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Air Power

Don Quixote tilted at windmills. We can use them to increase our energy supply.

By Pete du Pont

Where does America get its electrical power, the annual four billion megawatt-hours of electricity consumed by our industries, cities, transportation, hospitals, homes and personal needs? Coal plants provide 51% of the nation's electrical energy; nuclear power 21%, natural gas 16%, oil 3% and renewable resources 9%, most of which is hydropower.

And where do the electrical sector's carbon dioxide emissions come from? About 82% from burning coal, 13% from natural gas, 3% from petroleum, and none at all from nuclear power plants.

So if additional electrical power were needed in a community, as it is in Delaware's growing coastal Sussex County, what kind of a power generation facility should be built? Nuclear is politically untenable, especially with a plant across the river, in New Jersey, so two traditional proposals have been submitted, one for a 177-megawatt gas turbine at an existing energy facility, and another for a new 600-megawatt coal-fired plant.

And then came a third proposal: construction off the Delaware coast of 200 wind turbines that would generate 600 megawatts of electrical power.

Wind power is global, clean and environmentally safe. Germany has 18,000 wind turbines generating electricity; Denmark has 5,300; and America has more than 20,000 wind turbines, which in 2006 produced less than 1% of our electricity--26 million megawatt-hours.

Unlike Europe, where many turbines are offshore in the ocean, our wind turbines are all on land. But two years ago a proposal was advanced to build 130 turbines in the waters of Nantucket Sound. It was opposed by environmental lawyer and activist Robert F. Kennedy Jr., who complained that they would "damage the views from 16 historic sites," including the Kennedy compound at Hyannis, Mass. In March the project was deemed in compliance with the Massachusetts Environmental Policy Act, but the argument over whether to build it will go on for some time.

Depending on the site selected, Delaware's 200 turbines would be 12 or 17 miles off the coast, and although very large--extending 256 feet in the air with 163 foot blades that would further extend their height to 400 feet at the top of their spin--they would be seen as only pinpoints on the horizon. They wouldn't be built in the shipping lanes or have a negative impact on the fishing industry or marine life. They are estimated to produce enough electricity to supply 130,000 homes, and would be pollution-free--no oil, coal, no natural gas is needed to make them run, so they would generate no CO2, particulates, or pollutants of any kind.

But wind turbine electrical generation faces one serious

challenge: inconsistent supply. Wind velocity is highly variable, and so the electricity generated by the turbines is highly variable too. As the Tennessee Valley Association pointed out in 2002, wind-speed variations can be extreme, "from less than 10 mph to more than 35 mph within a single second, and bursts of up to 70 to 100 miles per hour." Such wind fluctuations will cause equally unpredictable levels of electricity generation, from surges of 160 megawatts in high winds to no juice at all when the air is calm.

Offshore wind turbines in Europe illustrate the problem. They start generating electricity when the wind speed reaches nine miles per hour, and have to shut down if it exceeds 55 mph. They generate electricity somewhere between 70% and 90% of the time, but in lower wind speeds much less than their capacity. According to an analysis by Denmark's Incoteco energy consulting firm, in 2002 there were 54 days in western Denmark on which the wind power systems "supplied less than 1% of demand." For the whole week of Feb. 13 through 20, 2003, there was no offshore breeze so "virtually no wind power was generated in West Denmark." And for two days in March wind power electrical output exceeded power consumption for only two hours, between 2 and 4 a.m. one of those days.

Wind power systems are also less efficient than other power sources. Because of wind speed changes, turbines cannot generate over time more than about 30% of their capacity. For half the days in Germany in 2004, wind plant output was less than 11% of rated capacity; in California at the time of peak demand in July 2006, turbines generated 10% of capacity, and Texas generates about 17%. In contrast, coal and natural gas plants generate at a little better than 70% of capacity, and nuclear plants at more than 90%.

If our electricity was generated only by wind turbines, such inefficiencies and variability in the electrical power supply would be routine and entirely unacceptable. When we flip a switch we expect our home, hospital, business, transportation and communication systems to switch on, light up, heat up or cool down. Our electricity must be constantly and fully available.

So if we hook up to wind turbines for our electricity needs, where will our energy come from when the wind speed declines? Well, from traditional power sources--from the oil, coal, natural gas and nuclear plants that supply our current electrical needs. The electrical grid system that covers the area between New Jersey and North Carolina and west to Illinois--is the country's largest, connecting 1,271 electrical generation plants that supply our minute-by-minute, variable power needs. That grid would supply power when the wind speed drops or dies and the offshore turbines are unable to generate enough electricity, so the grid's plants cannot be replaced by wind power--we still need them.

So why, if we have to resort to traditional power sources when the wind dies, would we want to build wind turbines?

One reason is that they produce electricity with less pollutants than oil, coal, and natural gas fired plants. According to the Alliance to Save Energy, a 600-megawatt offshore wind farm would annually save the emission of 2.5 billion pounds of CO2, 29 million pounds of sulfur dioxide, and nine million pounds of nitrous oxide. But of course when the grid power kicks in to make up for a lack of wind, the coal, oil, and gas plants will emit their normal pollutants.

Another reason is the cost advantage of wind. Turbine wind power is too variable to be the base supply of our energy system, but it does generate electricity, and wind is free.

Four hundred years ago Don Quixote tilted at windmills because he believed them to be ferocious giants. Today they are proving to be far less threatening, and indeed helpful in addressing our energy challenges.

Mr. du Pont, a former governor of Delaware, is chairman of the Dallas-based National Center for Policy Analysis. His column appears once a month.