Energy Within Environmental Constraints Conversion Sheet

	Heat of Combustion		Mass Density		Carbon Intensities		
	GJ/kg	GJ/m^3	kg/m^3	kg/GJ	kg CO_2/kg	kg CO_2/m^3	kg CO_2/GJ
Coal	.027	x	x	37	2.2	x	90
Crude Oil	.046	39	850	22	3.3	2800	71
Diesel	.046	38	840	22	3.2	2600	69
Gasoline	.047	35	740	21	3.2	2400	68
Hydrogen	.14	.013	.09	7	0	0	0
Natural Gas	.052	.04	0.78	19	2.6	2	50

$$\frac{.0036\ GJ}{kWh}\ or\ \frac{278\ kWh}{GJ} \qquad \frac{28\ m^3}{Mcf}\ or\ \frac{.035\ Mcf}{m^3} \qquad \frac{42\ gallons}{barrel}\ or\ \frac{.024\ barrels}{gallon}$$

$$\frac{3412\ BTU}{kWh}\ or\ \frac{.000293\ kWh}{BTU} \qquad \frac{.0038\ m^3}{gallon}\ or\ \frac{264\ gallons}{m^3} \qquad \frac{2.78\ \$/GJ}{c/kWh}\ or\ \frac{.36\ c/kWh}{\$/GJ}$$

$$\frac{.1\ c/kWh}{\$/MWh}\ or\ \frac{10\ \$/MWh}{c/kWh}$$

Useful metric to imperial conversions: 1 mile = 1.61 km. 1 pound = 0.454 kg.
Heats of combustion are HHV's (higher heating values). All quantities are as measured at 1 atm and 25° C
Mcf – thousand cubic feet
"Carbon intensity" is for combustion only (not lifecycle); adapted from from the EIA
Coal properties vary with rank; we use the average of bituminous and sub-bituminous which constitute 90+% of US production
Mass- and energy-density data adapted from Argonne Nat'l Labs' GREET Project
Numbers have few significant digits for convenience; not intended for extremely precise calculation
Please report errors using a [STAFF] thread in the course discussion board. Updated 08/06/2018