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The Op/Ed Page for Virginia's New Economy

Wind Shear

Virginia is an energy-rich state, and the mother lode sits off the coast. Electric power generated by off-shore wind turbines could slice our dependence on polluting fossil fuels within a decade or two.

By James A. Bacon

Outside the coalfields of the far southwest, Virginia has never been regarded as an energy-rich state. The oil and gas reserves off the coast have generated some attention recently, but the biggest treasure trove of energy may be not what lies beneath the surface but what blows above.

According to a team of Virginia Tech researchers, the continental shelf off Virginia is an ideal location to harness the power of wind to generate electricity. "It's better than Cape Cod," site of a widely publicized effort to build a wind farm, says Saifur Rahman, an electrical engineering professor with Tech's Advanced Research Institute in Arlington. "It's one of the best locations on the East Coast."

Several miles off Virginia's coast the winds are strong and reliable -- classified as Class 5 and Class 6 winds, ideal for power generation. The water is relatively shallow, so installing wind turbines would not encounter formidable engineering challenges. Turbines could be located far enough off-shore that they'd be invisible from the beach resorts on a hazy summer day. And Virginia is situated far enough north that wind farms would be rarely threatened by hurricanes.

Using technology and engineering already being implemented in Europe, a wind farm with a footprint the size of Virginia Beach -- about three percent of Virginia's continental shelf -- could supply the equivalent of 20 percent of the Commonwealth's current electricity needs. "People don't think of Virginia as a windy state," says Rahman. And it's not -- on land. "But we have very good wind off-shore."



Wind turbines located off the coast of Arklow, Ireland.

George Hagerman, an electrical engineering professor and colleague of Rahman, envisions wind power forming the basis of a sizeable new industry in Hampton Roads. Not only would operating the wind farms constitute a formidable business opportunity, so would fabrication and installation of the off-shore

turbines -- an activity that would seem to be well suited to the region's ship building and repair industry.

Off-shore wind farms would sidestep the environmental problems posed by land-based farms, such as the controversial project in Highland County. If located 12 nautical miles off-shore, the turbines would appear as barely visible flecks on the horizon. You'd have to be sitting on the roof of the Ramada Hotel with a binoculars, quips Hagerman -- and even then, you'd have to know where to look.

Furthermore, the turbines would be located well away from the migratory paths of ducks, geese and other birds, which stick to the marshlands during their flights. Declares Hagerman: "It's a win-win-win."

Just as Texas was endowed by nature with large reservoirs of oil, Tech researchers contend, the Mid-Atlantic is meteorologically blessed -- by the contour of its coastline, the veering off of the Gulf Stream and other factors that affect the velocity and regularity of wind. But the optimistic appraisal of Virginia's wind resources is based on an extension of land-based computer models that can break down 20 or 30 miles offshore. The quality of data is not yet good enough for someone to build a business case for investing. "We need to find out the distribution of the wind source, how it varies over time," Hagerman says.

The next phase of research is to compile and integrate several



The Mid-Atlantic coastline offers the greatest opportunity on the East Coast for wind-powered electric generation.

The purple band indicates Class 5 power density and the red Class 6. Virginia does have Class 5 and 6 power densities on land but, limited to ridge lines of major mountain chains, they appear as no more than pinpricks on the map.

Map: courtesy of Virginia Tech Advanced Research Institute.

large bodies of data in order to confirm or disprove the computer models. The National Oceanic and Atmospheric Administration has collected a large body of weather data. So has the Army Corps of Engineers during its work rebuilding the beaches in Virginia Beach. There are other data sets collected by airports and lighthouses. "Someone needs to take ownership of it," says Hagerman. "The data was done for different purposes. We need to rework it."

And that's a bit of a problem. There are no readily available funds to underwrite such a project. It's not "researchy" enough, says Hagerman. He's hoping that the state of Virginia will recognize the economic development potential and decide to underwrite the research.

If further research confirms the computer models, Hagerman expects development of Virginia's wind potential to occur in phases -- maybe blocks of 300 to 350 megawatts of wind turbines at a time. (That compares to 1,000 megawatts for a typical coal-fired power plant.) Clusters of turbines would be stationed several miles offshore where they would be all but invisible to tourists frolicking in the surf --

yet close enough to constitute a tour boat attraction.

The electric power would run through buried cables. No ugly transmission lines to fuss about. Buried cable is a must to protect against waves, currents, dragging anchors, trawling gear, currents and, yes, even shark bites, Hagerman says. "The cable would only see the light of day at a sub-station near shore, where it would connect to the grid."

A decade or two from now Virginia may find wind turbines co-existing miles offshore with oil and gas-drilling platforms, assuming the concerns of regulators and environmentalists can be met. Looking two or three decades ahead, Hagerman foresees the potential to develop other off-shore energy resources in a synergistic system.

Wave energy has reached the same point where wind energy was in the 1980s, Hagerman says. The first wave-energy pilot plants are just now being build - there's one off the coast of Portugal, for instance. Preliminary indications are that Virginia is a suitable location for wave energy. He speculates that it may be possible to build floating platforms that combine wind and

wave power-generation.

Experiments in the 1970s and '80s also demonstrated that kelp and algae can be converted can be farmed at sea, desalted, anaerobically digested and converted into natural gas, Hagerman says. A different process has been shown to convert single-celled diatoms into diesel fuel. All this, he suggests, could be performed in Virginia's offshore waters.

Says Hagerman: "With the right kind of roadmap and research supporting that roadmap, you could start with today's offshore wind technology, then down the road, go [into] deeper [waters], then add wave energy, then produce liquid fuels offshore. A super combination would be combining offshore wind and wave, which are intermittent, with liquid fuels from marine biomass, which could run a gas turbine -- all with one cable to the shore."

Hagerman's full-blown scenario may sound pie-in-the-sky, but the wind farms are not. The Europeans are pushing applications -- wind blades the size of Boeing 747s, wind farms miles offshore -- that once seemed unimaginable. The Germans, British, Spaniards and Scandinavian countries are moving aggressively, driving technological improvements, creating economies of scale and making wind-power increasingly competitive with fossil fuels. Forecasts call for Germany to nearly double its wind-farm capacity by 2030, with almost all of the growth coming from off-shore installations. The U.S. lags five to 10 years behind.

The Kaine administration is preparing a state energy policy to secure dependable and affordable supplies for Virginia's future. Wind-farms, once thought

to be a niche power source, clearly hold the potential to become a significant contributor to the Commonwealth's energy portfolio. If Virginia gets the jump on other states in opening up this non-polluting energy source, it also could become a center for the fabrication, installation and maintenance of maritime wind farms throughout North America.

"Virginia is in a position to become a national leader," says Hagerman. "Why not start now?"

-- **November 20, 2006**

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