

Energy Value & Density

Mark Jenner

August 12, 2011

Just as Biomass Rules tracks biomass projects, policies, and technologies; we also track prices of traditional fuels, biofuels and other biomass materials. Published weekly data from public entities, US Dept. of Ag, or Energy, is used when it is available. Some of the materials, do not have public exchanges and some are reported monthly or quarterly rather than weekly.

	Tabled HHV Values	Table HHV Units	Density lb/cu ft.
Fossil Fuels			
Crude oil	5,800,000	BTU/barrel	53.305
Gasoline	125,000	BTU/Gallon	45.478
Diesel Fuel	128,700	BTU/Gallon	52.331
Natural gas	20,540	BTU/lb	0.050
Heating oil (wholesale)	138,000	BTU/Gallon	54.200
Electricity retail, residential	3,412	BTU/kWh	---
Coal (IL, 11,800 btu, 5.0 SO2)	11,800	BTU/lb	52.000
Liquid Fuels			
Ethanol (Iowa)	76,000	BTU/Gallon	48.881
biodiesel (Iowa)	118,000	BTU/Gallon	57.463
Soybean oil (Central IL)	17,000	BTU/lb	57.015
Number 2, Yellow grease	15,400	BTU/lb	47.957
Solid Fuels			
Fuel pellets	8,000	BTU/lb	40.000
Shelled corn	8,150	BTU/lb	45.016
Recycled cardboard	6,800	BTU/lb	40.741
Compost	6,885	BTU/lb	37.037
Sawdust	8,000	BTU/lb	18.000
Wheat straw	7,400	BTU/lb	6.000
Mixed Grass Hay	7,500	BTU/lb	11.000
Corn stover	7,800	BTU/lb	11.000
DDGS	9,400	BTU/lb	32.000

Modifying or constructing non-market economic values like \$/MMBTU, important boundaries get crossed. There is a physical and cultural world of difference between grass hay and crude oil. Moisture contents must be removed. The size and weight of the bale requires average values be assigned. Even with great care important information does not make the transition.

Two key components of these calculations are 1) the tabled higher heating value (HHV) that were used and 2) the densities of the materials. These densities may not enter directly into the energy value itself, but add significant value to the interpretation.

Coal, for instance, is a great bargain in the \$/MMBTU metric. Agricultural biomass like hay and straw are right behind coal as a fuel bargain, but coal is very dense. Hay and straw are light and fluffy. The added transportation costs of moving a ton of 'light and fluffy' changes the value, but not the \$/MMBTU. To supplement the information contained in the \$/MMBTU metric, I am posting the Higher Heating Values (HHV) and the material densities.

Moisture contents are also tracked, but not included in this table. The biomass materials in their native agricultural market are traded with standard moisture contents included in the price. Traditional fuels are traded with water removed, or as bone-dry tons. Water has not energy value.