RENEWABLES INFORMATION 2008 EDITION

DOCUMENTATION FOR BEYOND 2020 FILES

LIST OF ELECTRONIC TABLES

Data for all available years are provided here, generally from 1990 to 2006. Some data are available for 2007 and these should be considered preliminary.

Renewables Information 2008 - Electronic Tables

- World, Renewables Balance (Ktoe): RenBalances.IVT

In this table, a balance for different renewable and waste products is shown. These products are: hydro, geothermal, solar photovoltaics, solar thermal, industrial waste, renewable and non-renewable municipal waste, solid biomass, landfill gas, sludge gas, other biogas, biogasoline, biodiesels, other liquid biofuels and charcoal. This table provides a full balance of renewables and waste such as primary energy supply, transformation sector, energy sector and final consumption in ***kilotonnes of oil equivalent*** for ***OECD and Non-OECD countries***.

- World, Renewables Supply and Consumption : RENBES.IVT

Contrary to RenBalances.IVT, this table presents all the flows of renewables and waste in their ***original units*** as well as the electricity production from them for ***OECD and Non-OECD countries***.

- OECD, Net Capacity - Renewables (MWe): RenCapacities.IVT

This table shows a comprehensive status of net electrical capacity by type of fuel, as well as solar collectors' surface for OECD countries.

- OECD, Electricity and Heat Generation – Renewables (GWh, TJ): RenHeatGen.IVT

This table presents ***gross electricity and heat production*** from each of the renewable and waste sources and ***their corresponding inputs*** as well as the breakdown according to the type of plant (electricity only, CHP or heat only). It should be noted that the heat part of this table is not available for all countries. In the case of geothermal, if transformation inputs are not submitted by the national administrations they are estimated based on 10% efficiency for electricity generation and 50% efficiency for heat generation. Solar photovoltaic and thermal transformation inputs into electricity and heat production are estimated at 100% efficiency (based on the IEA methodology that the first energy form downstream in the energy production is considered the primary supply). Hydro electricity production includes outputs from pumped storage.

1. PRODUCT DEFINITIONS

Combustible Renewables and Waste		
Flow	**Short name**	**Definition**
Industrial Waste	INDWASTE	Industrial waste of non-renewable origin consists of solid and liquid products (e.g. tyres) combusted directly, usually in specialised plants, to produce heat and/or power. Renewable industrial waste is not included here, but with solid biomass, biogas or liquid biomass.
Municipal Waste (Renewable)	MUNWASTER	Municipal waste consists of products that are combusted directly to produce heat and/or power and comprises wastes produced by households, industry, hospitals and the tertiary sector that are collected by local authorities for incineration at specific installations. Municipal waste is split into renewable and non-renewable.
Municipal Waste (Non-Renewable)	MUNWASTEN	Municipal waste consists of products that are combusted directly to produce heat and/or power and comprises wastes produced by households, industry, hospitals and the tertiary sector that are collected by local authorities for incineration at specific installations. Municipal waste is split into renewable and non-renewable.
Solid Biomass	SBIOMASS	Solid biomass is defined as any plant matter used directly as fuel or converted into other forms before combustion. This covers a multitude of woody materials generated by industrial process or provided directly by forestry and agriculture (firewood, wood chips, bark, sawdust, shavings, chips, sulphite lyes *also known as black liquor*, animal materials/wastes and other solid biomass).
Landfill Gas	LANDFILL	Covers gas formed by digestion of landfilled waste.
Sludge Gas	SLUDGEGS	Covers gas produced from the anaerobic fermentation of sewage sludge.
Other Biogas	OBIOGAS	Covers gas such as biogas produced from the anaerobic fermentation of animal slurries and of waste abattoirs, breweries and other agro-food industries.

Biogasoline	BIOGASOL	Biogasoline includes bioethanol (ethanol produced from biomass and/or the biodegradable fraction of waste), biomethanol (methanol produced from biomass and/or the biodegradable fraction of waste), bioETBE (ethyl-tertio-butyl-ether produced on the basis of bioethanol; the percentage by volume of bioETBE that is calculated as biofuel is 47%) and bioMTBE (methyl-tertio-butyl-ether produced on the basis of biomethanol: the percentage by volume of bioMTBE that is calculated as biofuel is 36%). Biogasoline includes the amounts that are blended into the gasoline - it does not include the total volume of gasoline into which the biogasoline is blended.
Biodiesels	BIODIESEL	Biodiesels includes biodiesel (a methyl-ester produced from vegetable or animal oil, of diesel quality), biodimethylether (dimethylether produced from biomass), Fischer Tropsh (Fischer Tropsh produced from biomass), cold pressed bio-oil (oil produced from oil seed through mechanical processing only) and all other liquid biofuels which are added to, blended with or used straight as transport diesel. Biodiesels includes the amounts that are blended into the diesel - it does not include the total volume of diesel into which the biodiesel is blended.
Other Liquid Biofuels	OBIOLIQ	Other liquid biofuels includes liquid biofuels used directly as fuel other than biogasoline or biodiesels.
Charcoal	CHARCOAL	Covers the solid residue of the destructive distillation and pyrolysis of wood and other vegetal material. Since charcoal is a secondary product, its treatment is slightly different than that of the other primary biomass. Production of charcoal (an output in the transformation process) is offset by the inputs of primary biomass into the charcoal production process. The losses from this process are included in the transformation sector. Other supply (e.g. trade and stock changes) as well as consumption are aggregated directly with the primary biomass. In some countries, only primary biomass is reported.

Electricity and Heat		
Flow	**Short name**	**Definition**
Hydro	HYDRO	Hydro power represents the potential and kinetic energy of water converted into electricity in hydroelectric plants. Electricity production from pumped storage is included.
Geothermal	GEOTHERM	Geothermal energy is the 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 stream or high enthalpy brine after flashing • directly as heat for district heating, agriculture, etc.
Solar Photovoltaic	SOLARPV	Electricity from photovoltaic cells.
Solar Thermal	SOLARTH	Solar energy is the solar radiation exploited for hot water production and electricity generation, by: • flat plate collectors, mainly of the thermosyphon type, for domestic hot water or for the seasonal heating of swimming pools • solar thermal-electric plants Passive solar energy for the direct heating, cooling and lighting of dwellings or other buildings is not included.
Tide, Wave and Ocean	TIDE	Tide, wave and ocean represents the mechanical energy derived from tidal movement, wave motion or ocean current and exploited for electricity generation.
Wind	WIND	Wind energy represents the kinetic energy of wind exploited for electricity generation in wind turbines.
Electricity	ELECTR	Gross electricity production is measured at the terminals of all alternator sets in a station; it therefore includes the energy taken by station auxiliaries and losses in transformers that are considered integral parts of the station. The difference between gross and net production is generally estimated as 7% for conventional thermal stations, 1% for hydro stations, and 6% for nuclear, geothermal and solar stations. Production in hydro stations includes production from pumped storage plants.
Heat	HEAT	Heat production includes all heat produced by main activity producer CHP and heat plants, as well as heat sold by autoproducer CHP and heat plants to third parties. Fuels used to produce quantities of heat for sale are included in the transformation sector under the rows *CHP plants* and *Heat plants*. The use of fuels for heat which is not sold is included under the sectors in which the fuel use occurs.

2. BALANCE FLOW DEFINITIONS

Supply		
Flow	**Short name**	**Definition**
Production	INDPROD	Production is the production of primary energy. Production is calculated after removal of impurities (e.g. sulphur from natural gas).
Imports	IMPORTS	Comprise amounts having crossed the national territorial boundaries of the country whether or not customs clearance has taken place.
Exports	EXPORTS	Comprise amounts having crossed the national territorial boundaries of the country whether or not customs clearance has taken place.
International Marine Bunkers	BUNKERS	Covers those quantities delivered to ships of all flags that are engaged in international navigation. The international navigation may take place at sea, on inland lakes and waterways, and in coastal waters. Consumption by ships engaged in domestic navigation is excluded. The domestic/international split is determined on the basis of port of departure and port of arrival, and not by the flag or nationality of the ship. Consumption by fishing vessels and by military forces is also excluded. See *domestic navigation*, *fishing* and *non-specified "other sectors"*.
Stock Changes	STOCKCHA	Reflects the difference between opening stock levels on the first day of the year and closing levels on the last day of the year of stocks on national territory held by producers, importers, energy transformation industries and large consumers. A stock build is shown as a negative number, and a stock draw as a positive number.
Total Primary Energy Supply	TPES	Total primary energy supply (TPES) is made up of production + imports – exports – international marine bunkers ± stock changes.
Transfers	TRANSFER	Comprises *interproduct transfers*, *products transferred* and *recycled products*.
Statistical Differences	STATDIFF	Includes the sum of the unexplained statistical differences for individual fuels, as they appear in the basic energy statistics. It also includes the statistical differences that arise because of the variety of conversion factors in the coal and oil columns.

Transformation Sector		
Flow	**Short name**	**Definition**
Transformation Sector	TOTTRANF	The transformation sector comprises the conversion of primary forms of energy to secondary and further transformation (e.g. coking coal to coke, crude oil to petroleum products, and heavy fuel oil to electricity). **Inputs to transformation processes are shown as negative numbers and output from the process is shown as a positive number. Transformation losses will appear in the "total" column as negative numbers.**
Main Activity Producer Electricity Plants	MAINELEC	Refers to plants which are designed to produce electricity only. If one or more units of the plant is a CHP unit (and the inputs and outputs can not be distinguished on a unit basis) then the whole plant is designated as a CHP plant. Main activity producers (formerly referred to as public supply undertakings) generate electricity 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 Electricity Plants	AUTOELEC	Refers to plants which are designed to produce electricity only. If one or more units of the plant is a CHP unit (and the inputs and outputs can not be distinguished on a unit basis) then the whole plant is designated as a CHP plant. Autoproducer undertakings generate electricity wholly or partly for their own use as an activity which supports their primary activity. They may be privately or publicly owned.
Main Activity Producer CHP Plants	MAINCHP	Refers to plants which are designed to produce both heat and electricity (sometimes referred to as co-generation power stations). If possible, fuel inputs and electricity/heat outputs are 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. Main activity producers (formerly referred to as public supply 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 CHP Plants	AUTOCHP	Refers to plants which are designed to produce both heat and electricity (sometimes referred to as co-generation power stations). If possible, fuel inputs and electricity/heat outputs are 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. Note that for autoproducer CHP plants, all fuel inputs to electricity production are taken into account, while only the part of fuel inputs to heat sold is shown. Fuel inputs for the production of heat consumed within the autoproducer's establishment are not included here but are included with figures for the final consumption of fuels in the appropriate consuming sector. 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.

Main Activity Producer Heat Plants	MAINHEAT	Refers to plants (including heat pumps and electric boilers) designed to produce heat only and who sell heat to a third party (e.g. residential, commercial or industrial consumers) under the provisions of a contract. Main activity producers (formerly referred to as public supply undertakings) generate 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 Heat Plants	AUTOHEAT	Refers to plants (including heat pumps and electric boilers) designed to produce heat only and who sell heat to a third party (e.g. residential, commercial or industrial consumers) under the provisions of a contract. Autoproducer undertakings generate heat, wholly or partly for their own use as an activity which supports their primary activity. They may be privately or publicly owned.
Heat Pumps	THEAT	Includes heat produced by heat pumps in the transformation sector. Heat pumps that are operated within the residential sector where the heat is not sold are not considered a transformation process and are not included here – the electricity consumption would appear as residential use.
Electric Boilers	TBOILER	Includes electric boilers used to produce heat.
Chemical heat for electricity production	TELE	Includes heat from chemical processes that is used to generate electricity.
Blast Furnaces	TBLASTFUR	Includes the production of town gas, blast furnace gas and oxygen steel furnace gas. The production of pig-iron from iron ore in blast furnaces uses fuels for supporting the blast furnace charge and providing heat and carbon for the reduction of the iron ore. Accounting for the calorific content of the fuels entering the process is a complex matter as transformation (into blast furnace gas) and consumption (heat of combustion) occur simultaneously. Some carbon is also retained in the pig-iron; almost all of this reappears later in the oxygen steel furnace gas (or converter gas) when the pig-iron is converted to steel. In the 1992/ 1993 annual questionnaires, Member Countries were asked for the first time to report in the *transformation sector* the quantities of all fuels (e.g. pulverised coal injection [PCI] coal, coke oven coke, natural gas and oil) entering blast furnaces and the quantity of blast furnace gas and oxygen steel furnace gas produced. The Secretariat then needed to split these inputs into the transformation and consumption components. The transformation component is shown in the row *blast furnaces/gas works* in the column appropriate for the fuel, and the consumption component is shown in the row *iron and steel*, in the column appropriate for the fuel. The Secretariat decided to assume transformation efficiency such that the carbon input into the blast furnaces should equal the carbon output. This is roughly equivalent to assuming an energy transformation efficiency of 40%.
Gas Works	TGASWKS	Includes the manufacture of town gas. *Note: in the summary balances this item also includes other gases blended with natural gas (TBLENDGAS).*
Coke Ovens	TCOKEOVS	Includes the manufacture of coke and coke oven gas.
Patent Fuel Plants	TPATFUEL	Includes the manufacture of patent fuels.

BKB Plants	TBKB	Includes the manufacture of BKB.
Petroleum Refineries	TREFINER	Includes the manufacture of finished petroleum products.
Petrochemical Industry	TPETCHEM	Covers backflows returned from the petrochemical sector. Note that backflows from oil products that are used for non-energy purposes (i.e. white spirit and lubricants) are not included here, but in non-energy use.
Coal Liquefaction Plants	TCOALLIQ	Includes coal, oil and tar sands used to produce synthetic oil.
Gas-to-Liquids (GTL) Plants	TGTL	Includes natural gas used as feedstock for the conversion to liquids, e.g. the quantities of fuel entering the methanol product process for transformation into methanol.
For Blended Natural Gas	TBLENDGAS	Includes other gases that are blended with natural gas.
Charcoal Production Plants	TCHARCOAL	Includes the transformation of solid biomass into charcoal.
Non-specified (Transformation)	TNONSPEC	Includes other non-specified transformation.

Final Consumption		
Flow	**Short name**	**Definition**
Total Final Consumption	TFC	Equal to the sum of the consumption in the end-use sectors. Energy used for transformation and for own use of the energy producing industries is excluded. Final consumption reflects for the most part deliveries to consumers (see note on *stock changes*).
Industry Sector	TOTIND	Consumption of the industry sector is specified in the following sub-sectors (energy used for transport by industry is not included here but is reported under transport):
Iron and Steel	IRONSTL	[ISIC Group 271 and Class 2731]
Chemical and Petrochemical	CHEMICAL	[ISIC Division 24] Excluding petrochemical feedstocks. *Prior to last year, the petrochemical feedstocks were included in energy use in the industry sector: starting with last year they have been included with non-energy use*.
Non-Ferrous Metals	NONFERR	[ISIC Group 272 and Class 2732] Basic industries.
Non-Metallic Minerals	NONMET	[ISIC Division 26] Such as glass, ceramic, cement, etc.
Transport Equipment	TRANSEQ	[ISIC Divisions 34 and 35]
Machinery	MACHINE	[ISIC Divisions 28, 29, 30, 31 and 32] Fabricated metal products, machinery and equipment other than transport equipment.
Mining and Quarrying	MINING	[ISIC Divisions 13 and 14] Mining (excluding fuels) and quarrying.
Food and Tobacco	FOODPRO	[ISIC Divisions 15 and 16]
Paper, Pulp and Print	PAPERPRO	[ISIC Divisions 21 and 22]
Wood and Wood Products	WOODPRO	[ISIC Division 20] Wood and wood products other than pulp and paper.
Construction	CONSTRUC	[ISIC Division 45]
Textile and Leather	TEXTILES	[ISIC Divisions 17, 18 and 19]
Non-specified (Industry)	INONSPEC	[ISIC Divisions 25, 33, 36 and 37] Any manufacturing industry not included above. Note: Most countries have difficulties supplying an industrial breakdown for all fuels. In these cases, the *non-specified* industry row has been used. Regional aggregates of industrial consumption should therefore be used with caution.

Transport Sector	TOTTRANS	Consumption in the transport sector covers all transport activity (in mobile engines) regardless of the economic sector to which it is contributing [ISIC Divisions 60, 61 and 62], and is divided into the following sub-sectors:
International Aviation	INTLAIR	Includes deliveries of aviation fuels to aircraft for international aviation. Fuels used by airlines for their road vehicles are excluded. The domestic/international split should be determined on the basis of departure and landing locations and not by the nationality of the airline. For many countries this incorrectly excludes fuel used by domestically owned carriers for their international departures;
Domestic Aviation	DOMESAIR	Includes deliveries of aviation fuels to aircraft for domestic aviation - commercial, private, agricultural, etc. It includes use for purposes other than flying, e.g. bench testing of engines, but not airline use of fuel for road transport. The domestic/international split should be determined on the basis of departure and landing locations and not by the nationality of the airline. Note that this may include journeys of considerable length between two airports in a country (e.g. San Francisco to Honolulu). For many countries this incorrectly includes fuel used by domestically owned carriers for outbound international traffic;
Road	ROAD	Includes fuels used in road vehicles as well as agricultural and industrial highway use. Excludes military consumption as well as motor gasoline used in stationary engines and diesel oil for use in tractors that are not for highway use;
Rail	RAIL	Includes quantities used in rail traffic, including industrial railways;
Pipeline Transport	PIPELINE	Includes energy used in the support and operation of pipelines transporting gases, liquids, slurries and other commodities, including the energy used for pump stations and maintenance of the pipeline. Energy for the pipeline distribution of natural or manufactured gas, hot water or steam (ISIC Division 40) from the distributor to final users is excluded and should be reported in the *energy sector*, while the energy used for the final distribution of water (ISIC Division 41) to household, industrial, commercial and other users should be included in *commercial/public services*. Losses occurring during the transport between distributor and final users should be reported as *distribution losses*;
Domestic Navigation	DOMESNAV	Includes fuels delivered to vessels of all flags not engaged in international navigation (see *international marine bunkers*). The domestic/international split should be determined on the basis of port of departure and port of arrival and not by the flag or nationality of the ship. Note that this may include journeys of considerable length between two ports in a country (e.g. San Francisco to Honolulu). Fuel used for ocean, coastal and inland fishing and military consumption are excluded;
Non-specified (Transport)	TRNONSPE	Includes all transport not elsewhere specified. Note: *International marine bunkers* are shown in *Supply* and are not included in the transport sector as part of final consumption.
Other Sectors	TOTOTHER	Includes residential, commercial/public services, agriculture/

		forestry, fishing and non-specified (other).
Residential	RESIDENT	Includes consumption by households, excluding fuels used for transport. Includes households with employed persons [ISIC Division 95] which is a small part of total residential consumption.
Commercial and Public Services	COMMPUB	[ISIC Divisions 41, 50-52, 55, 63-67, 70-75, 80, 85, 90-93 and 99]
Agriculture/Forestry	AGRICULT	Includes deliveries to users classified as agriculture, hunting and forestry by the ISIC, and therefore includes energy consumed by such users whether for traction (excluding agricultural highway use), power or heating (agricultural and domestic) [ISIC Divisions 01 and 02].
Fishing	FISHING	Includes fuels used for inland, coastal and deep-sea fishing. Fishing covers fuels delivered to ships of all flags that have refuelled in the country (including international fishing) as well as energy used in the fishing industry [ISIC Division 05]. *Prior to last year, fishing was included with agriculture/forestry and this may continue to be the case for some countries*.
Non-specified (Other)	ONONSPEC	Includes all fuel use not elsewhere specified as well as consumption in the above-designated categories for which separate figures have not been provided. Military fuel use for all mobile and stationary consumption is included here (e.g. ships, aircraft, road and energy used in living quarters) regardless of whether the fuel delivered is for the military of that country or for the military of another country.

3. ELECTRICITY AND HEAT GENERATION

Transformation Sector		
Used in OECD Electricity and Heat production - Renewables		
Flow	**Short name**	**Definition**
Main Activity Producer Electricity Plants	MAINELEC	Is equal to MAINELEC.
Main Activity Producer CHP Plants	MAINCHP	Is equal to MAINCHP.
Main Activity Producer Heat Plants	MAINHEAT	Is equal to MAINHEAT.
Autoproducer Electricity Plants	AUTOELEC	Is equal to AUTOELEC.
Autoproducer CHP Plants	AUTOCHP	Is equal to AUTOCHP.
Autoproducer Heat Plants	AUTOHEAT	Is equal to AUTOHEAT.
Total Plants	TOTPLANT	Is equal to sum of MAINELEC, MAINCHP, MAIN HEAT, AUTOELEC, AUTOCHP and AUTOHEAT.
Fuel Input (TJ)	TOTINPUT	
Fuel Input (Metric ton)	INTON	

Electricity Output (GWh)		
Flow	**Short name**	**Definition**
Electricity Output in GWh	ELOUTPUT	Shows the total number of GWh generated by power plants separated into electricity plants and CHP plants. **Electricity production for hydro pumped storage is included.**
Electricity Output-main activity producer electricity plants	ELMAINE	
Electricity Output-autoproducer electricity plants	ELAUTOE	
Electricity Output-main activity producer CHP plants	ELMAINC	
Electricity Output-autoproducer CHP plants	ELAUTOC	
Used in OECD Electricity and Heat production - Renewables		
Flow	**Short name**	**Definition**
Gross Electricity Production (GWh)	GELEPROD	Is equal to ELOUTPUT.

Heat Output (TJ)		
Flow	**Short name**	**Definition**
Heat Output in TJ	HEATOUT	Shows the total amount of TJ generated by power plants separated into CHP plants and heat plants.
Heat Output-main activity producer CHP plants	HEMAINC	
Heat Output-autoproducer CHP plants	HEAUTOC	
Heat Output-main activity producer heat plant	HEMAINH	
Heat Output-autoproducer heat plants	HEAUTOH	
Used in OECD Electricity and Heat production - Renewables		
Flow	**Short name**	**Definition**
Gross Heat Production (TJ)	GHEATPRO	Is equal to HEATOUT.

4. RENEWABLE CAPACITY

Renewable Capacity		
Flow	**Short name**	**Definition**
Total Capacity (MWe)	TOTALCAP	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. 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. The reported figures relate to the maximum capacities on 31st of December and are expressed in megawatts (MW). The reported electrical capacity includes both electricity (only) and CHP plants.
Hydro	HYDRO	Is equal to HYDRO.
Pumped Storage	HYDPUMP	
Geothermal	GEOTHERM	Is equal to GEOTHERM.
Solar Photovoltaic	SOLARPV	Is equal to SOLARPV.
Solar Thermal	SOLARTH	Is equal to SOLARTH.
Tide, Wave and Ocean	TIDE	Is equal to TIDE.
Wind	WIND	Is equal to WIND.
Industrial Waste	INDWASTE	Is equal to INDWASTE.
Municipal Waste	MUNWASTE	Includes renewable municipal waste and non renewable municipal waste.
Solid Biomass	SBIOMASS	Is equal to ELECTR.
Gas from Biomass	GBIOMASS	Is equal to HEAT.
Liquid Biomass	LBIOMASS	
Non-specified Renewables	RENEWNS	Is equal to RENEWNS.

Solar Surface (1000 m2)	SOLARSUR	Accumulated surface area of solar panels in 1000 m2.
Cap. of Solar Collectors (MWth)	SOLARTHSQ	Converted at 0.7 kWth/m2 of solar collector area, as estimated by the IEA Solar Heating & Cooling Programme.

5. GEOGRAPHICAL COVERAGE (WORLD)

Countries and Regions		
Flow	**Short name**	**Definition**
Australia	AUSTRALI	Excludes the overseas territories.
Austria	AUSTRIA	
Belgium	BELGIUM	
Canada	CANADA	
Czech Republic	CZECH	
Denmark	DENMARK	Excludes the Danish Faroes and Greenland
Finland	FINLAND	
France	FRANCE	Includes Monaco, and excludes the following overseas departments and territories (Guadeloupe, Guyana, Martinique, New Caledonia, French Polynesia, Reunion, and St.-Pierre and Miquelon).
Germany	GERMANY	
Greece	GREECE	
Hungary	HUNGARY	
Iceland	ICELAND	
Ireland	IRELAND	
Italy	ITALY	Includes San Marino and the Vatican.
Japan	JAPAN	Includes Okinawa.
Korea	KOREA	
Luxembourg	LUXEMBOU	
Mexico	MEXICO	
Netherlands	NETHLAND	Excludes Suriname and the Netherlands Antilles.
New Zealand	NZ	
Norway	NORWAY	
Poland	POLAND	

Portugal	PORTUGAL	Includes the Azores and Madeira.
Slovak Republic	SLOVAKIA	
Spain	SPAIN	Includes the Canary Islands.
Sweden	SWEDEN	
Switzerland	SWITLAND	Does not include Liechtenstein.
Turkey	TURKEY	
United Kingdom	UK	
United States	USA	Includes the 50 states and the District of Columbia.
OECD Total	OECDTOT	Includes Australia, Austria, Belgium, Canada, the Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Korea, Luxembourg, Mexico, the Netherlands, New Zealand, Norway, Poland, Portugal, the Slovak Republic, Spain, Sweden, Switzerland, Turkey, the United Kingdom and the United States.
OECD North America	OECDNAM	Includes Canada, Mexico and the United States.
OECD Pacific	OECDPAC	Includes Australia, Japan, Korea and New Zealand.
OECD Europe	OECDEUR	Includes Austria, Belgium, the Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, the Netherlands, Norway, Poland, Portugal, the Slovak Republic, Spain, Sweden, Switzerland, Turkey and the United Kingdom.
IEA Total	IEATOT	Includes Australia, Austria, Belgium, Canada, the Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Korea, Luxembourg, the Netherlands, New Zealand, Norway, Portugal, Slovak Republic, Spain, Sweden, Switzerland, Turkey, the United Kingdom and the United States. *Poland* is expected to become Member country of the IEA in 2008 and has been included in IEA aggregates for this edition.
IEA North America	IEANAM	Includes Canada and the United States.
IEA Europe	IEAEUR	Includes Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Slovak Republic, Spain, Sweden, Switzerland, Turkey and the United Kingdom. *Poland* is expected to become Member country of the IEA in 2008 and has been included in IEA aggregates for this edition.
Argentina	ARGENTINA	
Bolivia	BOLIVIA	
Brazil	BRAZIL	
Chile	CHILE	
Colombia	COLOMBIA	

Costa Rica	COSTARICA	
Cuba	CUBA	
Dominican Republic	DOMINICANR	
Ecuador	ECUADOR	
El Salvador	ELSALVADOR	
Guatemala	GUATEMALA	
Haiti	HAITI	
Honduras	HONDURAS	
Jamaica	JAMAICA	
Netherlands Antilles	NANTILLES	
Nicaragua	NICARAGUA	
Panama	PANAMA	
Paraguay	PARAGUAY	
Peru	PERU	
Trinidad and Tobago	TRINIDAD	
Uruguay	URUGUAY	
Venezuela	VENEZUELA	
Other Latin America	OTHERLATIN	Includes Antigua and Barbuda, Bahamas, Barbados, Belize, Bermuda, Dominica, French Guiana, Grenada, Guadeloupe, Guyana, Martinique, St. Kitts and Nevis, Saint Lucia, St. Vincent and Grenadines and Suriname.
Latin America	LATINAMERI	Includes Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Guatemala, Haiti, Honduras, Jamaica, Netherlands Antilles, Nicaragua, Panama, Paraguay, Peru, Trinidad and Tobago, Uruguay, Venezuela and Other Latin America.
Albania	ALBANIA	
Bulgaria	BULGARIA	
Cyprus	CYPRUS	Note by Turkey: With respect to the Cyprus question, Turkey reserves its position as stated in its declaration of 1 May 2004. The information in the report under the heading Cyprus relates to the southern part of the Island. There is no single authority representing both Turkish and Greek Cypriot people on the Island. Turkey recognises the Turkish Republic of Northern Cyprus (TRNC). Note by all the European Union Member States of the OECD and the European Commission: The Republic of Cyprus is recognised by all members of the United Nations with the exception of Turkey. The information in this

		report relates to the area under the effective control of the Government of the Republic of Cyprus.
Gibraltar	GIBRALTAR	
Malta	MALTA	
Romania	ROMANIA	
Bosnia and Herzegovina	BOSNIAHERZ	
Croatia	CROATIA	
FY Republic of Macedonia	FYROM	
Montenegro	MONTENEGRO	
Serbia	SERBIA	Data for Serbia include Montenegro until 2004 and Kosovo until 1999.
Slovenia	SLOVENIA	
Former Yugoslavia (if no detail)	YUGOND	
Non-OECD Europe	NONOECDEUR	Includes Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Gibraltar, Former Yugoslav Republic of Macedonia (FYROM), Malta, Romania, Serbia, Montenegro, and Slovenia.
Armenia	ARMENIA	
Azerbaijan	AZERBAIJAN	
Belarus	BELARUS	
Estonia	ESTONIA	
Georgia	GEORGIA	
Kazakhstan	KAZAKHSTAN	
Kyrgyzstan	KYRGYZSTAN	
Latvia	LATVIA	
Lithuania	LITHUANIA	
Republic of Moldova	MOLDOVA	
Russia	RUSSIA	
Tajikistan	TAJIKISTAN	
Turkmenistan	TURKMENIST	
Ukraine	UKRAINE	
Uzbekistan	UZBEKISTAN	

Former USSR (if no detail)	USSRND	
Algeria	ALGERIA	
Angola	ANGOLA	
Benin	BENIN	
Botswana	BOTSWANA	
Cameroon	CAMEROON	
Congo	CONGO	
Democratic Rep. of Congo	CONGOREP	
Cote d'Ivoire	COTEIVOIRE	
Egypt	EGYPT	
Eritrea	ERITREA	
Ethiopia	ETHIOPIA	
Gabon	GABON	
Ghana	GHANA	
Kenya	KENYA	
Libya	LIBYA	
Morocco	MOROCCO	
Mozambique	MOZAMBIQUE	
Namibia	NAMIBIA	
Nigeria	NIGERIA	
Senegal	SENEGAL	
South Africa	SOUTHAFRIC	
Sudan	SUDAN	
United Republic of Tanzania	TANZANIA	
Togo	TOGO	
Tunisia	TUNISIA	
Zambia	ZAMBIA	
Zimbabwe	ZIMBABWE	
Other Africa	OTHERAFRIC	Includes Burkina Faso, Burundi, Cape Verde, Central African Republic, Chad, Comoros, Djibouti, Equatorial Guinea, Gambia, Guinea, Guinea-Bissau, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Mauritius, Niger, Reunion, Rwanda, Sao Tome and Principe, Seychelles, Sierra Leone, Somalia, Swaziland and

		Uganda.
Africa	AFRICA	Includes Algeria, Angola, Benin, Botswana, Cameroon, Congo, Democratic Republic of Congo, Côte d'Ivoire, Egypt, Eritrea, Ethiopia, Gabon, Ghana, Kenya, Libya, Morocco, Mozambique, Namibia, Nigeria, Senegal, South Africa, Sudan, United Republic of Tanzania, Togo, Tunisia, Zambia, Zimbabwe and Other Africa.
Bahrain	BAHRAIN	
Islamic Republic of Iran	IRAN	
Iraq	IRAQ	
Israel	ISRAEL	
Jordan	JORDAN	
Kuwait	KUWAIT	
Lebanon	LEBANON	
Oman	OMAN	
Qatar	QATAR	
Saudi Arabia	SAUDIARABI	
Syria	SYRIA	
United Arab Emirates	UAE	
Yemen	YEMEN	
Middle East	MIDDLEEAST	Includes Bahrain, Islamic Republic of Iran, Iraq, Israel, Jordan, Kuwait, Lebanon, Oman, Qatar, Saudi Arabia, Syria, United Arab Emirates and Yemen.
Bangladesh	BANGLADESH	
Brunei	BRUNEI	
Cambodia	CAMBODIA	
India	INDIA	
Indonesia	INDONESIA	
DPR of Korea	KOREADPR	
Malaysia	MALAYSIA	
Mongolia	MONGOLIA	
Myanmar	MYANMAR	
Nepal	NEPAL	
Pakistan	PAKISTAN	

Philippines	PHILIPPINE	
Singapore	SINGAPORE	
Sri Lanka	SRILANKA	
Chinese Taipei	TAIPEI	
Thailand	THAILAND	
Vietnam	VIETNAM	
Other Asia	OTHERASIA	Includes Afghanistan, Bhutan, Fiji, French Polynesia, Kiribati, Laos, Macao, Maldives, New Caledonia, Papua New Guinea, Samoa, Solomon Islands, East Timor, Tonga and Vanuatu.
Asia excluding China	ASIA	Includes Bangladesh, Brunei Darussalam, Cambodia, Chinese Taipei, India, Indonesia, DPR of Korea, Malaysia, Mongolia, Myanmar, Nepal, Pakistan, Philippines, Singapore, Sri Lanka, Thailand, Vietnam and Other Asia.
Hong Kong (China)	HONGKONG	
People's Republic of China	CHINA	
Non-OECD Total	NONOECDTOT	
World	WORLD	

6. COUNTRY NOTES

General Notes

The notes given below refer to data for the years 1990 to 2007 and cover the tables of the book, as well as the information on CD-ROM and the online data service.

These series show data from 1990 to 2007, due to limited availability of data prior to this period.

For Australia, Japan and New Zealand (prior to 1994) electricity data refer to fiscal years.

Australia

Biogas production at sewage treatment plants is unavailable.

Prior to 1995, electricity production from biogas existed but was not reported.

A different industry consumption breakdown is available from 1996 and leads to breaks in series.

Inputs of solid biomass to CHP plants are estimated by the Secretariat until 1999.

The surface and capacity of solar collectors are estimated by the IEA Secretariat from 2001 to 2005.

Austria

Data for solar photovoltaic and for wind are available from 1993.

Geothermal input to main activity producer heat plants has been estimated by the IEA Secretariat from 1993 to 2003.

Belgium

Some electricity production from CHP plants is included in electricity plants.

The federal authorities are changing their method of collecting data: The operators in the relevant sectors are to be surveyed by the Ministry of Economic Affairs according to a survey based on that of the IEA. The Institut de Conseil et d'Études en Développement Durable will continue to provide complementary information. Due to this ongoing change, industrial waste and other biogas consumed in Transformation sector for 2004 was estimated by the IEA Secretariat.

In 2003, combustion of municipal waste for electricity and heat generation purposes increased significantly. However, as a portion of heat produced is not used (sold) it has led to a significant drop in plant efficiencies between 2002 and 2003. For the 2008 edition time series for industrial waste was revised back to 1990. The revisions concern production data and consumption in chemical sector.

Canada

Only gross maximum electrical capacity is available.

Inputs of combustible renewables and waste to autoproducer plants generating electricity are estimated by the Canadian administration.

The IEA Secretariat has estimated the data for municipal waste, industrial waste, and biogas from 1990 to 2006 and liquid biomass (ethanol) from 1998 to 2004 based on information supplied by Natural Resources Canada.

The surface and capacity of solar collectors were estimated by the IEA Secretariat back to 2001.

Czech Republic

The Czech Republic became a separate state in 1993 and since then data have been officially submitted by the Czech administration. This may lead to breaks in series between 1992 and 1993.

Solid biomass inputs to main activity producer electricity plants and CHP plants include industrial waste and biogas for 1995 and 1996.

Data on biogas used in main activity producer CHP and autoproducer heat plants start in 1997.

Data for liquid biomass are available starting in 1992 and for municipal waste starting in 1999.

The restructuring of the Czech electricity market leads to breaks in the time series in all sectors between 1998 and 2000. New survey systems cause breaks in final consumption in 1999 and in 2002. Breaks in both supply and consumption of combustible renewables and waste occur again in 2003.

The exports of biodiesel increased in 2005 driven by high prices for the commodity.

For the 2008 edition the Czech administration reclassified a part of wind and solar PV installations from autoproducers to main activity producers.

Denmark

Fish oil used in heat plants is included with solid biomass.

Electricity consumption in non-specified energy sectors includes consumption in district heating plants and use for the distribution of electricity.

Geothermal input to main activity producer heat plants has been estimated by the IEA Secretariat from 1990.

Number of heating companies burning wood chips in boilers that are equipped with flue-gas condensation is increasing. This implies a very high efficiency of heat plants.

Finland

Prior to 1992, outputs from the use of combustible renewables and waste to generate electricity and/or heat were included in peat therefore the IEA Secretariat estimated the breakdown of outputs from municipal waste and solid biomass based on inputs reported.

Before 1999, all wood electricity production from autoproducers is allocated to CHP plants.

Data for biogas and industrial waste are available from 1996.

Heat output from autoproducer CHP plants become available in 1996.

A new survey system and a reclassification of the data lead to breaks in series for most products and sectors between 1999 and 2000.

Prior to 2004, industrial waste included some other products such as hydrogen, heat from chemical process, natural gas and blast furnace gas etc.

Finish National Administration is working on harmonizing combustible renewables and waste data for the years 2004 to 2006, where several breaks occur.

France

Electricity production from wind is available from 1991.

Plants using municipal waste were reclassified as autoproducer CHP plants from 1995.

For the 2008 edition the final energy consumption of geothermal has been revised back to 2002 , and production and final energy consumption of solid biomass has been revised back to 2001.

Germany

Prior to 2003 electricity production in electricity plants includes production from CHP plants and heat production in CHP plants includes production from heat plants.

GDP figures prior to 1991 are based on conversions made by the German Institute for Economic Research (*Deutsches Institut für Wirtschaftsforschung*) and the former Statistical Office of the GDR (*Statistisches Amt der DDR*). These conversions are highly dependent on

specific hypotheses and do not necessarily reflect economic realities.

The German Federal Statistics Office reclassified some industrial branches which may cause a break in series in final consumption sub-sectors of industry between 1994 and 1995.

The German administration started reporting near surface geothermal energy in 1995, which leads to a break in time series with 1994, where only deep geothermal energy is reported.

A new survey for renewables causes breaks in the time series between 1998 and 1999.

In some instances, electricity generation from hydro, solar and wind in autoproducers electricity plants are confidential or non-available and therefore included in main activity producer electricity plants. The same applies to gas from biomass from 1999.

The German administration submitted an incomplete annual questionnaire on renewables and waste for the years 2001 and 2002. As a consequence, the Secretariat estimated the missing data based on statistics published by the Federal Environment Ministry and data submitted in the Electricity and Heat questionnaire.

Electricity consumed in the energy sector is not available for small industrial plants in 2000, which may cause breaks in the time series.

A new reporting system leads to break in series between 2002 and 2003. The German administration is undertaking the reconciliation of historical data.

There is large drop in the series reported for industrial waste between 2004 and 2005 because new information redistributed amounts previously reported as industrial waste into municipal waste, solid biomass and biogas.

Greece

No heat production of solar heat is reported although it exists.

Data on industrial waste are available from 1992.

New information on solid biomass is available from 1996.

The Greek administration is investigating on its geothermal reporting.

Industrial waste used in autoproducer CHP plants decreased a lot in 2006 because a plant closed.

Hungary

Electricity and heat production from solid biomass autoproducer CHP plants is available from 1995. Geothermal heat production from main activity producer heat plants is also available from 1995.

The Hungarian administration reclassified some of their plants in 1996 and 2000 which may lead to breaks in time series.

Data for wind and solar thermal are available from 2001. Industrial waste data are available from 2003. Data for biogas are available from 2000.

From 1995, a better allocation of solid biomass used in autoproducer CHP plants and specific industry sectors is available.

Iceland

Electricity production from geothermal sources in CHP plants is available from 1992.

Heat production from municipal waste is available from 1993.

In 1998, 60 MW of generating capacity was installed in a single geothermal CHP plant. Since the plant was inoperable for four months, production of geothermal heat decreased compared to 1997. The extra electricity capacity caused electricity production from geothermal to almost double over the same period.

Ireland

Electricity production from wind begins in 1992.

From 1993 to 1995, end-use consumption of gas from biomass is included in the transformation sector.

For 2008 edition, the Irish administration revised time series for solid biomass back to 1991.

Italy

Up to 2003 solid biomass capacity includes industrial waste capacity.

Heat produced for sale (distributed heat) is not available and hence not officially reported to the IEA till 2004.

Data on charcoal production and consumption prior to 2000 are estimated by the IEA Secretariat.

From 2000 onwards, the Italian administration defines electricity production from autoproducers as including generation from producers consuming more than 70% of their own production. However, for the 2000 to 2002 period all electricity production from autoproducers is reported with main activity producers.

For the 2008 edition the surface solar collectors was revised by the Italian administration based on a new study.

Japan

Data are reported on a fiscal year basis (April 2006 to March 2007 for 2006).

Electricity and heat produced in CHP plants are not included in the data series.

Production of electricity from solar photovoltaic and wind in autoproducer electricity plants is understated as it only covers generation from plants with capacity of 1000kW or more.

Production of electricity from solar photovoltaic from 1998 to 2004 is estimated by the Japanese administration.

Heat production from geothermal and solar thermal sources is not reported.

Inputs to charcoal production are estimated by the IEA Secretariat assuming efficiency of 40%.

Solar PV capacity is estimated by the IEA Secretariat back to 1990 based on data submission to the IEA-Photovoltaic Power System Implementing Agreement on grid-connected and off-grid installed capacity.

The surface and capacity of solar collectors are estimated by the IEA Secretariat back to 2001.

Korea

Data on pumped storage in electricity plants are available from 1991.

For heat production and a part of electricity production for 1990 to 2004 estimates were made by the IEA Secretariat.

The Korean administration is undertaking a study to improve its energy statistics reporting. As a part of this effort autoproducers electricity production data and heat production data were revised for the years 2000 and 2001, municipal waste and primary solid biomass data were revised for the year 2001, and biogas data were revised for the years 2000 and 2001.

The solar collectors' surface was estimated by the IEA Secretariat back to 1997.

Luxembourg

Most of the hydro production shown for Luxembourg is from a pumped storage plant and is exported directly to Germany.

Data on solid biomass are available from 1992.

Electricity and heat production from gas from biomass are available from 1999.

Mexico

Electricity production from wind is available from 1994.

Data on electricity production from solid biomass and gas from biomass are available from 1998.

Direct use of solar thermal and electricity production from solar PV is available from 1998.

CRE (Comisión Reguladora de Energia) publishes data for electricity generation by autoproducers since 1998.

Netherlands

All electricity and heat produced from combustible renewables and waste is included in CHP plants for the years 1990-1994. From 1995 onwards the electricity and heat produced is broken down into Electricity only, CHP and Heat only.

In 2006 some plants changed ownership and classification from Electricity only to CHP as they started heat projects. This has an impact on the balance of municipal waste and landfill gas.

For 2008 edition the time series for solid biomass was revised back to 1990. The revisions concern production and final energy consumption data. Furthermore, production and exports are underestimated due to unavailability of exports data.

Biodiesel imports data for 2006 are net imports which include exports and stock changes.

For 2007, for biogasoline and biodiesels only consumption data were submitted by the Dutch administration and therefore production and imports were estimated by the IEA Secretariat.

New Zealand

The series reported as industrial waste in previous editions represents industrial waste heat. The portion used to generate autoproducer electricity was correctly reported but the amounts consumed in the chemical industry should not have been included in production and consumption as well.

From 1994, data refer to calendar year, which results in a break in series between 1993 and 1994.

Electricity production by autoproducers from geothermal is available from 1995.

In 1999, a reclassification of autoproducer plants leads to breaks in the time series.

Solid biomass data were revised back to 2000.

Norway

Data for industrial waste and biogas are available from 1991.

Electricity production from wind is available from 1992.

Heat production from biogas is available from 1995.

Breaks in series between 1996 and 1997 are due to a reclassification of main activity producers and autoproducers.

Data for liquid biofuels are confidential till 2005.

The surface and capacity of solar collectors were estimated by the IEA Secretariat back to 2001.

Poland

Data for biogas refer only to the gas from fermentation of biomass.

Data for industrial waste includes gaseous industrial waste.

Due to changes in data availability, there is a large increase in solid biomass between 1992 and 1993.

The Polish administration adopted new methodologies to estimate the production of heat sold in heat plants (1993) and in CHP plants (1995). This causes breaks in series for years from 1992 to 1995 for heat production and fuel inputs in these plants

In the 2005 edition, biogas electricity production by main activity producers was reclassified as autoproducer production from 1995 to 2003.

Changes in the data collection process lead to breaks between 1996 and 1997.

Before 2000, industrial waste was used interchangeably with light fuel oil in some plants, which might result in breaks in the time series.

Data on direct use of geothermal became available in 2000.

Data on liquid biomass is available starting in 2003.

The installed capacity for industrial waste and solid biomass is relatively low.

Multi-fuel generating capacity for industrial waste is reported under the dominant fuel, which is coal.

The surface and capacity of solar collectors were estimated by the IEA Secretariat back to 2002.

Portugal

Data are available from 1994 for biogas, from 1999 for municipal waste and from 2003 for industrial waste.

Solid biomass consumption in the residential sector includes the non-commercial part of solid biomass consumed in households.

Slovak Republic

The Slovak Republic became a separate state in 1993 and harmonised its statistics to EU standards in 2000. These two facts lead to several breaks in time series between 1992 and 1993, and between 2000 and 2001. The Slovak Republic is planning to revise its time series for the period between 1990 and 2000.

Until 2000, electricity statistics have been estimated by the IEA Secretariat. From 1993, IEA estimates are based on direct submissions from the Statistical Office of the Slovak Republic and the Power Research Institute (EGU) of Bratislava.

From 1993 to 2000, the data reported in previous editions as gas works gas represent industrial waste used for electricity and heat production by main activity producers.

Before 2001, municipal waste inputs are included in the transformation sector of solid biomass.

Industrial waste, municipal waste, biogas, liquid biomass and geothermal direct use data became available in 2001.

Geothermal input to heat plants in 2004 was estimated by the IEA Secretariat.

The surface and capacity of solar collectors were estimated by the IEA Secretariat for years 2004 and 2005.

Spain

Solar and geothermal data are available from 1994.

A new reporting system leads to breaks in final consumption sectors between 1999 and 2000. In 2000, many plants were reclassified from main activity producer to autoproducer or vice versa.

Sweden

Heat production from solid biomass in autoproducer CHP includes waste heat and chemical heat.

Heat produced for sale in heat pumps is reported from 1992.

Data for biogas also begins in 1992. Before 1992, it is included in solid biomass.

Transformation data for industrial waste are not available prior to 1998.

Switzerland

Geothermal direct use is overstated as it refers to heat production by geothermal heat pumps, which include inputs from electricity and/or gas in the transformation process.

Electricity production from wind and pumped storage by autoproducers is available from 1996.

In 2006, production of heat from municipal waste ceased as a plant closed.

Turkey

The Turkish administration surveys renewables and waste used for power and heat intermittently. Due to this fact some breaks may appear in the combustible renewables and waste series.

In 1995, the Turkish administration reclassified autoproducer plants by type and source to be consistent with IEA definitions. This causes breaks between 1994 and 1995 for electricity production.

Electricity production from wind is available starting in 1998.

Data for the transformation sector are estimated for industrial waste from 2002.

The accuracy of data on inputs for industrial waste is compromised by ongoing data collection problems.

United Kingdom

Prior to 2001, some of the industrial waste was reported with other oil products.

Final consumption of industrial waste in commercial/public services includes hospital waste, which should be shown under municipal waste.

Efficiency of electricity production from industrial waste is increasing in 2005 and 2006 due to increased capturing and reusing of waste heat to generate electricity.

United States

The Energy Information Administration collects generation and consumption data from all plants 1 MW or more in capacity.

Heat production from solid biomass became available in 1991.

Data on industrial waste and gas from biomass for 1990 and 1991 were estimated by IEA Secretariat.

Data on liquid biomass became available in 1993.

Solar thermal electricity production was overstated for the years prior to 1999 because it included electricity production from natural gas occurring in solar thermal power plants.

The US introduced a new methodology for data from 1999. From 1999, independent power producers are included in main activity producers, leading to breaks in series between 1998 and 1999. In addition, because the US administration cannot distinguish between heat sold by autoproducers and heat used in the final consumption sector, all heat produced by autoproducers is included in final consumption from 1999 on.

Capacity is net summer capacity.

Solar PV capacity was estimated by the Energy Information Administration for 2003 to 2006. These estimates include on-grid connected and off-grid installations.

Solar PV electricity production is reported only for grid-connected installations.

For 2006 and 2007 biodiesel exports are estimated by the IEA Secretariat.

7. EXPLANATORY NOTES

The following section is structured as follows:

- General Notes
- Data Sources
- Primary Energy Conventions
- Units and Conversions

General Notes

This publication is the seventh edition of *Renewables Information*.

Energy data for OECD countries are submitted by all OECD Member countries to the IEA Secretariat in a common reporting format and methodology to allow international comparison.

Even though data quality improves with each new edition due to the continuous efforts of the IEA in partnership with national administrations, it is important to highlight once again that the published time series often have breaks. Difficulties remain in the collection of some renewable statistics and coverage among countries.

For example, one continuing problem is the breakdown between renewable municipal waste and non-renewable municipal waste. The breakdown is important because most countries include the renewable (biodegradable) part of municipal waste in their renewables definition, while they exclude the remainder. Furthermore, the non-renewable component is counted when calculating CO_2 emissions.

Data collection from off-grid systems that work independently or are connected to a local distribution system also remains a problem. These systems are frequently omitted in national statistics due to difficulties in collecting these data. This is, for example, the case of solar energy sector, where for a number of countries production and capacity are likely to be considerably higher than indicated in this publication.

One general issue regarding renewables is the variety of definitions used by national and international bodies, some of which include specific renewables technologies such as large hydro, geothermal, peat, municipal waste or industrial waste while others exclude them. Similarly, some studies do not include non-commercial biomass in developing countries while others do.

The Renewable Energy Working Party of the International Energy Agency set down the following broad definition:

"Renewable Energy is derived from natural processes that are replenished constantly. In its various forms, it derives directly or indirectly from the sun, or from heat generated deep within the earth. Included in the definition is energy generated from solar, wind, biomass, geothermal, hydropower and ocean resources, and biofuels and hydrogen derived from renewable resources."

Therefore, in this publication the renewable products are: hydro (large, medium and small), geothermal, solar photovoltaic, solar thermal, tide, wave, ocean, wind, solid biomass, gases from biomass, liquid biomass and renewable municipal waste.

It follows that total renewables does not include industrial waste, non-renewable municipal waste, waste heat, net heat generated by heat pumps, and electricity generated with hydro pumped storage.

While some OECD member countries accept industrial waste and non-renewable municipal waste as *renewable energy sources, many countries exclude*

them on the grounds that they are not biodegradable. Under IEA methodology, industrial waste and non-renewable municipal waste are excluded from the definition of renewable energy sources. However, these data are included in this publication in order to account for the full range of statistics collected in the Annual Renewables and Waste Questionnaire. A division into renewable and non-renewable municipal waste is sometimes based on estimates. Similarly, in some countries industrial waste statistics are not of the same quality as those for other products, because renewables and waste data collection systems were not in place in many countries in the early 1990s.

Non-commercial biomass is included in our definition, but data are not always complete. Electricity from fuel cells using hydrogen from renewable as well as non-renewable sources is not included in this publication due to lack of reliable information.

Energy flows data reported for 2007 (shown as 2007e) are preliminary estimates based on the submissions received in early 2008 and on monthly submissions to the IEA from Member countries.

Special attention should also be given to the percentage of renewables over TPES in countries where the net trade of electricity is large and represents a significant percentage. In these cases, the high net imports or exports of electricity can heavily influence upward or downwards the percentage of renewables in TPES.

Statistics of non-OECD countries presented in this publication are based on data available at time of publishing and may differ from the final non-OECD data to be published in *Energy Statistics of non-OECD Countries*.

Additional information on methodologies and reporting conventions are included in the notes in *Energy Balances of OECD Countries* and *Energy Statistics of OECD Countries*.

Data Sources

Historical Data (1990-2006)

The annual historical data in Part III of this report are taken from the IEA/OECD databases of Energy Statistics which are based on annual submissions from all OECD Member countries.

i) IEA/OECD Renewables Statistics

This database of annual statistics for OECD countries covers hydro, solid biomass, geothermal, renewable municipal waste, wind, gas from biomass, liquid biomass, solar photovoltaic, solar thermal, tide/wave/ocean, non-renewable municipal waste and industrial waste. It includes electricity and heat production from renewable sources and supply/demand balances of renewable and waste products.

The main data from this system are published annually in this publication.

ii) IEA/OECD Electricity Statistics

This database of annual statistics for OECD countries covers generating capacity and electricity production from main activity producer (formerly public) and autoproducer plants. It includes information on electricity production by fuel type and supply/demand balances for electricity and for heat sold to third parties from different types of power and heat plants.

The main data from this system are published annually in the IEA/OECD publication *Electricity Information.*

iii) IEA/OECD Energy Balances

Overall energy balances are constructed annually for all OECD countries from the basic energy statistics systems of the IEA. The overall energy balance data are expressed in a common energy unit of tonnes of oil equivalent (toe) and presented in a standard matrix format. The balances are published annually in the IEA/OECD publication *Energy Balances of OECD Countries* in which detailed country notes referring to historical data can be found.

iv) OECD Main Economic Indicators

OECD Main Economic Indicators is a monthly compilation of a range of indicators on recent economic developments for the 30 OECD Member countries. Please refer to this publication for detailed notes regarding the selected indicators.

Latest Year Data: 2007

Energy data reported for 2007 in this publication are submitted to the Secretariat by Member countries as preliminary data and are shown in this book as 2007e. Final 2007 data on renewables and waste will be submitted by OECD Member countries to the Secretariat in Annual Questionnaires in late 2008. As a result,

final data for 2007 and preliminary 2008 data will be published in the 2009 edition of *Renewables Information*.

Primary Energy Conventions

When constructing an energy balance, it is necessary to adopt conventions for primary energy from several sources, such as geothermal, solar, hydro, wind, etc. The two types of assumptions that have to be made are described below.

Choice of the primary energy form

For each of these sources, there is a need to define the form of primary energy to be considered; for instance, in the case of hydro energy, a choice must be made between the kinetic energy of falling water and the electricity produced. For photovoltaic electricity, the choice is between the solar radiation received and the electricity produced. The principle adopted by the IEA is that the primary energy form should be the first energy form downstream in the production process for which multiple energy uses are practical. The application of this principle leads to the choice of the following primary energy forms:

- **Heat** for geothermal and solar thermal;
- **Electricity** for hydro, wind, tide/wave/ocean and solar photovoltaic.

Calculation of the primary energy equivalent

There are essentially two methods that can be used to calculate the primary energy equivalent of the above energy sources: the partial substitution method and the physical energy content method.

The partial substitution method: In this method, the primary energy equivalent of the above sources of electricity generation represents the amount of energy that would be necessary to generate an identical amount of electricity in conventional thermal power plants. The primary energy equivalent is calculated using an average generating efficiency of these plants. This method has several shortcomings, including the difficulty of choosing an appropriate generating efficiency and the fact that the partial substitution method is not relevant for countries with a high share of hydro electricity. For these reasons, the IEA, as most of the international organisations, adopted the physical energy content method.

The physical energy content method: This method uses the physical energy content of the primary energy source as the primary energy equivalent. As a consequence, there is an obvious link between the principles adopted in defining the primary energy forms of energy sources and the primary energy equivalent of these sources. For instance, in the case solar thermal and geothermal electricity production, as heat is the primary energy form selected by the IEA, the primary energy equivalent is the quantity of heat generated in the geothermal or solar thermal plant for electricity generation. In the case of hydro, wind, tide and solar PV, as electricity is the primary energy form selected, the primary energy equivalent is the physical energy content of the electricity generated in the plant, which amounts to assuming an efficiency of 100%.

For geothermal, if no country-specific information was available, the primary energy equivalent is calculated as follow:

- 10% for geothermal electricity
- 50% for geothermal heat.

Since these two types of energy balances differ significantly in the treatment of electricity from solar, hydro, wind, etc., the share of renewables in total energy supply will appear to be very different depending on the method used. As a result, when looking at the percentages of various energy sources in total supply, it is important to understand the underlying conventions that were used to calculate the primary energy balances.

Units and Conversions

Conversion (to toe)

All units in this publication are metric units.

Most IEA/OECD publications showing inter-fuel relations and projections present such information in a common energy unit, the tonne of oil equivalent (toe). A tonne of oil equivalent is defined as 10^7 kcal (41.868 GJ), a convenient measure because it is approximately the net heat content of one tonne of average crude oil. This unit is used by the IEA/OECD in its energy balances.

Note also that totals may not be the sum of their components due to independent rounding.

The balances are expressed in terms of net calorific value. The difference between the net and the gross

calorific value for each fuel is the latent heat of vaporisation of the water produced during combustion of the fuel. The use of net calorific value is consistent with the practice of the Statistical Offices of the European Communities and the United Nations.

Electricity data are converted from original units of gigawatt hours to million tonnes of oil equivalent using the relationship:

1 TWh = 0.086 Mtoe.

Complete listings of net calorific values to convert energy sources from basic units to tons of oil equivalent are reported in section IV and can be found at the end of this Chapter.

Electricity

All electricity data are reported to the IEA in GWh and MWh or MW (for capacity).

Figures for the energy equivalent of electricity production and final consumption are calculated using the energy content of the electricity, i.e. at a rate of 1 TWh = 0.086 Mtoe. Hydro electricity production (excluding pumped storage) and electricity produced by other non-thermal means (wind, tide, photovoltaic, etc.) are accounted for similarly using 1 TWh = 0.086 Mtoe.

In the case of electricity produced from geothermal heat the primary equivalent is calculated assuming an efficiency of 10 per cent when the geothermal energy input is not submitted by a country.

1 TWh = (0.086 ÷ 0.1) Mtoe

Heat

Information on heat is supplied in Terajoules (TJ). 1 TJ = 2.388×10^{-5} Mtoe

In the case of geothermal heat, the primary equivalent is calculated assuming an average thermal efficiency of 50 per cent, when the geothermal energy input is not submitted by a country.

1 TJ = ($2.388 \times 10^{-5} \div 0.5$) Mtoe

Solar Thermal Capacity of Solar Collector Surfaces

The nominal solar thermal capacity of solar collectors' surfaces is derived using a factor of 0.7 kW_{th}/m^2 (IEA-Solar Heating and Cooling Implementing Agreement).

8. CONVERSION FACTORS

General Conversion Factors for Energy

To:	**TJ**	**Gcal**	**Mtoe**	**MBtu**	**GWh**
From:	multiply by:				
TJ	1	238.8	2.388×10^{-5}	947.8	0.2778
Gcal	4.1868×10^{-3}	1	10^{-7}	3.968	1.163×10^{-3}
Mtoe	4.1868×10^{4}	10^{7}	1	3.968×10^{7}	11630
MBtu	1.0551×10^{-3}	0.252	2.52×10^{-8}	1	2.931×10^{-4}
GWh	3.6	860	8.6×10^{-5}	3412	1

Conversion Factors for Mass

To:	**kg**	**t**	**lt**	**st**	**lb**
From:	multiply by:				
kilogramme (kg)	1	0.001	9.84×10^{-4}	1.102×10^{-3}	2.2046
tonne (t)	1000	1	0.984	1.1023	2204.6
long ton (lt)	1016	1.016	1	1.120	2240.0
short ton (st)	907.2	0.9072	0.893	1	2000.0
pound (lb)	0.454	4.54×10^{-4}	4.46×10^{-4}	5.0×10^{-4}	1

Conversion Factors for Volume

To:	**gal U.S.**	**gal U.K.**	**bbl**	**ft^3**	**L**	**m^3**
From:	multiply by:					
U.S. gallon (gal)	1	0.8327	0.02381	0.1337	3.785	0.0038
U.K. gallon (gal)	1.201	1	0.02859	0.1605	4.546	0.0045
Barrel (bbl)	42.0	34.97	1	5.615	159.0	0.159
Cubic foot (ft^3)	7.48	6.229	0.1781	1	28.3	0.0283
Litre (l)	0.2642	0.220	0.0063	0.0353	1	0.001
Cubic metre (m^3)	264.2	220.0	6.289	35.3147	1000.0	1

Decimal Prefixes

10^1	deca (da)	10^{-1}	deci (d)
10^2	hecto (h)	10^{-2}	centi (c)
10^3	kilo (k)	10^{-3}	milli (m)
10^6	mega (M)	10^{-6}	micro (μ)
10^9	giga (G)	10^{-9}	nano (n)
10^{12}	tera (T)	10^{-12}	pico (p)
10^{15}	peta (P)	10^{-15}	femto (f)
10^{18}	exa (E)	10^{-18}	atto (a)

9. ABBREVIATIONS

GJ	:	Gigajoule (10^9 joules)
GW	:	Gigawatt
GWh	:	Gigawatt hour = 3.6 Terajoules
kW	:	kilowatt
kWh	:	kilowatt hour
MW	:	Megawatt (electric)
MWh	:	Megawatt hour
MWth	:	Megawatt thermal
m^2	:	metre squared
t	:	metric ton = tonne
TJ	:	Terajoule (10^{12} joules)
1 toe	:	tonne of oil equivalent = 41.868 GJ = 10^7 kcal
TWh	:	Terawatt hour
GDP	:	Gross Domestic Product
RES	:	Renewable Energy Sources
TPES	:	Total Primary Energy Supply
c	:	confidential data
e	:	estimated data
..	:	not available
x	:	not applicable