Levelized Cost of Energy (LCOE):

A Misleading Measure of Value for a Carbon-free World

The levelized cost of energy (LCOE) is widely used to compare the value of different energy sources. In particular, many people point to the declining cost of photovoltaic solar installations and wind turbines to support plans to move towards a 100%-renewable energy system. Indeed, a number of analysts have recently pointed to Lazard's analysis of LCOE, showing that solar and wind installations have an LCOE far below that of nuclear plants to justify carbon-free scenarios in which no nuclear is present.

Yes, the levelized cost of solar might be low, but no amount of solar will power our TV at night. We'll need to add storage, especially long-term (overnight, weekly, even seasonal usage) to make a solar- and wind-based system meet our need for 24/7 electricity. That kind of storage does not exist at this point, and its cost, whatever it might turn out to be, is not included in the LCOE for solar and wind. Further, if that storage did exist, we would need to add more solar and wind facilities so that, when the sun was shining and the wind was blowing, there would be excess electricity that could be stored for later use.[1] Further, widespread installation of wind and solar will require the construction of extended transmission lines. All of this will add quite significant costs that are omitted from the LCOE computations.

The US Energy Information Administration points out in a presentation of LCOE values that "the LCOE values for dispatchable and non-dispatchable technologies are listed separately in the tables, because comparing them must be done carefully. The direct comparison of LCOE across technologies is, therefore, often problematic and can be misleading as a method to assess the economic competitiveness of various generation alternatives."

Solar and wind are "non-dispatchable," that is, they are available when time -- solar is never available at night -- and weather are favorable. They cannot be counted on to be available when they are needed. They might produce the amount of energy we want at the lowest possible price, but they won't necessarily produce that energy when we actually need it. When planning an energy system, we have to think not only about the cost, but also about the other requirements the system has to meet. One of them, in our present society, is that electric power must be available when it is needed. When we press the light switch, the light has to go on.

If we want a reliable energy system, one that doesn't always turn on the lights is not the one we would want. We have to balance cost and reliability. For a carbon-free system, we need the reliable power nuclear can provide, perhaps accompanied by the flexibility that solar and wind can supply. Since hydropower is limited, nuclear is the only expandable carbon-free source we have that can provide the reliability we need.

Prepared by Leonard Rodberg, May 27, 2020

[1] How much added facilities would be needed? The ratio of the actual annual output to the maximum possible output is called the "capacity factor". Typical capacity factors are 15% for solar, 25% for land-based wind, and 45% for off-shore wind. If storage were available, and we want 1 kw of electricity full=time, then we need to expand the facility by 1/capacity factor, that is 1/.15=6.7 kw, 1/.25=4 kw or 1/.45=2.2 kw, to achieve that level of output for solar, land-based wind, and off-shore wind..