The Motley Fool

2 Charts Show Why Wind Power Won't Solve the Carbon Problem

By Reuben Brewer | More Articles
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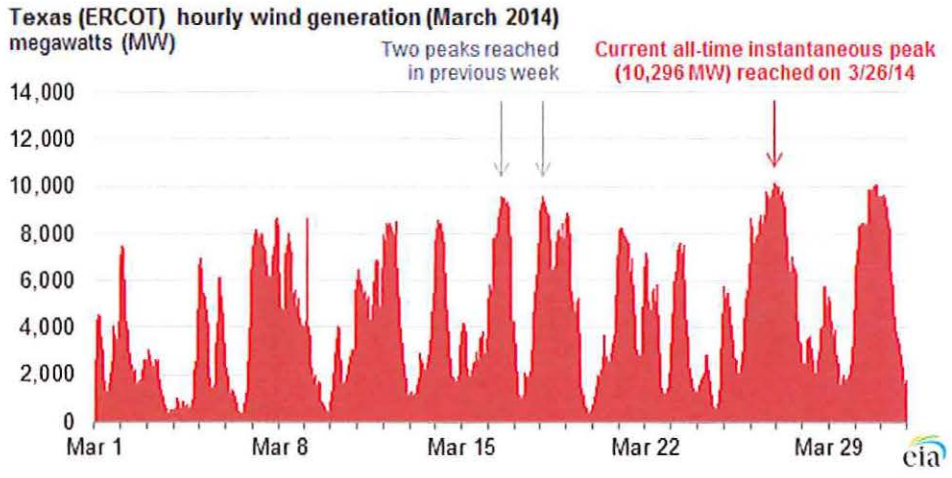
When discussing electricity, the words "carbon dioxide" invariably come into play. The utility industry's use of carbon based fuels is responsible for roughly 40% of the generation of this greenhouse gas domestically. Alternative power options are often held up as the solution to this problem. But wind turbines are a great example of why this isn't true—and these two graphs show why.

Getting into wind

Xcel Energy (NYSE: XEL) has made a big commitment to wind power. This mid-western utility got just 3% of its power from wind in 2005, which happens to be the backdated starting date for CO2 emission regulations being proposed by the Environmental Protection Agency (EPA). By 2020, however, wind is projected to make up 22% of the company's generation.

That's a huge increase, with coal taking most of the hit. However, even after the rapid wind power growth coal will still account for 43% of Xcel Energy's power pie. Natural gas, which is cleaner than coal but still emits carbon dioxide, and nuclear power will throw in another 30%. And the Texas experience with wind power shows why:



Source: EIA

According to the Energy Information Administration (EIA), "At 8:48 p.m. on March 26, wind generation on the electric grid covering most of the state of Texas reached a new instantaneous peak output of 10,296 megawatts (MW). At that moment, wind supplied almost 29% of total electricity load." While that's impressive, note the use of the word "instantaneous" as you look at the graph above.

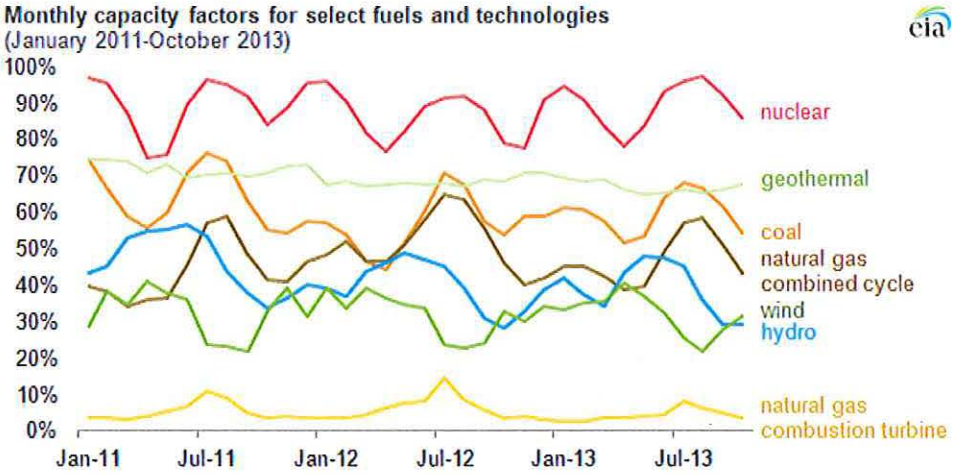
The power generated by wind turbines is anything but constant. It juts up and down with often severe moves. For example, before and after hitting that peak, wind turbines in Texas were only producing around 2,000 MW of power. It's not because someone in Texas turned the turbines off, it's because the wind stopped blowing. That's why Xcel Energy isn't giving up on the base-load trio of coal, gas, and nuclear.

Note on variability

Witness Exhibit No 49
Date 9-4-14 Reporter
File No EA-2014-0207
Hamilton, MO

This trio is controlled by the utility and can be run as hard as needed. Nuclear, for example, is usually run between 80% and 100% of capacity. Coal and natural gas tend to run at lower levels, but could easily be pushed higher if needed. The important thing is that how hard these power sources are worked is within the control of the utility.

In fact, the next graphic shows how important the interplay between nature-controlled wind and man-controlled power is. Look at the lines for wind and coal. When wind is up, coal is down. And when wind is down, coal is up. The same dynamic is true for natural gas.



Note on capacity factors

Source: EIA

This isn't a fluke -- it's because utilities like Excel need to have a reliable power source to offset the peaks and valleys of an inherently unreliable fuel source. It's the same reason why **Southern Company** (NYSE: SO) is building 1.5 gigawatts of nuclear and coal plants right now. It wants to maintain its flexibility.

For example, in 2020, the company expects to have the option to generate as much as 50% of its power from coal or gas, whichever is cheaper. Nuclear, meanwhile, is expected to run at a steady state of around 18%. Renewables? Well, they are just small slice of the pie at 8% of total capacity in 2020.

Note, however, that renewable sources provided 4% of Southern Company's power last year, despite coming in at 6% of the utility's total capacity. And the 4% is elevated by the fact that hydro, which tends to run at high capacity rates, is a big part of the mix. Despite investing in solar and wind, Southern Company isn't willing to give up the control offered by natural gas, coal, and nuclear power plants.

Good and bad

Renewable power like wind turbines is a wonderful thing. However, it isn't an answer to the CO2 problem. The generation profiles of Xcel energy and Southern Company prove this out. Expect the wind to become an increasingly important utility player, but don't expect it to kill coal, gas, or nuclear anytime soon.

Reuben Brewer has no position in any stocks mentioned. The Motley Fool

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Comments from our Foolish Readers

On July 14, 2014, at 8:04 PM, PeakOilBill wrote:

> Fossil fuels are FINITE and have many uses, other than electricity production. Uranium is finite too, but has only one other main use, making atomic bombs. You don't need to be Elon Musk to figure out that you use the uranium to generate as much electricity as you can, and conserve the fossil fuels as much as possible for other critical uses, which only they can accomplish, like moving things around, making millions of chemicals, covering your roof, and paving roads.

On July 14, 2014, at 8:40 PM, HannibalKhan wrote:

> I believe the problem with these wind generators is in the design. They are nothing more than airplane propellers which are very inefficient as wind generators go. If there is no wind, no power generation. If the wind is too strong, the wind generators have to shut down. Also, they don't have to be 200 feet tall. Properly designed, a wind generator can operate very efficiently are ground level. Back to the drawing board boys. You don't have it right!

On July 15, 2014, at 12:06 AM, AnnGrewe wrote:

> You're right - wind power won't solve the carbon problem by itself. It will take all the "green" forms of energy. Moving investments away from big oil & gas, nuclear & coal utilities and into solar, wind, tidal energy, wave energy, ocean thermal, hydroelectric, hydrokinetic power (i.e., flowing water), geothermal electric, municipal solid waste, anaerobic digestion, landfill gas, and biomass technologies makes a statement - and provides a nice rate of return. That's been our experience from having 26 solar panels put up on the south-facing roof of our Florida house while "putting our money where our mouth is". We weren't expecting it to become a good investment - but it has!

On July 15, 2014, at 12:18 AM, sypoth wrote:

> First off, Wind still generates more power than Solar at this stage in the game, although the turbine style generators are not in wide spread use despite their massive superiority edge. Second Off, and yes this is in my field of expertise, atmospheric levels of Carbon Dioxide are not significantly higher than they were forty or even fifty years ago, if they were the range of oxygen absorption for healthy lung function would have changed since then, which it hasn't and yes the level of CO2 in the atmosphere does affect O2 absorption in the lungs as was observed with literally any volcanic eruption where they had to go in and do a medical check on people lungs, like Mt. St. Helen's.

On July 15, 2014, at 3:58 AM, guber wrote:

> Well, if you know a bit about wind power, you know that this local chart says absoultely nohing, as much as a chart from a single conventional power station showing that this one does not deliver power for some weeks per year due to maintenance and repair - which like everybody knows does not proof that a reliable power supply with conventional power stations is impossible.
>
> Wind power must be distributed over large areas, like there are several power stations in a net neccessary to create a reliable power supply.
>
> Each area of about 1000 km in diameter behaves like a conventiolnal power station in a usual net. Given there are enough of them - 10 in the US alone, about 20 in north amerika - there are always enough areas which deliver power to produce a constant supply. There are diagrams which calculate this distributed constant supply over large areas, and the random part of the power production becomes very, very small in large areas. And todays High voltage Systems, especcially HVDC allows to transport theis Power to the places where it is needed, with low losses. In china today there is a single HVDC.-System transporting 10 GW of Power over 2400km of distance. So there is no real problem to supply NewYork from texas at one day, and Texas from New York the other