

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 | = 16.86 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 |
| Coal Production | 18299 | 18267 | 18096 | 18051 | 17819 | 17316 | 17273 | 17131 | 16905 | 16822 | 16856 |
| Coal Import | 21331 | 20889 | 21183 | 21978 | 22183 | 22182 | 22005 | 22065 | 22473 | 23277 | 22257 |
| Coal Export | 28200 | 28200 | 28200 | 28200 | 28200 | 28200 | 28200 | 28200 | 28200 | 28200 | 28200 |
| Stock Changes | 24283 | 24283 | 24283 | 24283 | 24283 | 24283 | 24283 | 24283 | 17637 | 17637 | 17565 |
| Coal Dispatched to Power Sector OR Coal Consumption in Power Sector | 17411 | 17411 | 17411 | 17411 | 17411 | 17411 | 17424 | 17342 | 17001 | 16846 | 16911 |
| Coal Dispatched to Non-Power Sector (Industry) OR Coal Consumption in Non-Power Sector (Industry) | 22029 | 22029 | 22029 | 22029 | 22029 | 22029 | 22413 | 22510 | 22093 | 21027 | 21145 |
| Lignite | 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 2022-23 | |
| | 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 2022-23 | 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 | | |