K. Units Used

Multiples

Prefix	Symbol	Factor	Term
kilo	k	E3	thousand
mega	M	E6	million
giga	G	E9	billion
tera	T	E12	
peta	P	E15	

Mass

1 tonne	= 1.102	short tons
	= 0.9842	long tons
	= 2,204.62	pounds

Volume

Million cubic metres (Mm^3)

Volume of liquid, or of gas measured at 15ºC and 101.325 kPa pressure.

1 Mm^3	= 0.0353147	billion cubic feet (Bcf)
	= 6.289	million barrels (mmbbls)

Energy and Heat

Petajoules (PJ)

The joule is the Système International (SI) derived unit of energy and heat. Its consistent use simplifies comparisons between different forms of energy and between energy supplied or consumed in New Zealand and overseas. A joule is the energy required to heat 1 cubic centimetre of water by about a quarter (0.239) of a degree Celsius, or the energy needed to lift a kilogram about 102 millimetres. A PJ is 10^{15} joules.

1 PJ	= 0.2388 E15	international calories
	= 0.2389 E15	15ºC calories
	= 0.239 E15	thermochemical calories
	= 0.9478 E12	British thermal units (btu)
	= 277.778	gigawatt hours (GWh)
	= 0.2388 E5	tonnes of oil equivalent (toe)

Calorific value

The energy content or energy value of a fuel can be measured as the heat released on complete combustion. Referenced to unit quantity or mass, the energy content of a fuel is referred to as its *calorific value*, or specific energy. The choice of unit, however, is a matter of convention. For gas the cubic metre is typically used. For coal the kilogram is more usual. For liquid fuels, both volumes and masses are commonly used. Calorific values based on gas volumes are assigned to specific conditions of temperature and pressure.

Gross and net PJ

The energy contents or calorific values can be expressed as an upper (or *gross*) value and a lower (or *net*) value. The difference between the two values is due to the release of energy from the condensation of water in the products of combustion.

In general, the difference between gross and net calorific values is of the order of 6% to 8% for liquid fuels, and 10% for gaseous fuels. In coals, the greater

chemical variability (in contrast with petroleum products) gives rise to a much wider range of gross/net differences, from 2% to 15% or more.

Net calorific values give the amount of useful heat available on combustion, rather than the total heat theoretically available. Thus, net calorific values generally form a better basis by which to compare the energy contents of different fuels. However, in New Zealand the convention for energy accounting and statistical recording has been to use gross calorific values. For this reason, the EDF generally presents gross calorific values. The latest annual energy supply and demand balance is presented in both gross (Table B.2l) and net (Table B.3) terms, and conversion factors for different fuels are provided in Section M. All references in the EDF to PJ are to gross PJ unless specifically noted as net PJ.

kWh and GWh

In the electricity industry, energy is measured in kilowatt hours (kWh), sometimes referred to in context as "units", or, for large quantities, gigawatt hours (GWh). 1 GWh = 1,000,000 kWh. A device with a rating of 1,000 watts or one kilowatt running for one hour would consume one kilowatt hour of electricity. A similar device running for half an hour or two hours would use 0.5 kWh or 2 kWh respectively.

Gross and net generation

Gross generation includes power used for the station's auxiliary plant and other internal losses. Net generation is generated power measured at the output transformer.

Power and Capacity

Megawatt (MW)

Power is the rate of doing work or the rate of energy flow, ie, the rate at which energy is produced or used. The SI unit of power is the watt (W), defined as a rate of one joule per second. In this publication, the standard unit of power is the megawatt (MW). Power is usually recorded (and is shown in these statistics) as the average over a period (typically a half-hour period) rather than as an instantaneous value.

Capacity (MW)

The capacity of a generation plant, given in megawatts (MW).

Capacity (MVA)

This refers to the installed rated capacity of a transformer in mega volts-amps (MVA). Where dual ratings are given, the lower rating is used in this publication.

Length

Kilometre (km)

The lengths in kilometres of transmission and distribution networks (in Table G.8) refers to circuit lengths of reticulation, distribution and transmission lines and cables. That is, if two or more lines share the same route, the circuit length is two or more times the length of the route.

Price

Dollars ($) and cents (c)

All prices are given in New Zealand dollars and cents unless otherwise specified, and are nominal unless specified as real. Conversions to New Zealand dollars carried out for purposes of international comparisons are based on exchange rates used by the International Energy Agency.