RESIDENTIAL ENERGY USAGE

In the continuing debate over wind power, advocates frequently point to the number of homes "served" by a wind turbine or group of turbines. This produces a "feel-good" number, which makes people think that all of these homes are now off the grid insofar as conventional power is concerned, and hence there will be a huge reduction in emissions of CO_2 of other greenhouse gases and pollutants. Let us look at several scenarios to see the fallacy of this argument.

It is a winter night and the family has gone to bed. There is a night light on, the computer and some other electronic gadgets are in "sleep mode." The furnace is running, along with a circulation pump or fan. In this instance the home is using at most 500 watts of power or 0.5 kW. Meanwhile, the wind is blowing briskly and a nearby 39-MW wind plant is running at full capacity. At this moment the wind plant is serving about 78,000 residences.

Now it is a hot afternoon in summer and the family has gotten home from work and school. They turn on some lights and the TV, wake up the computer, turn down the thermostat so the AC kicks on, and begin to prepare supper. Drawing water will cause the water heater to come on and opening the refrigerator door several times will cause it to run as well. The electric meter is spinning wildly. We could easily be drawing 10 kW. Meanwhile, the air is a sultry calm. The turbine blades are motionless, serving no one.

Even if the turbines were running at full capacity, they would be serving only 3900 homes at this time. Looked at from yet another aspect, a typical summer capacity factor for Appalachian turbines is around 15%, which means that they will be generating, on average, about 15% of their rated capacity. Now they would be generating less than 6 MW and would thus serve about 590 homes.

"Homes served" ranges from 0 to 590 to 3900 to 78,000 for the same wind plant, depending only on when you look at it. Is this not the definition of nonsense?

What about the reduction in greenhouse-gas emissions? Unless all of these residential customers are happy to have Baghdad-style electric service, back-up generation is necessary. A typical base-load coal plant cannot react quickly enough to follow the variations in demand and the added variation due to intermittent wind generation. If spare hydropower is available, it can be cycled quickly to meet demand, but there is no CO_2 emission from hydro, thus no CO_2 reduction from replacing hydro with wind. Gas turbines can also be cycled rather rapidly to back up wind, which would mean reduced CO_2 emissions when wind allowed the gas to be turned off, but gas is an expensive power source so using gas for backup raises the overall cost of power. In reality, coal-fired plants are typically kept running at less than full capacity as backup, operating less efficiently than they do at full load, hence putting out more CO_2 per MWh. Thus, it turns out that much of the greenhouse-gas reduction touted for wind power is a mirage.

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5 February 2007