Why Windmills Can't Fly : The Non-Science of Wind Energy

by Gregory Murphy

Unless you want to kill people by energy starvation, wind is useless for an industrial society. It is intermittent, unreliable, high cost, and low energy density. Although its proponents call wind energy a renewable source, even that is not true: You cannot produce even one wind turbine from the electricity produced by a wind farm of 100 wind turbines.

Sandia National Laboratory

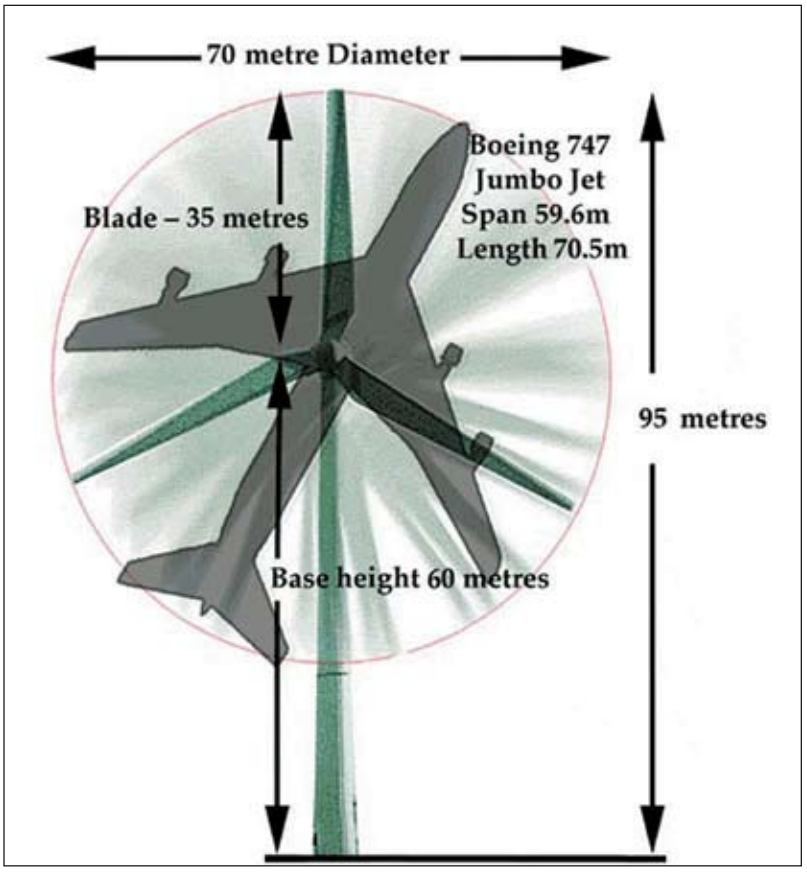
An offshore wind farm in Denmark, the country that has the most wind turbines per capita. But Denmark has never been able to shut down one of its coal-fired plants.

Let's look at the basics: Like most renewables, wind needs lots of land area. For comparison, let's take a typical nuclear power plant in Texas. I have chosen the Comanche Peak Nuclear Power Plant, south of Dallas, which has two units with a combined capacity of 2,500 megawatts (MW). Comanche Peak is sitting on 4,000 acres, which includes a man-made cooling lake that also serves as a recreation area.

How many 1.5-MW General Electric wind turbines (the kind chosen by T. Boone Pickens for his much-hyped plan to replace baseload electric sources with wind turbines) would it take to produce the same amount of energy that the Comanche Peak reactors produce? To find out, we first divide the amount of energy that the reactors produce (2,500 megawatts) by the nameplate rating of the wind turbine, which is 1.5 megawatts. That would seem to give us the number of turbines that would be needed to produce that same amount of energy as the nuclear reactor: 1,667 wind turbines.

But not so fast. It turns out that the nameplate rating is not what the wind turbine actually puts out. The average wind turbine has a capacity factor of only 25%. This means that only 25% of the rated capacity is actually produced, on average, by the wind turbine, and thus it will take four turbines to equal the nameplate rating of one turbine. Given that fact, we must now multiply our 1,667 wind turbines by 4, which gives us 6,668 wind turbines to equal the output of the two nuclear reactors at Comanche Peak.

Now let us look at the amount of land area that would be needed for these 6,668 wind turbines. General Electric, the producer of the 1.5-MW wind turbines used in this example, recommends spacing the turbines at three times the diameter of the turbine's rotor, so that the wind trailing off the rotor does not affect neighboring turbines. GE also recommends that the spacing between rows of turbines be five times the diameter of the rotor, so that the next row of turbines can make use of the available wind.



Naturstrom-Euphorie

This gives an idea of the immensity of a 1.5-megawatt wind turbine, the model that T. Boone Pickens has ordered from General Electric for his now-on-hold project to build the world's largest wind farm, in the Texas panhandle. The area that the rotor sweeps out is large enough to fit a 747 jumbo jet.

The GE 1.5-MW wind turbine has a rotor diameter of 77 meters (262.6 feet). To get an idea of the size, the area that the rotor sweeps out is big enough to place a 747 jumbo jet inside.

To figure the spacing between the turbines, multiply the rotor diameter of 77 meters by 3, which gives us 231 meters. Now, to figure the spacing between rows of wind turbines we multiply the rotor diameter of 77 meters by 5, which gives us 385 meters between rows. If we multiply the 231 meters by 385 meters, it will give us the total area required to site one of our 1.5-MW wind turbines. This comes out to 88,935 square meters, or 22 acres of land.

If we multiply the 22 acres by our 6,668 wind turbines, we get 146,696 acres, which is 229.21 square miles (about three times the size of the metropolitan Washington, D.C. area).

Compare that to the 4,000 acres required for the nuclear plants. And then consider, that the Comanche site can support two more units (the license is currently under review by the Nuclear Regulatory Commission). That would double the power output achieved on the same 4,000 acres, and bring the ratio of land use efficiency of nuclear power, compared to windmills, to 73 to 1.

Statistical Fakery

Promoters of wind energy use every conceivable numerical trick to hype the great benefits of wind energy. The biggest fraud comes in the comparisons of levelized cost. Levelized cost is figured by taking the nameplate-rating capacity and multiplying it by, say, 30 years, and then subtracting the cost of maintenance. In the case of wind, however, there is major element of fraud: It is assumed that the wind is going to blow 25-27 miles per hour, every hour of the day, for 30 years! In truth, there is no place on the planet where the wind blows at those speeds every day for 30 years.

Another piece of fakery relates to the availability factor, that is, the percentage of time that the wind turbine or any other power source is available. Wind energy advocates purposely confuse the availability factor with the capacity factor, in order to show how many wind turbines could produce the same energy as a nuclear power plant. The fraud is that although the availability factor of a wind turbine is 100%—because it is available to produce power at any time—wind turbines actually produce their full-rated power less than 25% of the time.

Compare this to the nuclear power plant, in which the availability factor and the capacity factor are the same—around 95%. The only time the nuclear reactor is not producing power is during maintenance periods. But wind turbines also have maintenance downtime, and a lot more of it.

Then there is the subsidy issue. Renewables like wind and solar are highly dependent on government subsidies. The Production Tax Credit (PTC), recently

NRC

The Comanche Peak nuclear plant site in Texas, has two reactors totalling 2,500 megawatts, sited on 4,000 acres that include a cooling pond and recreation area. The nominally equivalent output in wind turbines would occupy 229 square miles, about three times the size of the metropolitan Washington, D.C. area.

extended for another year, is a 1.8-cent tax credit per kilowatt hour for the first ten years of the wind turbine's life. Average electricity rates fall between 7 and 11 cents per kilowatt hour, so the credit amounts to a subsidy of 16 to 25%.

This is not the only subsidy that wind energy industry gets. Several states offer tax breaks on operating revenue, and allow write-offs for capital investment. State laws that require a certain percentage of electricity to be produced by renewables guarantee that there will be a market, no matter what the cost.

Myth of Green Job Creation

In December 2008, radical Malthusian Lester Brown of the Earth Policy Institute held a teleconference where he said that millions of "green collar" jobs could be created with the transition to a green energy economy. This author challenged that claim, and asked in an e-mail, what the real effect of the green-collar jobs would be, and if these were permanent jobs or only temporary jobs. Jonathan Dorn, the lead researcher responsible for compiling the data for the reports issued by the Earth Policy Institute, gave a telling answer.

After reiterating the statistical mumbo jumbo of his job creation model, Dorn admitted that "the majority of the jobs are temporary construction and manufacturing jobs. Once construction of the power facility or the retrofitting of a building is completed, the construction workers will be laid off."

To review the case against wind energy ever becoming a mainstay power source:

- Great tracts of land are needed to produce the same amount of energy as a nuclear or conventional power plant.
- Wind patterns can be erratic. Even if the wind blows fairly regularly in an area, physical design requirements limit the speeds at which the turbines work. This means that you cannot make the most use of the available energy contained in the wind.
- Because of the irregularity of wind, there always has to be a back-up power source available.
- Wind requires a high level of government subsidy to operate.

The case of Denmark shows that it is a pipe-dream to suppose wind will ever replace mainstream power. Denmark has more wind turbines per capita than any country in the world, and still, it has not been able to turn off a single coal-fired plant.