Energy 104 – Wind Turbines

Prof. Ken Johnson

In a previous episode, the subject of wind turbines was briefly discussed. They could be considered in an 'esoteric' class because of their various disadvantages, primary among them is the lack of reliability, i. e., if the winds don't blow or they blow too fast, there is no electricity. Actually, there isn't much to discuss, because massive increases in government spending on wind power is pretty much a done deal . . . with a lot of credit (?) to Boone Pickens, who has lots of windy land down Texas way, just waiting for someone to give him a return on his investment. Along with the wind he is selling, those lands also have lots of natural gas, which he is promoting as the transportation fuel of the future, but actually many large cities have been using it for many years for public transportation and city vehicles. All in all, wind power is like a giant cotton ball rolling downhill, and neither reason nor argument will stop it. One can bury his fist in it up to the shoulder, but it just keeps on rolling. It is like Global Warming from atmospheric CO2 . . . after all the evidence proving it was a scam and Climategate identified the scammers, Congress is still going to try to pass a bill to condemn fossil fuels and tax them out of existence . . . along with many other useful products that contain CO2 or use it in their manufacturing.

Economically, wind is thought to be free energy, but as my old Daddy used to say, "Nothing in this world is free". I don't have anything against the concept. Some of my farming relatives in Missouri had windmills generating electricity for personal use nearly a century ago. Those were largely eliminated because of the Tennessee Valley Authority (TVA) and Rural Electric Associations (REAs), which put the US Government into the electricity business, where they were selling it as low as 10% of what it cost to produce, the rest being paid for by taxes in one of President F. D. Roosevelt's Socialistic style programs.

The most successful and common use of wind power in the U. S. has actually been pumping water from under ground to water livestock. The livestock industry would probably look very different and the meat prices much higher if it were not for the hundreds of thousands of still functioning windmill driven water well pumps spread out across the nation, almost all privately owned.

The farmer's electricity producing windmills provided power for lighting the house, barn, and the barnyard. Using equipment with 'Universal' AC/DC motors, gave the

ability to operate some appliances and food processing equipment. They were limited to the generator power rating and using the electricity when the wind was blowing . . . until some entrepreneur came up with the idea of using storage batteries. These became very popular and were of the lead/acid type. The casings were rectangular, cast of thick glass, about the size of a beer six-pack, and with the plates and electrodes mounted on a phenolic cover. Keeping their liquid levels up with distilled water, and charged (from the windmills), were additional farm chores, but they eliminated dependence on the wind blowing when the family wanted to do their evening Bible reading, letter writing, or work on the farm accounts. If there hadn't been wind for several days and the batteries were dead, they had to rely on fossil fueled (kerosene or benzene) lamps to provide their early morning and late evening lighting . . . as many of us do now when our electric power fails.

Most windmills for electric power generation are driven by 2 or 3 bladed airplane-like propellers, whereas the water pumping windmills are fashioned of many large vanes, all fastened together, set at an angle, in a circle around and perpendicular to the drive shaft. There is a trend, for small electric 'vertical' windmills, toward a smaller, less dangerous design of the rotary element. Their rotor is like a modified 'squirrel cage' centrifugal fan rotor, which is shaped like the old fashioned water wheels, with the vanes mounted parallel to the shaft between two disks and the wind is directed to the outer edge, creating a torque on the vertical shaft, driving the generator. There are several companies making them in different sizes for small businesses or private home use. You might be able to find them on the Net by searching for "Jay Leno wind turbine". He bought some for his car museum. If you get the one where Ken Johnson is the turbine salesman and you are curious, no, I am <u>not</u> that Ken Johnson.

There is one more consideration that I think should be made about wind turbines, i. e., their direction of rotation. Several years ago NASA concentrated on a study to determine the source and nature of Atlantic hurricanes. The study showed they are probably 'bred' as small counterclockwise (CCW) (viewed from above) 'Coriolis vortices' [water spirals CCW down the drain in the northern hemisphere and clockwise (CW) in the Southern Hemisphere] as the winds moved down the western slopes of a mountain range in West Africa. They are then carried over the Atlantic where many merge together and pick up thermal energy, which gets transformed to rotational kinetic energy. If the temperature gradient is right, they continue to grow and merge together to become giant hurricanes, all spinning in a counterclockwise direction. I believe a similar thing happens in the Southwestern US. In the Spring, the prevailing westerly winds, approaching the West Coast, change from the Winter pattern of being from the northwest to the Summer pattern of blowing from the southwest over the south end of the mountains in southern Texas and northern Mexico. They create small vortices as they move down those eastern mountain slopes, which gain energy as they travel over the hot deserts and plains, winding up as tornados in the Midwest. My belief is these small CCW tornado 'seeds' are also generated by two cars passing each other at high speeds on a two lane highway . . . which means if true, we would have fewer tornados if we all drove on the left side of the road . . . plausible? Then think about a hundred 5 MW wind turbines in the Southwest, turning in the same direction so as to form thousands of CCW tornado seeds. Of course, if we built them to turn in the direction to generate thousands of

strong CW vortices, they would tend to cancel any existing CCWs and we should have fewer tornados. Again, plausible?

How does the cost of electrical power from wind turbines compare to that supplied from other means? US News recently worked up a comparison of the cost of producing electricity by various systems, and some are shown below:

EXPECTED COSTS OF PRODUCING

ELECTRICAL POWER

$ PER MW-Hr.

(Before Subsidies)

Method	High	Low	Likely
Ocean Wave Action	510	260	380
Solar PV, Crystal Silicon	420	210	290
Solar PV, Thin-Film	290	160	210
Wind, Off Shore	250	130	160*
Biomass	210	70	100
Wind, On Shore	110	60	90*
Geothermal	80	50	75
Gas, Landfill	90	45	60
Gas, Natural	--	--	55*
Coal	--	--	55*

Looking at these from the standpoint of viability, there are some things to consider other than price because the present government regime's approach seems to be 'price is no object'. The higher price the better, because it justifies raising subsidy taxes more.

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