The Balance of Energy

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Once again wind farms are in the news, especially here in Florida where the legislature has banned them. Most of the arguments and positions taken on wind farms are emotional, environmental, or aesthetic. But how do we find the truth?

If we can let go of the emotions and conduct a proper analysis, the answer is rather straight forward. I need to make this simple, so please bear with me.

Consider that, in constructing a single wind turbine, there are energy costs. Materials must be mined, refined, shipped, and prepared for the manufacturing process. There are energy costs involved in each of those steps. I left out the energy costs of Research and Development, but for a complete analysis they too ought to be considered. Doing so, however, is nearly impossible because that cost is distributed over each unit installed.

Once manufactured, the components must be shipped to the installation site, incurring more energy cost. To that, we must add the costs of erecting the tower itself. And let us not forget the energy cost incurred during permitting and obtaining public acceptance, but, again, those are distributed over many towers. Once installed, there is an energy cost associated with connecting the tower to the grid.

That pretty much outlines the cost in energy to erect the tower. Now we need to look at the other side of the equation. Once installed, the tower will generate electricity. It is clear to see that on the first day, the energy generated could not possibly equal the energy cost that was required to manufacture and install the tower. The time factor must now be considered. If, on each day in operation, the tower produced a certain average quantity of energy, the question becomes, "How many days does it take for the amount of energy produced to exceed the energy cost of constructing the tower?" Of course, we will also need to add in the energy cost of maintenance, but there are no reliable data or even estimates on that.

Right now, that's where we get into trouble. There is no reliable estimate of how long the tower will be functional. On year? Ten years? Twenty years?

The bottom line in any of the energy production methods is when, if ever, will the energy produced exceed the energy cost of construction and maintenance of the method used. I offer Hoover Dam as an example of a method that may have met this criterion.

But then, we go back to environmental, emotional, and aesthetics. Nonetheless, the critical metric is the balance of energy needed to produce the energy and the resulting energy produced.