

Terminology

Biomass is defined as material with biological origin that has not, or only to a small extent, passed through chemical or biological transformation.

Biofuels are defined as fuels that have biomass as their original material. Biofuels can be subdivided into five groups namely: wood fuels, black liquor, agricultural fuels, peat fuels, and biofuel from assorted waste.

Wood-fuel is raw material from trees that has not been subjected to any chemical process. This wood-fuel can be divided into wet fuel and dry fuel. Wet fuel includes felling residues, thin branch cuttings, bark, shavings, and sawdust. Dry fuel includes milled wood powder, pellets, and briquettes. Wood pellets and briquettes are also referred to as refined or densified biofuel.

Forest residues or waste wood, include logging residues, imperfect commercial trees, dead wood, and other non-commercial trees thinned from forests.

Wood logs are manufactured from crosscut timber.

Wood chip is a general term for mechanically chipped wood, made from branches, treetops, or other sawmill wood waste.

Wood pellets are refined, densified fuels produced from sawdust, milled wood dust, bark, wood or waste wood remaining after processing trees to timber and other wood products. They are clean and convenient compared to conventional wood heating. They are flowable due to their small uniform size, CO₂ neutral and non-toxic.

Wood briquettes are somewhat larger than

pellets. Their raw material and characteristics are similar to that of wood pellets.

Wood powder is milled, dry wood shavings or other dry waste wood which remains after processing wood to finished products.

Agricultural fuels are various wood based fuels such as willow (*Salix* sp.) grown as biomass forestry or short-rotation forestry. Willow is often grown on land that has been set aside from food production. Willow is also used in a grey or wastewater cleaning process. Surplus cereal crops such as wheat, oats and barley can be used as biofuel.

Peat fuels are made from peat, an incomplete decomposed biomass. According to the definitions by the UN Framework Convention on Climate Change (UNFCCC) and the EU definitions, peat-fuel is not classified as a renewable fuel. The CO₂ released during the burning process becomes a part of the overall increase in CO₂ emissions. However many countries have access to large peat resources, and the use of peat-fuel, as a local energy source, is important to some communities.

District heating is a system that provides districts of towns, or whole towns with heating from one or more heat generating plants.

Local district heating network is a small system providing heat to a limited number of factory buildings or residential buildings.

Combined heat and power or CPH produces heat and electricity simultaneously in a single power plant.

Key Figures - Energy content and weight comparisons.

(These figures are quoted from the International Panel on Climate Change)

Fuel		Moisture content %	Weight, Tonnes	Volume		Energy content		Ash content, %
				m ³ (solid)	m ³ , (bulk) ^a	MWh	GJ	
Biofuels	Woodchip	35-45	0,25 - 0,31	0,38	1	0,70 - 0,75	2,5 - 2,7	1,2
	Sawdust	50-55	0,28 - 0,33	0,32	1	0,60 - 0,65	2,2 - 2,3	1,2
	Wood shavings	10-15	0,12 - 0,14	0,15 - 0,20	1	0,50 - 0,55	1,8 - 2,0	0,5 - 0,8
	Wood pellet	8-12	1	1	1,4-1,7	4,5-5,0	16,2-18,0	0,5-0,8
	Wood briquette	10-15	1		1,5-1,8	4,5-5,0	16,2-18,0	1
	Milled wood powder	4-6	1		4,5	4,8-5,2	17,3-18,7	0,4-0,6
Sod Peat		35	0,3-0,35		1	3,0-3,3	10,8-11,9	2-8
Fossil fuels	Heavy fuel oil		0,95-1	1		11,15	40,14	
	Shale oil		0,95-1	1		10,8	38,88	
	Light oil		0,83	1		11,8	42,48	
	Natural gas			1000Nm ³		9,35	33,7	
	Coal	5-15	0,9		1	5,5-7,5	19,8-27,0	5-30

Table for energy unit comparison

Unit	MWh	GJ	Gcal	toe	MBTU
MWh	1	3,6	0,86	0,086	3,412
GJ	0,278	1	0,239	0,024	0,948
Gcal	1,163	4,148	1	0,100	3,969
toe	11,63	41,87	10,00	1	39,69
MBTU	0,293	1,055	0,252	0,025	1

MWh- megawatt-hour
 GJ- Gigajoule
 Gcal- Gigacalorie
 toe- ton oil equivalent
 MBTU- Mega British Thermal Unit

Average emissions of CO₂ and SO₂ of fuels per energy content and weight

Fuel		CO ₂		SO ₂	
		kg CO ₂ /MWh	kg CO ₂ /t	kg SO ₂ /MWh	kg SO ₂ /t
Biofuels	Woodchip with 40-50% moisture content.	-	-	0,04	0,09
	Pellet with 8-10% moisture content	-	-	0,04	0,17
Sod peat with moisture content 35 %		378	1206	0,72	2,3
Fossil fuels	Heavy fuel oil	276	3075	1,8	20
	Oil shale oil	276	2965	1,5	16
	Light oil	256	3024	0,34	4
	Natural gas	201	1879*	0	0
	Coal	339	2377	1,7	12

Table for comparing biofuels with light fuel oil

	sizes		Weight in tonnes comparing energy content to 1 m3 light oil	Bulk weight, kg/m3	Energy content, MWh/t
	Diameter, mm	length			
Pellet	6 - 12	Max 4 x diameter	2,1	600 - 700	4,75 - 4,85
Briquette	60 - 80	Ca 1,5 diameter	2,2	550 - 650	4,65 - 4,75
Woodchip with 50% moisture content			4,3 - 4,6	250 - 350	2,25 - 2,35
Light oil				850	11,9