Critique of NREL's 20% Wind by 2030

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Just so you don't think I'm making up the up my claim that the CO2 savings numbers are questionable, I present the following example. I wasn't even looking for it, but it popped up and it seemed egregious enough to maybe get someone's attention. Make no mistake, this is typical of wind proponent claims and can be found any time you look at their literature. You'd expect the wind energy industry associations to stretch the truth, but sadly the government seems oddly uncritical of their methodology.

NREL (the U.S. National Renewable Energy Lab, at nrel.gov) is part of the DOE. They published a large (9mb!) detailed paper titled http://www.nrel.gov/docs/fy08osti/41869.pdf , *20% Wind Energy by 2030*, that has been widely used by wind proponents as an authoritative report. Part of this paper, not surprisingly, covers the benefits of implementing this plan. One of those benefits is, again not surprisingly, a reduction of CO2 emissions. They present numbers for how much this plan saves, into the billions of pounds.

Where do these numbers come from? You might assume, given that this report was published by a government laboratory filled with very smart people, they would certainly have all this figured out. Right? Certainly they can calculate the number of mw-hr's the turbines will have to generate, and then multiply that number by the CO2 savings per mw-hr to come up with a number for how much CO2 emissions they've prevented. But where did the savings number per mw-hr come from?

I'd been looking for a reality-based number for a very long time, and I thought maybe this was it. Their answer is on page 107, in the side box, where they state that a single 1.5mw turbine will save 2700 tons of CO2 per year. And where does this number come from? Surprisingly, the source is the AWEA (American Wind Energy Association) which is a wind energy industry organization. So apparently all those smart people can't come up with their own number. The term "regulatory capture" comes to mind.

Obviously the AWEA is going to present the highest number that can reasonably be defended. So off we go to AWEA's web site to see where they got their numbers. I checked their calculations (backing out the amount of kw-hr's their example turbine generates each year given their savings) and it looks like they assumed the turbine operated at about 27% utilization for the year.

A quick calculation of NREL's 2700 tons then looks like this. In one year, at 100% capacity, a 1.5mw turbine will generate 1,500 * 24 * 365 = 13,140,000kw-hr of electricity. Assuming the same 27% from above (BTW, Germany averages

about 20%, Denmark is in the teens) it generates 3,547,800kw-hr.   If each kw-hr displaces 1.52 lb of CO2 (as stated elsewhere in the AWEA link above), that gives 2696 tons, which is close enough to 2700. So we can feel confident this really is where the NREL's number came from.

Finally (whew!) to the critical point. Where did the 1.52 lb come from? Well, that's just the average calculated emissions generated for every kw-hr from our mix of nuclear, gas, coal and so on. It was not produced as the result of any measurements on any grid. This is what I term "direct displacement", where every kw-hr generated by wind is assumed to entirely replace the emissions resulting from the production of a kw-hr by fossil fuels. There's no allowance for maintaining spinning reserve nor running plants below their most efficient range, and the emissions that are generated maintaining a balance for erratic wind could be significant. Nor is there any allowance for energy consumed by the turbines, which could also be significant. If all this is foreign to you, I go into more details about CO2 issues on my http://windfarmrealities.org web site. Peter Lang has made a more diligent effort at: http://windfarmrealities.org/wfr-docs/Lang_WindGasEmissions.pdf to figure out the real number and he comes up with an answer of 0.128 lb (converted from metric, in the middle of page 8), which is far far below the 1.52 figure sited earlier. What's the real number? Nobody knows, it seems, as a real-life study has never been done. Or at least - not published.

As an aside, the AWEA based their savings on the efficiency of a 750kw turbine in a "class 4" wind at 10m above ground, which NREL essentially just doubled to get their number for a 1500kw turbine. This ignores the fact that a class 4 wind is somewhat stronger at 80m above ground, where the larger turbine would operate. If one accepts NREL's class 4 situation their efficiency should be even greater than 27% and the CO2 savings should be even higher than it is. So even their stated methodology has some problems. All in all, not a very impressive demonstration of technical proficiency. And this from all those Ph.D.'s.

Lazy, lazy.