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Is There Really Enough Offshore Wind Power To Replace Coal?

Sure ... If you can imagine building 3,540 new East Coast offshore wind farms the size of the world's largest project.

Factcheck.org is one of The Daily Green's trusted sources of information. Here's one of its latest, all about those alarming emails we've been getting about the supposed death of organic farming and gardening at the hands of HR. 875: The Food Safety Modernization Act. It's republished with permission.

Is there really enough wind power to replace coal as the nation's main source of electric power?

Don't expect wind power to replace coal as the nation's main source of electric power, whatever Obama's interior secretary said.

Interior Secretary Salazar said that the amount of "developable" wind power off the East Coast could produce more energy than all the coal-fired electric plants in the U.S., and that wind's potential to replace most of our coal power "is a very real possibility." We find his claims to be wildly optimistic, to say the least.

It's true that government studies show there's enough offshore wind to generate far more than coal plans currently do – in theory. But converting that wind to enough electricity to replace what's now produced by coal won't happen anytime in the foreseeable future. The Interior Department itself made clear its offshore wind estimate was a gross figure of potential resources only, saying in a report that there are several obstacles to achieving that.

We calculate that converting wind to enough electricity to replace all U.S. coal-fired plants would require building 3,540 offshore wind farms as big as the world's largest, which is off the coast of Denmark. So far the U.S. has built exactly zero offshore wind farms.

Another government study last year concluded that to supply just 20 percent of U.S. electricity with wind turbines would require land-based equipment taking up an area "slightly less than the area of Rhode Island," plus scores of offshore wind farms.

A Salazar spokesman says the secretary did not mean to say that replacing coal power with offshore wind power was a realistic goal, but was only trying to draw attention to its potential.

At a public hearing in Atlantic City, N.J., on Monday, Interior Secretary Ken Salazar said that wind turbine installations off the East Coast could generate 1 million megawatts (1,000 gigawatts) of energy, enough to replace 3,000 coal plants. The Associated Press quoted Salazar claiming that wind power could replace most of

the coal power in the United States. The AP account was syndicated in papers across the country. Salazar's department says that he never implied that wind power would be immediately or even eventually capable of replacing fossil fuels. What did Salazar actually say? And is replacing coal power with wind power really plausible?

What Salazar Said

Here's what Salazar said at the hearing, a public discussion of the offshore energy potential of the Outer Continental Shelf.

> **Salazar, April 6, 2009:** According to our report there is over 1,000 gigawatts of power, that's a million megawatts of power, that are developable off the Atlantic coast. You think about that, put it in the context of what it means, with respect to an analogy to, or a comparison to coal-fired power plants, it's the equivalent of the amount of energy that would be produced from about 3,000 medium-sized coal-fired power plants. That's a tremendous amount of energy that's out there in the Atlantic.

The AP also quoted Salazar as saying:

> **Salazar, April 6, 2009:** The idea that wind energy has the potential to replace most of our coal-burning power today is a very real possibility. ... It is not technology that is pie-in-the sky; it is here and now.

According to the AP's reporter, Wayne Parry, Salazar made the "here and now" claim in remarks to reporters, not during his public remarks on camera.

DOI spokesman Frank Quimby says of Salazar's 3,000 coal plant claim: "He was using it as a metric, as a frame of reference," not as realistic goal-setting. Salazar "has said many, many times that we're going to need conventional fossil fuels ... for the foreseeable future."

But we find that Salazar's claim that a million megawatts of offshore wind power is "developable" and that replacing coal with wind power is "a very real possibility" are far-fetched propositions.

A Mighty Wind

The report to which Salazar refers in his remarks is a recently released Department of the Interior publication that reviewed the available research on resources from the Outer Continental Shelf. In contrast to Salazar's enthusiastic description, the report itself is sober about the challenges involved.

So what would it really take to replace coal with wind? Salazar is correct to say that there is evidence that winds along the East Coast offer a potential 1,000 gigawatts of energy production. The DOI report showed a potential 1,024 gigawatts from that area, based on information from the National Renewable Energy Laboratory. And if power plants with 1,000 gigawatts of capacity were running at full power 100 percent of the time, they could theoretically generate 8.8 million gigawatt hours of energy a year, more than twice as much as the entire United States 2008 electricity production. Of course, the wind doesn't blow all the time and so wind turbines don't operate at peak capacity all the time, either. But even if they ran at an average of 40 percent capacity, the DOE's base assumption for offshore wind, the plants could in theory generate enough energy to replace coal and most other electricity sources as well.

That's the theory. In reality, some backup source of power would still be required for those times when winds were not producing enough. Jonathan Cogan of the Department of Energy told us: "You couldn't really, just by themselves, replace a steady baseload supply like coal-fired or nuclear plants with an intermittent supply" such as wind turbines.

And in any case, a number of factors stand in the way of achieving the full 1,000-gigawatt potential. For one thing, Interior report shows that 75 percent of the wind energy is far offshore and would require development

in waters of greater than 30 meters in depth, which the report finds too deep for economically and technologically feasible turbines. DOI shows only 253 gigawatts of energy resource potential from turbines off the East Coast in shallower water. And as the report points out, that still doesn't "account for other competing uses of the ocean that may conflict with offshore wind development."

NIMBY Power

So far no offshore wind farms have been built in U.S. waters, even in shallow water. Turning "potential" offshore wind energy into real electricity requires overcoming huge practical problems including the NIMBY ("Not In My Back Yard") factor. In a celebrated case, Cape Wind Associates is proposing to build 130 wind turbines on Horseshoe Shoal in Nantucket Sound, off Cape Cod. The project would occupy 25 square miles of ocean and come within 5.6 miles of Cotuit, near Hyannis. On a clear day, the 258-foot-tall towers (with blades reaching as high as 440 feet, taller than the 305-foot Statue of Liberty) would be visible on the horizon.

Opponents complain of "aesthetic pollution" and raise other objections on their "Save Our Sound" Web site. Project foes include former Gov. Mitt Romney and Sen. Ted Kennedy, who would be able to see the wind farm on the horizon from his family's Hyannis compound (as in the simulated photo view from Hyannis Port at left, which was commissioned by Wind Power Associates for a federally required environmental review.) Former CBS News anchor Walter Cronkite, a longtime yachtsman, appeared in a TV commercial opposing the project, though he withdrew his opposition in 2003.

The project has been in the works for years, and plans were first made public in 2001. It now has the support of the current governor, Deval Patrick, and in January it cleared a major regulatory hurdle when the Interior Department's Minerals Management Service concluded that it would have little lasting impact on wildlife, tourism or navigation. But according to the Boston Globe, the project still lacks nine state and local permits. Meanwhile opponents are fighting on, including local Native American tribes who say they are "spiritually connected" to Nantucket Sound and that the project would desecrate a "sacred site." Nevertheless, Cape Wind says it expects to begin construction next year. Its maximum expected production will be 454 megawatts an hour, but Cape Wind says it expects the actual average to be 170 megawatts.

If that's the case, it would take more than 1,300 such projects to equal the current annual output of all U.S. coal-fired electric plants.

There Goes Rhode Island

Another way to look at the practical problem of locating wind turbines is given in a Department of Energy report from last May. It concluded that to produce enough wind power to satisfy only 20 percent of U.S. demand (less than half of what coal plants fulfill) would require land-based turbines and related infrastructure that would take up an area "slightly less than the area of Rhode Island."

And in addition to those land-based plants, the 20 percent goal would require another 54 gigawatts of wind turbine capacity in offshore, shallow-water wind farms. That's the equivalent of 119 wind farms the size of the proposed Nantucket Sound facility.

DOE found that the goal of producing 20 percent of U.S. electric power from the wind – by the year 2030 – "could be feasible if the significant challenges identified in this report are overcome." Those challenges include limits on turbine performance and high initial costs of installation.

A Quarter-Million Turbines?

But what would it take to go beyond 20 percent, and replace all the coal-fired plants that now account for nearly half the nation's electricity? And to do that using only wind farms in waters off the U.S. East Coast?

The highest-producing offshore wind turbine installation in operation, Nysted Wind Farm in Denmark, has 72 turbines and a capacity of 165.6 megawatts an hour. Assuming that 40 percent of that capacity can actually

be realized, we figure those turbines put out an average of about 66 megawatts an hour. Producing enough power to account for all of what is now put out by coal-fired plants in the U.S. would require 3,540 installations of that size, comprising well over 250,000 individual turbines.

Bigger wind farms are on the way. Planned projects like the 95-square-mile London Array could have capacities closer to 1,000 megawatts, with perhaps a 400-megawatt per hour output. But it would take 569 farms the size of the London Array to equal the output of all U.S. coal plants.

— Jess Henig, with Brooks Jackson
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