## Renewable fuels and energy

Renewable fuels and energy (Renewables) are captured directly or indirectly from the incoming sunlight, geothermal heat and the effects of gravitational forces. The main groups of renewables are described below and the various sub categories defined within them.

**Solar renewables - Direct**

*Photovoltaic cells*
Incoming sunlight is converted into electricity through the photoelectronic processes in the cells.

*Thermal collectors*
Incoming sunlight heats the surfaces of the collectors which transfer the heat to a fluid which, in turn, carries it away for use.

Tim SIMMONS 10 May 2008 11h51
Are there any reported instances of 'ocean' energy in which the temperature differences in the ocean are exploited to produce electricity?

**Solar renewables - Indirect**

*Wind*
Some of the kinetic energy of wind is transferred to the motion of the propellor rotors for the production of mechanical and electrical energy.

*Wave*
The action of wind on the surface of water produces vertical oscillations in water level which may be used to drive mechanical devices and generate electricity.

*Hydro*
Mechanical energy (usually converted to electricity) is obtained from the kinetic or potential energy of falling water by passing it through a rotor system. The energy is renewable because the water is continually returned to higher levels by the climate system driven by sunlight.

*Biofuels*
Fuels derived from recent (that is, non-fossil) plant matter in which the carbon content is stored in sugars formed through the photosynthesis of carbon dioxide and water using sunlight. Fuels produced from animal fats and wastes obtain their calorific value indirectly from the plants eaten by the animals.

*Wood and wood wastes*
Fuelwood or firewood (in log, brushwood, pellet or chip form) obtained from natural or managed forests or isolated trees. Also included are wastes used as fuel which are obtained from the preparation of wood for fuel or derived products (for example, paper, furniture, etc).

*Charcoal*
The solid residue from the carbonisation of wood or other vegetable matter by pyrolysis.

*Vegetal material and wastes (other than wood)*
Bagasse, straw, vegetable husks, ground nut shells, pruning brushwood, olive pomace and other wastes arising from the maintenance, cropping and processing of plants.

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

liquor is burned to release heat when the concentrated liquor is sprayed into a recovery furnace and heated with hot gases at 900° C.

*Animal wastes*
Excreta of animals which, when dry, are used directly as a fuel.

*Biogasoline*
A biomass derived liquid which is blended with fossil fuel derived gasoline. The blending may take place in refineries or at or near the point of sale. Common examples are:

bioethanol

biomethanol

bio ETBE (ethyl-tertio-butyl-ether)

bio MTBE (methyl-tertio-butyl-ether)

Tim SIMMONS 10 May 2008 12h01
Do we need to mention the biodegradeable fraction of waste? I assume that this is its biomass component.

*Biodiesel*
Oil derived from biological sources and modified chemically so that it can be used as fuel in diesel engines either directly or after blending with petroleum diesel. Biodiesel is a linear alkyl ester made by transesterification of vegetable oils or animal fats with methanol. The transesterification distinguishes biodiesel from straight vegetable and waste oils. Straight oils can be used as fuel only if the engine is modified; for this reason, it is not recommended to report them as biodiesel. Biodiesel has a flash point of around 150°C and a density of 0.86 kg/litre. Biological sources of biodiesel include, but are not limited to, vegetable oils made from canola (rapeseed), soybeans, corn, oil palm, peanut, or sunflower.

Tim Simmons 8/4/08 21h29
Suggest replace 'report' with 'classify'.

Tim Simmons 8/4/08 21h31
Is there a consensus on this point?

*Other liquid biofuels*
Liquid biofuels not used as transport fuels.

*Landfill gas*
Gases composed principally of methane and carbon dioxide arising from the anaerobic digestion of biomass in landfills.

*Other biogases*
Sewage sludge gas and other gas obtained from the anaerobic fermentation of sewage sludge or animal slurries or wastes from abbatoirs, breweries and the agro-food industries.

**Gravitational renewables**

*Tidal energy*
Mechanical energy (usually used to generate electricity) provided by rotors driven by tidal currents resulting from the rotation of the earth and the gravitational forces from the earth, moon and sun.

**Geothermal renewables**

*Heat*
Heat captured from hot rocks in the earth's crust. The rocks are heated by the decay of radioactive elements in the crust.

**Wastes**

Wastes are materials no longer required by the holder and destined for disposal in landfills or incineration plants. Wastes need inclusion in energy statistics when they are incinerated with heat recovery as they are then considered fuels. The heat may be used for space heating or electricity generation.

Certain wastes are mixtures of materials of fossil and biomass origin and this complicates the task of estimating the fossil and renewable fuels components for reporting purposes.

The following waste categories have been identified.

**Industrial waste**
This category comprises waste of non-renewable origin originating from industrial processes, institutions and hospitals and which are incinerated with heat recovery.

Renewable industrial waste is not included under this definition but is covered in the solid biomass, biogas and/or liquid biofuels categories.

**Municipal waste**
Waste produced from households and commercial activities and which are collected by services funded by public administration and incinerated with heat recovery.
Municipal wastes are divided into renewable and non-renewable categories.

Tim SIMMONS 17 June 2008 09h51
The definitions given here must create data collection difficulties as distinctions are made which seek to select only parts of the waste flows. I suggest that more work be done to understand the use of waste as a fuel by the holder and waste collection practices so that definitions are framed which may be more easily implemented and serve the needs of fuel and emission statistics.

Tim SIMMONS 17 June 2008 10h00
This revised definition permits the inclusion of waste from industry collected by public authorities or their agents. In this respect it reflects the current definitions employed by some organisations. It is not evident to me that this is desirable but consideration of the point can take place in the context of a wider review suggested above.