

Valuing Electricity in Reporting Energy Supply and Demand

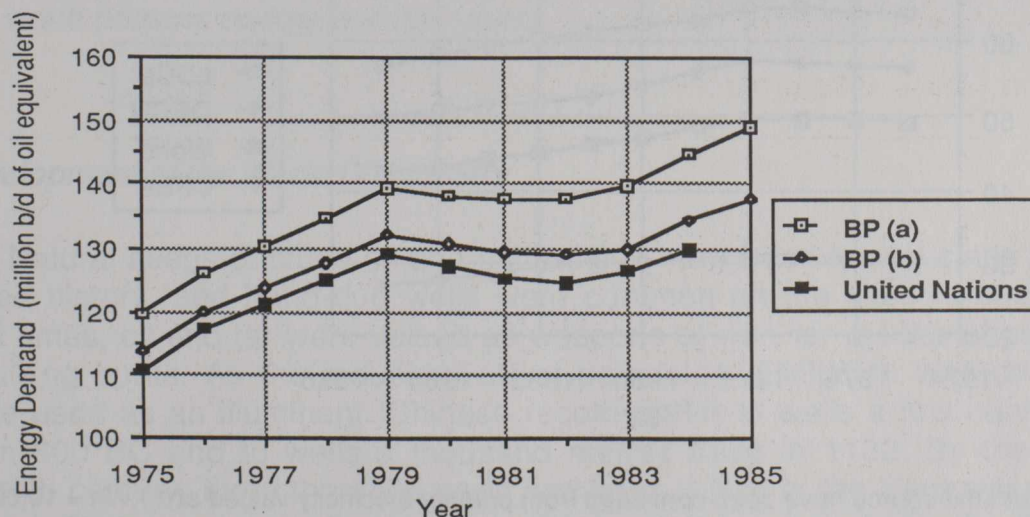
With the exception of countries like Canada and Norway, where the electrical system is primarily based on hydro-electric generation, nations produce most of their electricity by thermal generation using coal, oil, natural gas or uranium as fuel. For thermodynamic reasons, thermal power plants release about two units of heat for each unit of electricity produced. Should thermal electricity be valued in terms of the three units of energy needed in its manufacture (its "fossil fuel equivalence") or the one unit of electricity produced (its "energy output")?

Many agencies have adopted the convention of reporting all electricity – including hydropower – as if it were thermal electricity valued in terms of the fossil fuel that would be required to produce it (about 10,000 Btu/kWh or 10,550 kilojoules/kWh), instead of the true value of its energy content (3,412 Btu/kWh or 3,600 kJ/kWh). This statistical convention is useful for making certain international comparisons but it overstates energy demand in Canada and it inflates the role of hydro-electricity. Hydropower satisfied 12.1% of Canada's primary energy demand in 1985 measured by its energy output value, but 27.5% measured by its fossil fuel equivalence value.

This distinction is important because of the apparent discrepancies introduced in statistical reporting. Comparing per capita energy consumption between Canada and the United States, for example, the values are approximately equal when hydro-electricity is measured by its energy output, but Canada is significantly higher when hydropower is valued at its fossil fuel equivalence. EMR usually reports hydro-electricity by its fossil fuel equivalence; Statistics Canada uses the energy output value. Further complicating matters, both EMR and the NEB have begun reporting nuclear-electricity at a value of 12,100 kJ per kWh (approximately 11,480 Btu/kWh), reflecting the fact that Canadian nuclear reactors are about 30% efficient in producing electricity. This report adopts the energy output approach – valuing all electricity production at 3,412 Btu/kWh – because the Committee believes that this gives a clearer picture of energy supply and demand.

International statistics show the same divergence. United Nations data, for example, report electricity at 3,412 Btu per kWh while British Petroleum, in its *Statistical Review of World Energy*, reports electric energy at 10,000 Btu per kWh. The following illustration shows how this affects a compilation of world energy use. The difference between U.N. and BP reporting was roughly 15 million barrels/day of oil equivalent in 1984. Note that the two data sets do not fully correspond, even after conversion to a common basis for reporting primary electricity.

The Global Demand for Commercial Primary Energy, as Reported by BP and by the United Nations



BP (a): British Petroleum data with primary electricity valued at 1 kWh = 10,000 Btu.

BP (b): British Petroleum data converted to value primary electricity at 1 kWh = 3,412 Btu.