

spotlight

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A WIND POWER PRIMER

Emission reduction negligible for land-intensive, unreliable, noisy, ugly bird-killing turbines

KEY FACTS: • Wind power is generated through large groups of massive industrial wind turbines, sometimes as tall as 50-story skyscrapers.

• Like the wind itself, wind power is intermittent and extremely unreliable. The wind must be strong enough, but not too strong, to generate power. So wind cannot be used for baseload generation nor to meet peak demand. For example, to avoid a blackout, a Texas grid manager recently had to cut off electricity to some customers, in large part due to a sudden drop in wind power.

• The National Academy of Sciences has reported that wind power would not significantly reduce emissions of nitrogen oxide or sulfur dioxide. Its impact on carbon dioxide emissions would be miniscule.

• Wind power would have no effect on energy independence. Electricity generation accounted for only 1.5 percent of all petroleum consumption in the United States. With respect to electricity, the U.S. already is energy independent.

• Wind power plants take up to 88 times more land than coal plants. To generate 1,000 MW of electricity would require acreage the size of Fayetteville, Raleigh, and Wilmington combined. Placed in the mountains, it would require 300 miles of ridgeline.

• Wind power plants have proven to be exceedingly deadly to wildlife, especially birds and bats, and the U.S. Government Accountability Office reports that recent efforts to mitigate bird and bat deaths have failed.

• The noise effects of wind power plants are potentially so severe to people that both the French National Academy of Medicine and the United Kingdom Noise Association recommended against building wind turbines within a mile of residences, at least until further research has been conducted.

• North Carolina's legislature should develop a "Coast Law" to prohibit the construction of industrial wind turbines on the coast. Both the coast and the mountains should be protected from this unreliable form of electricity that would permanently ruin local landscapes, harm wildlife, and pose potential health risks to residents.

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In 2007, the North Carolina legislature passed legislation, SB 3, which requires utility companies to generate 7.5 percent of their electricity through renewable energy sources (i.e., wind, solar, and biomass).¹ To meet this requirement, the North Carolina Utilities Commission’s consultant on renewable energy explained that wind energy would need to play a critical role.²

There have to be massive industrial wind turbines on the coast or in the mountains if wind power is going to be an option. Interestingly, legislators on the coast and in the mountains supported³ SB 3 even though their support helped guarantee that their districts would soon be pressured into allowing the construction of wind turbines.

As expected, groups representing the wind industry, utilities, and even the state government are holding meetings both at the coast and in the mountains to sell residents on wind power. This *Spotlight* is designed to give North Carolinians some easy-to-understand guidance on wind power and explain why the wind power sales pitch should be rejected.

Wind Power: The Basics

➤ *What are wind turbines?*

Wind turbines are massive industrial machines that can be as tall as 500 feet, or about the height of 50-story skyscrapers. They should not be confused with cute little Dutch windmills—there is nothing cute about wind turbines.

➤ *What are wind farms?*

“Wind farms” is a clever way to make wind power sound like a quaint source of energy. It is like calling a nuclear power plant a “neutron farm.” These power plants generally consist of numerous wind turbines. The amount of turbines depends on the power plant, but it is not uncommon to have about 25 to 50 turbines or more. One wind power plant in Texas has 421 wind turbines.⁴

Wind Power: Location Issues

➤ *Does North Carolina have suitable locations for wind turbines?*

The Southeast generally is a poor source for wind power—this is why only one state in the Southeast, Tennessee,⁵ has a wind power plant.

North Carolina, along with eight other states and the Southeastern Association of Regulatory Utility Commissioners, recently sent a letter to Congress opposing a federal renewable energy requirement, arguing:

The reality is that not all states are fortunate enough to have abundant traditional renewable energy resources, such as wind ... this is especially true in the Southeast and large parts of the Midwest.⁶

In North Carolina, wind turbines would have to be on the coast or in the mountains. The latest United States Department of Energy (DOE) research⁷ ranks the wind potential for an area on a scale of one to seven (seven being the best). The Utilities Commission’s renewable energy consultant, La Capra Associates, recommended a four or higher ranking, with three being the absolute minimum.⁸

Based on DOE maps, the North Carolina coast is not a strong location for wind turbines. There are some limited onshore coastal areas ranked as a three with some offshore locations and the Outer Banks being ranked as a four or

higher.⁹ However, according to La Capra Associates “[d]evelopable on-shore sites in the East are primarily Class 3 wind resource sites.”¹⁰

The mountains have some small areas that are ranked five or above.¹¹ As of now, the Mountain Ridge Protection Act¹² (Ridge Law) likely prohibits construction of wind turbines in the mountains. However, wind power proponents will try to chip away at any protections.

Both Duke Energy and Progress Energy rejected the idea of using wind power in their 2003 annual plans. Duke Energy stated “the levels of wind is not sufficiently high in the Carolinas.”¹³ Progress Energy, which ironically is involved with the wind power plant in Carteret County,¹⁴ argued:

The average wind speed in the southeast is below 14 miles per hour and is not sufficient for wind projects to be an economic alternative. ... Further, because wind is not dispatchable, it is not a suitable alternative for peaking duty. As a result, wind was eliminated from consideration as a potential resource to meet future generation needs.¹⁵

Wind Energy: Reliability and Production

☞ *Is wind power a reliable source of electricity generation?*

No, wind’s unreliable nature is the major reason why it is a poor source of electricity. Wind power does not provide baseload electricity generation, which is the regular and consistent electricity needed to meet constant demand.

Since wind is intermittent and variable, wind power also does not provide a dispatchable source of electricity to meet peak demand—it is not a source that can be called upon to meet excess demand for electricity. These weaknesses make other sources of electricity, such as coal, nuclear, and gas, far more valuable in meeting the demand for electricity.

Since wind power is so unreliable, there needs to be reliable backup electricity sources. These backup sources, such as natural gas plants, must be put in what is called “spinning standby mode.” When they are in standby mode, they still burn fuel and emit pollutants.

Richard Courtney, a well-known British energy expert, wrote in a 2006 report:

Wind farms mostly force power stations to operate more spinning standby. They provide negligible useful electricity and make negligible reduction to emissions from power generation. Indeed, a wind farm is the true source of emissions from a thermal power station operating spinning standby as spare capacity in support of the wind farm.¹⁶

In some of the following questions, the proposed wind power plant in Carteret County is used to illustrate some points regarding wind power. The plant would be relatively small and consist of three 1.5 MW (megawatts) wind turbines allegedly producing electricity to serve about 900 homes.

☞ *What would be the maximum capacity of the proposed Carteret County plant?*

This plant would be a 4.5 MW power plant. This means that the most electricity that can be produced at any given time would be 4.5 MW.

☞ *How much electricity would the wind power plant generate?*

Wind power plants do not generate electricity that comes even close to their maximum capacity. To generate electricity, there must be enough wind but not too much wind—the wind speed has to be just right. To be generous, the wind power plant may generate 30 percent of its capacity¹⁷ (about 1.5 MW).

☞ ***When wind power does generate electricity, does it provide necessary electricity to consumers?***

No. Since wind often generates electricity when it is not needed, much of the electricity is simply a surplus. For example, according to ABS Energy Research, a British research firm, “In 2004, wind accounted for 20 percent of total electricity production in Denmark but supplied only 6 percent of consumption, because it produced a surplus at periods of lowest demand.”¹⁸

☞ ***Would the proposed wind power plant provide electricity for 900 homes?***

It is true that the power plant may be able to generate enough electricity so that when all the electricity is added together, the total amount is equivalent to the amount of electricity used by 900 homes.

However, it is misleading to state that the proposed wind farm would produce electricity for 900 homes.¹⁹ It gives the impression that all 900 homes are relying exclusively on wind power. If those 900 homes did rely exclusively on wind power, the electricity there would be on and off all day.

☞ ***Does wind power pose risks to the electricity system?***

Yes. In fact, just recently, the Texas grid manager had to shut off power to some customers to avoid blackouts largely due to a sudden drop in wind power. According to a *Fort Worth Star-Telegram* article:

Kent Saathoff, vice president for system operations at ERCOT [Electric Reliability Council of Texas—the state’s grid manager], said Tuesday’s event illustrates the inherent challenges associated with using wind power. Because the wind sometimes stops blowing without a moment’s notice, engineers at ERCOT must remain nimble enough to respond to resulting instability on the grid, he said.²⁰

Wind Power: Little If Any Benefits

☞ ***Don’t we need a more diverse mix of electricity resources?***

First, in and of itself, greater electricity diversity is not a benefit. North Carolina, like all states, has no problem meeting its electricity needs. The state has both low-cost and reliable electricity, and there is no reason absent government intervention for that to change in the long term. If there were more diversity, it should come about as a result of market choices, not government mandates. When someone makes the diversity claim, he should be asked *why* is a more diverse mix necessary?

Presumably, “diverse mix” proponents believe that a more diverse mix of energy resources is necessary to reduce air pollution, reduce carbon dioxide emissions, or promote energy independence. The following questions address those concerns.

☞ ***Would wind power reduce emissions of nitrogen oxides and sulfur dioxide associated with high ozone levels, acid rain, and fine particles in the atmosphere?***

The National Academy of Sciences has stated that wind power would not significantly reduce these emissions, largely due to existing regulations on conventional sources of electricity.²¹

☞ ***Would wind power reduce carbon dioxide emissions?***

Applying the data used in the National Academy of Sciences study, carbon dioxide emissions by 2020 would only be

0.5 percent to 1.8 percent less than it otherwise would have been if not for wind power.²² In other words, there would be a miniscule difference in carbon dioxide emissions.

☞ ***Would wind power help reduce our dependence on foreign oil?***

There is a big difference between alternative energy when it comes to electricity (e.g., wind, solar, and biomass) and alternative energy when it comes to transportation (i.e., biofuels). Electricity generation simply does not require any meaningful amount of petroleum. In 2006, electricity generation accounted for only 1.5 percent of all petroleum consumption in the country.²³

In other words, alternative energy sources related to electricity generation, such as wind, play an insignificant role in energy independence. The United States already is energy independent when it comes to electricity generation.

The Costs of Wind Power: Land Use

☞ ***How much land does wind power require?***

According to the Nuclear Regulatory Commission, a coal plant that generates 1,000 MW of electricity (a large baseload generation plant) would require 1,700 acres. To produce the same amount of electricity with wind power, it would require 150,000 acres, or about 88 times more land.²⁴ This is more area than the cities of Wilmington, Fayetteville, and Raleigh combined.

La Capra Associates explained that to install 1,000 MW of wind power in western North Carolina, approximately 100 miles of ridgelines would be required.²⁵ However, this is an incomplete picture because they are only referring to the maximum capacity of wind power, as described above, not actual generation. The amount of ridgeline required for 1,000 MW of electricity generation (not maximum capacity) from wind power would require an astonishing 300 miles of ridgeline.²⁶

According to La Capra Associates, for 2,000 MW of off-shore wind installation, it would require about 100 square miles of water surface.²⁷ In terms of generation, this would be equal to about 300 square miles (equal to 192,000 acres).²⁸ It should be noted that the desirable off-shore locations, according to the consultant, are only one to two miles off the coastline, and in the sounds.²⁹

The Costs of Wind Power: Birds and Bats

☞ ***Do wind turbines kill birds and bats?***

As many as 127,467 birds have been killed at a California wind farm called Altamont Pass, based on annual estimates from a California Energy Commission report.³⁰

There is an estimated 33,000 bird deaths a year due to wind turbines,³¹ but as the United States Fish and Wildlife Service (FWS) has explained, "This may be a considerable underestimate."³²

A recent Government Accountability Office (GAO) report provides just one example of the impact wind turbines have on bats. "A 2004 study conducted in West Virginia estimated that slightly over 2,000 bats were killed during a 7-month study at a location with 44 turbines."³³

☞ ***Aren't new turbines and new strategies helping to reduce bird and bat deaths?***

Wind proponents argue that lessons have been learned to mitigate bird and bat deaths. According to the GAO, that is not the case:

A recent 4-year study conducted by the California Energy Commission in Altamont Pass tested some of these mitigation efforts attempted by industry and suggested possible future mitigation strategies. This study found that some of the strategies adopted by industry, such as perch guards on turbines and rodent control programs that reduce prey availability, were ineffective in reducing kills. Another study compared the differences between turbines painted with ultraviolet reflectant or nonultraviolet reflectant to see whether one would act as a visual deterrent, but the study found no evidence of a difference in mortality between the two treatments.³⁴

In 2007 testimony, Dr. Michael Fry of the American Bird Conservancy stated “Unfortunately, to date, collaborative efforts to successfully address the impacts of wind projects on birds and wildlife have been a failure.”³⁵

The FWS explained in a report that the impact newer and larger turbines would have is unclear. Recent research though suggests some problems, and there needs to be more research on turbines:

[H]igher-levels of mortality might be associated with the newer and larger turbines, and they indicated that wind power-related avian mortality would likely contribute to the cumulative impacts on birds. Since little research has been conducted on the impacts of large land-sited and offshore turbines on birds and bats, this newer technology is ripe for research.³⁶

☞ ***Don't cats kill even more birds than wind turbines?***

Wind proponents make absurd (and humorous) arguments that household cats kill more birds than wind turbines.³⁷ This point would be relevant for an analysis of bird mortality. However, when trying to evaluate wind power, the proper comparison would be between wind power plants and other sources of electricity.

Also, the goal should be to try and avoid more bird deaths, not to justify them because birds are killed in other ways. For example, following the logic of wind proponents, it would be fine for a company to spill toxins in a lake even if it kills 100,000 fish because sharks kill millions of fish.

The Costs of Wind Power: Noise

☞ ***Are wind turbines very noisy?***

According to the United Kingdom Noise Association:

Research by medical doctors has unearthed persistent complaints from people saying they not only hear the noise from wind turbines, but can “feel” disturbance in their bodies. This has led to complaints of illness. The symptoms people are complaining about are very similar to those associated with vibroacoustic disease. The suggestion is that the unique combination of noise (containing an element of low-frequency) and the strobing effects of the flickering blades, is having a physical effect on some people.³⁸

The French National Academy of Medicine has recommended that wind turbines not be placed within approximately one mile of a residence, at least until more research has been done.³⁹ The United Kingdom Noise Association also recommends a one-mile distance between a wind turbine and a residence.⁴⁰

Conclusion

While the mountains have some state protection from wind turbines through the Ridge Law, coastal communities are not as fortunate. The legislature should make it a top priority to develop a “Coast Law” that prohibits the construction of industrial wind turbines. Local communities should not be burdened with fighting proposed wind power plants that will harm their communities.

If local communities do have to address wind power plant proposals, they should do careful research into the matter. Communities need to consider whether, for little to no benefit, it is worth ruining their landscapes forever, harming wildlife, and using excessive amounts of land to generate very little electricity. They should demand that wind power proponents prove that wind power is in the best interests of the community and the state.

It is easy for wind power proponents to push wind power plants down the throats of communities where they do not live. It is a lot different when the massive turbines are in their neighborhoods. Just ask Robert Kennedy, Jr., who is a wind power supporter, except when it comes to his beloved Cape Cod.⁴¹ People should not have to live on Cape Cod to enjoy the beauty and environmental health of their community.

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End Notes

1. North Carolina Senate Bill 3 (2007), www.ncga.state.nc.us/gascripts/BillLookUp/BillLookUp.pl?Session=2007&BillID=sb3.
2. La Capra Associates, “Supplemental Responses to Senate Agricultural Committee Meeting and House Energy and Energy Efficiency Committee Meeting,” March 15, 2007.
3. A vote history on SB 3 is viewable at www.ncga.state.nc.us/gascripts/BillLookUp/BillLookUp.pl?Session=2007&BillID=S3&votesToView=all.
4. “Wind Energy – Energy from Moving Air,” United States Department of Energy, Energy Information Administration, www.eia.doe.gov/kids/energyfacts/sources/renewable/wind.html.
5. U.S. Wind Energy Projects web page of the American Wind Energy Association, www.awea.org/projects.
6. “Southeastern Utility Commissioners to Congress: RPS Means Higher Prices for Consumers: Nine SE States Urge Congress to Reject Federal RPS,” United States Senate Committee on Energy and Natural Resources press release, June 6, 2007, energy.senate.gov/public_new/index.cfm?FuseAction=PressReleases.Detail&PressRelease_id=183a660e-c6ea-49e5-b4ce-8a0fe060365e&Month=6&Year=2007&Party=1.
7. See the following United States Department of Energy maps: www.eia.doe.gov/cneaf/solar.renewables/ilands/fig13.html and www.eere.energy.gov/windandhydro/windpoweringamerica/images/windmaps/nc_50m_800.jpg.
8. La Capra Associates, “Analysis of a Renewable Portfolio Standard for the State of North Carolina,” December 2006, p. 30, www.ncuc.commerce.state.nc.us/reps/NCRPSReport12-06.pdf.
9. *Op. cit.*, note 7.
10. *Op. cit.*, note 8, at p. 32.
11. *Op. cit.*, note 7.
12. N.C. Gen. Stat. § 113-205 *et seq.*, www.ncga.state.nc.us/EnactedLegislation/Statutes/HTML/ByArticle/Chapter_113A/Article_14.html.
13. Duke Power 2003 Annual Plan, North Carolina Utilities Commission, Docket No. E-100, Sub 98, p. 33, ncuc.commerce.state.nc.us/cgi-bin/webview/senddoc.pgm?dispfmt=&itype=Q&authorization=&parm2=1AAAAA64230B&parm3=000120555.
14. See, *e.g.*, Wade Rawlins, “Coastal wind farm proposed,” *The News & Observer* (Raleigh), February 6, 2008, www.newsobserver.com/news/story/926691.html.
15. Progress Energy 2003 Annual Resource Plan, Docket No. E-100, Sub 98, p. 4, ncuc.commerce.state.nc.us/cgi-bin/webview/senddoc.pgm?dispfmt=&itype=Q&authorization=&parm2=KBAAA54230B&parm3=000120555.
16. Courtney, Richard S., “Wind Farms Provide Negligible Useful Electricity,” Center for Science and Public Policy, March 2006, p. 14, ff.org/centers/csspp/pdf/20060331_wind.pdf.
17. See, *e.g.*, “Environmental Impacts of Wind-Energy Projects,” National Research Council, May 2007 (Prepublication copy), p. 34, www.upcwind.com/UserFiles/File/National%20Research%20Council%20Wind%20Report%202007_2.pdf.
18. “Wind Power Report Shows Facts Instead of Myths,” ABS Research press release, August 8, 2006, www.renewableenergyworld.com/realpartner/story?id=45658.
19. *Op. cit.*, note 14.
20. R.A. Dyer, “Texas power grid operators narrowly avoid rolling blackouts,” *Fort Worth Star-Telegram*, February 27, 2008, www.star-telegram.com/news/story/499512.html.
21. *Op. cit.*, note 17, at p. 46.
22. *Ibid.* The National Academy of Sciences (NAS) estimated that wind power would offset carbon dioxide emissions from electricity sources by about 1.2 percent to 4.5 percent. In 2005, according to the study, electricity generation accounted for 39 percent of carbon dioxide emissions in the United States. Assuming that electricity generation remains at 39 percent in 2020, the carbon dioxide emissions from all energy use would be 0.5 percent to 1.8 percent. This simple calculation also was independently done by a member of the NAS committee that wrote the report, Dr. James (Rick) Webb, a senior scientist at the University of Virginia; see, *e.g.*, www.vawind.org/Assets/Docs/Perspective/Key_Points_About_Wind_Development.pdf.

23. Total United States petroleum consumption data can be found on the EIA site at www.eia.doe.gov/neic/quickfacts/quickoil.html; total petroleum consumption for electricity generation can be found on the EIA site at www.eia.doe.gov/cneaf/electricity/epa/epat4p1.html.
24. "Generic Environmental Impact Statement for License Renewal of Nuclear Plants" (NUREG-1437 Vol. 1), United States Nuclear Regulatory Commission, May 1996, www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1437/v1/index.html. While the NRC report is from 1996, the estimates likely are conservative when it comes to determining acres required for electricity generation. See, e.g., H. Sterling Burnett, "Wind power puffery," *The Washington Times*, February 4, 2004, www.ncpa.org/prs/cd/2004/020404wpp.htm; also see this Texas State Energy Conservation Office web page discussing a wind farm (Horse Hollow Wind Energy Center) in Texas, www.seco.cpa.state.tx.us/re_wind.htm.
25. *Op. cit.*, note 8, at p. 33.
26. This assumes electricity generation of about 30 percent of maximum capacity.
27. *Op. cit.*, note 8, at p. 33.
28. *Op. cit.*, note 26.
29. *Op. cit.*, note 9, at p. 33.
30. H. Sterling Burnett, "Altamont Pass Settlement Fails to Reduce Bird Kills," *Environment News*, March 1, 2008, www.heartland.org/Article.cfm?artId=22774, citing "Developing Methods to Reduce Bird Mortality In the Altamont Pass Wind Resource Area," California Energy Commission, August 2004, www.energy.ca.gov/pier/final_project_reports/500-04-052.html.
31. "Interim Guidelines to Avoid and Minimize Wildlife Impacts from Wind Turbines," United States Department of the Interior, Fish and Wildlife Service, 2003, p. 50, www.blm.gov/nhp/what/lands/realty/FWS_wind_turbine_guidance_7_03.pdf.
32. *Ibid.*
33. "Wind Power: Impacts on Wildlife and Government Responsibilities for Regulating Development and Protecting Wildlife," United States Government Accountability Office, September 2005, p. 14, www.gao.gov/new.items/d05906.pdf.
34. *Ibid.* at p. 20.
35. Testimony of Dr. Donald Michael Fry, Director, Pesticides and Birds Program American Bird Conservancy, before the House Subcommittee on Fisheries, Wildlife and Oceans, United States House Committee on Natural Resources, May 1, 2007, resourcescommittee.house.gov/images/Documents/20070501b/testimony_fry.pdf.
36. *Op. cit.*, note 31.
37. See, e.g., North Carolina Sustainable Energy Association web page on wind power, www.ncsustainableenergy.org/resources/renewable/wind.
38. "Location, Location, Location, The Noise Association (UK), July 2006, www.wind-watch.org/documents/wp-content/uploads/UKNA-WindFarmReport.pdf.
39. "Le retentissement du fonctionnement des éoliennes sur la santé de l'homme," Académie Nationale de Médecine, March 2006, ventdubocage.net/documentsoriginaux/sante/eoliennes.pdf.
40. *Op. cit.*, note 38, at p. 21.
41. Robert F. Kennedy, Jr., "An ill wind off Cape Cod," *The New York Times*, December 16, 2005, www.nytimes.com/2005/12/16/opinion/16kennedy.html?ex=1292389200&en=58e5dd67e381fd58&ei=5090.