Busting Myth Busting

The writer is incorrect in assuming that other generation plants can have their output increased or decreased easily in response to wind's random, frequent and often extensive fluctuations. This is particularly true when wind plants are operating at their higher output levels, where output fluctuations can occur frequently over the full range of their capacity. In order to provide a steady supply of electricity to the grid, other duplicate generation resources have to be available to step in or out to the full extent of the wind capacity to meet these fluctuations.

Further, it is important to understand that the electricity output from wind turbines does not vary directly as changes in wind speed but as the cube of these changes. So for double the wind speed, wind turbine output increases to eight times, and for half the wind speed it is reduced to one-eighth.

The best source for "real-world" experience is E.ON Netz in Germany, which reports 90-95 per cent backup is required.

If coal plants are used as wind backup, fuel supply can be varied, but this is not very responsive. Another approach is to bypass the steam turbine (which drives the generator) to the condenser, wasting the steam produced. The coal burning operation is not necessarily varied and continues to burn coal whatever the wind is doing. In the case of gas turbine plants, some types can respond more quickly, but in doing so burn more gas per unit of electricity produced than in normal steady operation. This is like the difference in gas mileage of cars in highway versus stop/start city driving.

The problem with varying fossil fuel plants is that they then operate less efficiently, consume more fuel and produce more CO2 emissions. For gas turbines, every one per cent loss in efficiency produces 2-3 times the percentage increase of CO2 emissions. Varying fuel use in coal plants produces even less desirable results.

With hydro backup there are no reductions in CO2 emissions, because hydro generation produces none. It is theoretically possible that saving some hydro, where the water is impounded, may result in later savings in fossil fuel generation, but this is not necessarily the case as it could also be used for future wind backup.

With current technologies it is impossible for any jurisdiction to absorb wind production averaging in the range of 20 per cent of the total. This is because, in high production mode, wind output can vary from 0 to 100 per cent or more of the total demand for electricity, which current grid and other generation technologies could not withstand. Future technologies, including smart grids and large scale storage capabilities, may be able to support such surges, but these are many decades in the future and will require substantial investment.

An interesting example is Denmark, where wind production approaches 20 per cent. It has to export most of the production at highly discounted prices to Norway and Sweden and Germany, or their electricity system would not be manageable. An important aspect is the size of these other electricity systems relative to Denmark's. Sweden and Norway combined are over five times as large and Germany is eleven times the Danish system.

The US DOE is quoted as claiming that wind energy cuts natural gas use. Because gas plants are the wind backup means of choice, increasing wind production results in increases in gas turbine production and gas consumption, not a decrease. T. Boone Pickens has substantial gas assets, and this is one reason why he is promoting wind power so strongly.

Simplistically, many analyses calculate fossil fuel and CO2 reductions based on wind plant production alone, ignoring the effect on the electricity system as a whole. In the case of the Texas ERCOT study cited, the CO2 emissions reductions claimed are on this basis. The same applies to the DOE studies cited and the Hawaii wind plant example claimed by Kaheawa Wind Power.

In summary, the article is an example of the shortcomings of limited research and analysis. It is typical of those who want to believe in wind power or who project experience with small scale wind turbines to industrial wind plants.

Kent Hawkins
North Marysburgh
613-476-4808