consumed for generating the supplementary heat. If the unit is designed to produce directly mechanical power without first converting it into electrical energy, the annual generation of mechanical energy is used in the calculation of the overall efficiency instead of the electrical energy.

The unit is considered to have a low heat capacity compared to its electrical capacity, if the ratio between the nominal electrical capacity and the heating capacity is not within the following, indicative brackets or even close to them:

Type of the unit	Indicative bracket for the ratio between electrical and net heating capacity	
	District heating unit	Industrial unit
CCC – Combined cycle	0,70 – 1,20	0,50 – 1,00
CPC – Steam, backpressure turbine	0,30 – 0,60	0,15 – 0,45
CSC – Steam, condensing turbine	0,30 – 0,60	0,15 – 0,45
TGC – Gas turbine with heat recovery	0,35 – 0,75	0,20 – 0,6
CIC – Internal combustion engine	0,55 – 0,95	0,40 – 0,80

It is to be noted that these boundaries for the power-to-heat capacity ratios are only indicative.

If the ratio between nominal electrical and heat capacity is not even close to these indicative brackets, the CHP electrical capacity, P_{CHP} , for the units with a high power to heat capacity ratio is calculated by multiplying the heat capacity with the default power-to-heat ratio

$$P_{\text{CHP}} = H \cdot C$$

where H is the useful heat capacity, i.e. no supplementary heat capacity is included. The default power-to-heat ratios depend on the type of the unit, given in Annex II of the Directive 2004/8/EC to promote cogeneration in the EU:

Type of the unit	Default power to heat ratio
Combined cycle gas turbine with heat recovery	0,95
Steam backpressure turbine	0,45
Steam condensing extraction turbine	0,45
Gas turbine with heat recovery	0,55
Internal combustion engine	0,75

5. **CHP Electricity generation of a unit** is normally the gross electricity generation of the unit.

However, if the overall efficiency of the unit is below the value set by the Member States at a level of at least 75% (80% for combined cycle units and steam condensing turbines), the CHP electricity generation, E_{CHP} , is calculated by multiplying the net heat production by power-to-heat ratio:

$$E_{\text{CHP}} = Q \cdot C$$

where Q is the annual CHP heat production, i.e. the total heat production of the unit less the separate heat generation. If the actual power-to-heat ratio of the unit is not known (see 2.10), the default values given in Annex II of the Directive 2004/8/EC can be used *provided that the calculated cogeneration electricity is less or equal to total electricity generation of the unit*.

6. **CHP fuel energy** means the fuel energy based on lower heating value needed in a cogeneration process to cogenerate CHP electrical energy and useful heat energy in a reporting period, Commission decision of 19 December 2008 establishing detailed guidelines for the implementation and application of Annex II to Directive 2004/8/EC of the European Parliament and of the Council, 2008/952/EC.
7. **Useful Heat production** (CHP heat) means heat produced in a cogeneration process to satisfy an economically justifiable demand for heat or cooling. It refers to the total heat produced during the year less separate heat generation. In a steam unit the separate heat can be generated for example by using a heat reduction station or a separate district heating boiler. In gas turbines the separate heat is generated for example by post-firing. The part which is sold to third parties refers to the heat transferred outside the company (subtracting the heat consumed on-site by autoproducers).
8. **Electricity from cogeneration** (CHP electricity) is gross electricity generation in a process linked to the production of useful heat and calculated in accordance with the methodology laid down in Annex II of the Directive 2004/8/EC (see 2.5).
9. **Gross electricity generation** is the electricity generated by the CHP unit during the year measured at the output terminals of the main generator. It comprises both CHP and condensing electricity.
10. **Power-to-heat ratio** is the ratio between electricity from cogeneration and useful heat when operating in full cogeneration mode using operational data of the specific unit.

TABLE: EU-2
OPERATIONAL CHP UNITS FUEL INPUTS

1. **Hard coal and patent fuels** consists of:
 - Hard coal (coking coal, anthracite and other bituminous coal): Its gross calorific value is greater than 23 865 kJ/kg (5 700 kcal/kg) on an ash-free but moist basis.
 - Patent fuel: A composition fuel manufactured from hard coal fines with the addition of a binding agent.
2. **Sub-bituminous coal** : Non-agglomerating coal with a gross calorific value between 17 435 kJ/kg (4 165 kcal/kg) and 23 865 kJ/kg (5 700 kcal/kg).
3. **Lignite/brown coal and BKB** consists of:
 - Lignite and brown coal: Non-agglomerating coal with a gross calorific value less than 17 435 kJ/kg (4 165 kcal/kg) and greater than 31% volatile matter on a dry mineral matter free basis.
 - Brown coal briquettes: a composition fuel manufactured from lignite/brown coal, produced by briquetting under high pressure without the addition of a binding agent. These figures include peat briquettes, dried lignite fines and dust.
4. **Peat**: A combustible soft, porous or compressed, fossil sedimentary deposit of plant origin with high water content (up to 90 per cent in the raw state), easily cut, of light to dark brown colour.
5. **Coke-oven gas**: Gas recovered as by-product of coke ovens.
6. **Blast furnace and oxygen steel furnace gas**: Gas recovered as by-product of blast furnaces and oxygen steel furnaces.
7. **Other solid coal products**: Any other solid coal products not mentioned separately
8. **Residual fuel oil**: This covers all residual (heavy) fuel oils (including those obtained by blending). Kinematic viscosity is above 10 cSt at 80 °C. The flash point is always above 50 °C and density is always more than 0.90 kg/l.
9. **Refinery gas**: 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. This also includes gases which are returned from the petrochemical industry.
10. **Other liquid fossil fuels**: Any other liquid fossil fuels not mentioned separately, like gasoil, motor spirit, kerosenes and jet fuels etc..
11. **Natural gas and gas works gas**: Natural gas consists mainly of methane occurring naturally in underground deposits. This includes colliery gas. Gas works gas covers all types of gases produced in public utility or private plants, whose main purpose is manufacture, transport and distribution of gas.
12. **Solid biomass**: Covers organic, non-fossil material of biological origin which may be used as fuel for heat production or electricity generation. It comprises wood, wood wastes and other solid wastes: covers purpose-grown energy crops (poplar, willow etc.), a multitude of woody materials generated by an industrial process (wood/paper industry in particular) or provided directly by forestry and agriculture (firewood, wood chips, bark, sawdust, shavings, chips, black liquor etc.) as well as wastes such as straw, rice husks, nut shells, poultry litter, crushed grape dregs etc.
13. **Industrial waste**: Wastes of industrial non-renewable origin (solids or liquids).
14. **Municipal solid waste (renewable)**: Wastes produced by households, industry, hospitals and the tertiary sector which are biodegradable materials incinerated at specific installations.
15. **Municipal solid waste (non-renewable)**: Wastes produced by households, industry, hospitals and the tertiary sector which are **non-biodegradable** materials incinerated at specific installations.

16. **Biogas:** A gas composed principally of methane and carbon dioxide produced by anaerobic digestion of biomass
17. **Other renewables and wastes:** Any other renewables and wastes not mentioned explicitly.
18. **Nuclear heat:** Heat released as a result of fission of the nuclear fuel inside the reactor.

Table Relations in the Electricity and Heat Questionnaire

