

Measurement Units in Energy Statistics

Physical Units

Energy products are measured in physical units by their mass, volume, and energy content. The measurement units that are specific to an energy product and employed at the point of measurement of an energy flow are often referred to as “original” or “natural” units. Coal, for example, is generally measured by its mass and crude oil by its volume. On the other hand, cross-fuel tabulations, such as the energy balances, are displayed in a “common” unit to allow comparison across energy products. These “common” units are usually energy units and require the conversion from an original unit through the application of an appropriate conversion factor.

Typical examples of original units are: mass units (e.g., kilograms or metric tons) for solid fuels; volume units (e.g., barrels or litres) or mass units (metric tons) for oil; and volume units (e.g., cubic metres) for gases.

Solid fuels, such as coal and coke, are generally measured in mass units. The SI unit for mass is the kilogram (kg). Metric tons (tons) are most commonly used to measure coal and their derivatives. One metric ton corresponds to 1000 kg.

Volume units are original units for most liquid and gaseous fuels, as well as some traditional fuels. The SI unit for volume is the cubic metre, which is equivalent to a kilolitre or one thousand litres. Other volume units include the British or Imperial gallon (approximately 4.546 litres), United States gallon (approximately 3.785 litres), the barrel (approximately 159 litres), and the cubic foot, which is also used to measure volumes of gaseous fuels.

Energy Units

In the realms of Energy Statistics, the terms - Energy, heat and work are considered to be three facets of the same concept. The coherent derived SI unit of energy, heat and work is the joule (J)- defined as the work done when a constant force of 1 Newton is exerted on a body with mass of 1 gram to move it a distance of 1 metre. Common multiples of the joule are the megajoule, gigajoule, terajoule and petajoule. Other units include: the kilogram calorie in the metric system, or kilocalorie (kcal) or one of its multiples; the British thermal unit (Btu) or one of its multiples; ton of coal equivalent (tce), ton of oil equivalent (toe); and the kilowatt hour (kWh).

Power is the rate at which work is done (or heat released, or energy converted, often measured in the kilowatt hour (kWh), which refers to the energy equivalent of 1000 watt (joules per second) over a one-hour period. Thus, 1 kilowatt-hour equals 3.6×10^6 joules. Electricity is usually measured in kWh. Heat quantities, on the other hand, are usually measured in calories or joules.

Annexure- II

Conversion Factors

1 kilogram	=	2.2046 pounds
1 Pound	=	454 gm.
1 Cubic metres	=	35.3 cubic feet (gas)
1 Metric ton	=	1 Tonne =1000 kilogram
1 Joule	=	0.23884 calories
1 Mega Joule	=	10^6 joules = 238.84×10^3 calories
1 Giga Joule	=	10^9 joules = 238.84×10^6 calories
1 Tera Joule	=	10^{12} joules = 238.84×10^9 calories
1 Peta Joule	=	10^{15} joules = 238.84×10^{12} calories
One million tonnes of Coal	=	16.94 petajoules of energy
One million tonnes of Lignite	=	9.546 petajoules of energy
One million tonnes of oil equivalent (MTOE)	=	42.789 petajoules of energy
One billion cubic meter of natural gas	=	38.735 petajoules of energy
One million cubic meter of natural gas	=	38.735 terajoules of energy
One billion-kilowatt hour of electricity	=	3.60 petajoules of energy

Annexure- II

Net Calorific Value (NCV) used in the publication (kJ/Kg)												
	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24
Coal Production	18299	18267	18096	18051	17819	17316	17273	17131	16905	16822	16865	16943
Coal Import	21331	20889	21183	21978	22183	22182	22005	22065	22473	23277	22257	22418
Coal Export	28200	28200	28200	28200	28200	28200	28200	28200	28200	28200	28200	28200
Stock Changes	24283	24283	24283	24283	24283	24283	24283	24283	17637	17637	17545	17723
Coal Dispatched/Consumption to Power Sector	17411	17411	17411	17411	17411	17411	17424	17342	17001	16846	16939	17030
Coal Dispatched/Consumption to Non-Power Sector (Industry)	22029	22029	22029	22029	22029	22029	22413	22510	22093	21027	21877	22236
Lignite	9546	9546	9546	9546	9546	9546	9546	9546	9546	9546	9546	9546
Note: NCV=GCV*.95												

Conversion Factors of Crude Oil/Petroleum Products used in the publication				
Products	2012-13 to 2020-21		2021-22 to 2023-24	
	KJ/Kg	Toe/Metric Tonnes	KJ/Kg	Toe/Metric Tonnes
Crude Oil	42789	1.022	42789	1.022
LPG	47300	1.130	47300	1.130
Naphtha	45000	1.075	45000	1.075
Kerosene	41564.4	0.993	43752	1.045
Diesel Oil(HSD+ LDO)	43300	1.034	43334	1.035
Fuel Oil	39178	0.936	41240	0.985
Lubricants	42000	1.003	42000	1.003
Bitumin	39000	0.931	39000	0.931
Petrol/Motor Spirit	44800	1.070	44800	1.070
ATF	44600	1.065	44600	1.065
Petroleum Coke	32000	0.764	32000	0.764
Other Petroleum Products	40000	0.955	40193	0.960

Conversion Factor for Natural Gas used in the publication		
	BCM to Joule	Toe/TJ
2012-13 to 2019-20	1 BCM=38520 TJ or 38.52 PJ	0.02388
2020-21 to 2023-24	1 BCM =38735 TJ or 38.735 PJ	0.02388
Electricity/Electricity from hydro and RES, 1 Gwh= .086 Ktoe		
Electricity from Nuclear, 1 Gwh=(.086÷.33) Ktoe		