Wind Energy Development On Public Lands

By harnessing the wind to create electricity, wind power has the potential to help transition us away from fossil fuels and combat the effects of climate change. Guiding development to the right places and away from sensitive lands and ensuring the best practices to minimize impacts will be crucial in establishing a sustainable clean energy future.

Technology

Wind turbines harness the power of blowing wind to create electricity: wind turns the blades, which spin a shaft, which connects to a generator and creates electricity. Utility-scale turbines can generate as little as 100 kilowatts (KW) to as much as several megawatts (MW) of electricity. Wind power accounted for 16,515 MW of net summer capacity in 2007,[1] just 1.7% of the total U.S. capacity of 994,888 MW.[2] Nevertheless, wind-generated electricity increased by almost 21 percent in 2007 over 2006, more than any other energy source.[3]

Source: Associated Press

Efficiency

The maximum aerodynamic efficiency that blades and rotors can reach is usually around 50 percent. Since wind is cost-free, turbines are designed to achieve the best cost-effectiveness based on wind resource availability, not the best efficiency. The proportion of time (including time on standby) that a turbine is available to produce power is typically 95-99 percent with proper siting and planning.[4] Because the turbine is not producing the maximum power possible at all times, however, wind turbines typically have a "capacity factor" of 25-40%.[5] The capacity factor is the ratio of how much power is actually produced over a given amount of time compared to how much power would be produced if the turbine were operating at maximum capacity 100% of the time.

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[1] Energy Information Administration. "Existing Net Summer Capacity of Other Renewables by Producer" http://www.eia.doe.gov/cneaf/electricity/epa/epat2p1a.html

[2] Energy Information Administration. "Existing Net Summer Capacity by Energy Source and Producer Type." http://www.eia.doe.gov/cneaf/electricity/epa/epat2p1.html

[3] Energy Information Administration. "How much renewable energy do we use?" http://tonto.eia.doe.gov/energy_in_brief/renewable_energy.cfm

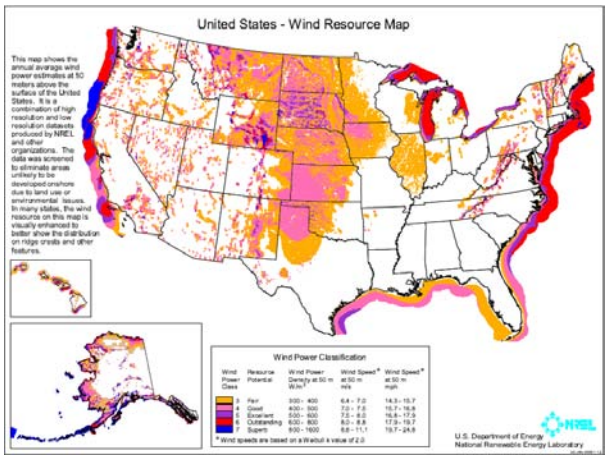
[4] United Kingdom Department for Business, Enterprise, and Regulatory Reform. "Efficiency and performance: Wind Energy Fact Sheet 14." http://www.berr.gov.uk/files/file17821.pdf

[5] American Wind Energy Association. "Wind Energy FAQ." http://www.awea.org/faq/wwt_basics.html

Supply & Demand

Deployment

Until 2007, Germany led the world in installed wind capacity. However, this recently changed when the installed wind energy generation facilities in the United States exceeded 25, 300 MW in 2008 with the addition of more than 8,500 MW of wind capacity, much of it in the West.[6] Developers usually group larger turbines together to create wind farms, as they are more efficient and cost-effective than small turbines. Small turbines are typically located individually next to houses and are not connected to the general grid.



Source: U.S. Department of Energy National Renewable Energy Laboratory.

Wind contributed to more than 30 percent of new U.S. generation capacity in 2007, making it the second largest source of new power generation after natural gas. Texas has overtaken California as the leader in wind power with 5,317 installed MW of wind energy.[7] Wind generation on federal lands is also growing. There are currently 327 MWs of installed wind capacity on public lands.[8]

Resource Potential

The U.S. Department of Energy's (DOE) Energy Information Administration estimates that 18 percent of total federal lands have a high potential for wind energy.[9] According to the DOE, the United States could garner 20 percent of its electricity from wind by 2030.[10] The American Wind Energy Association calculates that the total amount of electricity that could potentially be generated from wind on all lands in the U.S. is 10,777 billion kWh annually – more than twice the electricity generated in the U.S. today.[11]

Permitting Process

Federal

While other federal agencies have guidelines for wind development, only the Bureau of Land Management (BLM) has approved applications for wind projects on their lands. In September 2007, the Forest Service released new guidelines to provide direction for wind energy development on FS lands.[12] In June 2005, the BLM released a Programmatic Environmental

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[6] American Wind Energy Association. "2008: Another Record Year for Wind Energy Installations." http://awea.org/pubs/factsheets/Market_Update_4Q08.pdf
[7] American Wind Energy Association. "U.S. Wind Energy Projects – Texas." http://www.awea.org/projects/projects.aspx?s=Texas
[8] Bureau of Land Management. "Renewable Energy and the BLM: WND." January 2009. http://www.blm.gov/pgdata/etc/medialib/blm/wo/MINERALS__REALTY__AND_RESOURCE_PROTECTION_/energy.Par.58306.File.dat/09factsheetmap_Wind.pdf
[9] Energy Information Administration. "Federal lands, lower 48 states, with wind energy resource potential of 4, 5, or 6; located within 20 miles of a 115-230 kV transmission line; and weighted by land use class." http://www.eia.doe.gov/cneaf/solar.renewables/page/wind/wind.gif
[10] 20 Percent Wind Energy by 2030. "Increasing Wind Energy's Contribution to U.S. Electricity Supply." http://www.20percentwind.org/20p.aspx?page=Report
[11] American Wind Energy Association. "Top 20 States with Wind Energy Resource Potential." http://www.awea.org/pubs/factsheets/Top_20_states.pdf
[12] See the 9/24/2007 Federal Register Notice http://edocket.access.gpo.gov/2007/E7-18715.htm

Impact Statement (PEIS) regarding wind site permitting on BLM-managed lands in the 11 Western states.[13] The BLM estimates that out of the 20,634,000 acres of potentially developable land in the states studied, only 160,100 acres are economically developable.[14] The current PEIS describes the major phases associated with wind energy development: site testing and monitoring, construction, operation and decommissioning, and sets general guidelines for these phases along with suggestions for environmentally-friendly wind energy policies and technologies. Developers must first apply for a three-year site monitoring and testing application, after which they may submit a separate proposal for development. Development on BLM lands may require the development of an Environmental Assessment or, if there are complex or controversial issues, a more comprehensive Environmental Impact Statement.[15]

State

In addition to federal legislation regulating renewable energy development, wind projects are also subject to state and local regulations. Several states require developers to submit proposals that include preliminary statements of the relative environmental advantages and disadvantages of the proposed wind sites. Length of special use permits vary from state to state, from as short as one year in Washington State to as long as fifty years in Montana.

Impacts

Environmental Quality and Land Use

Construction and maintenance of turbines can have serious effects on the surrounding land, including habitat fragmentation from roads and the footprint of the turbines, soil erosion from surface area disturbance, and potential pollution from runoff.[16] These effects can be mitigated by keeping the impacts on land to a minimum by using existing roads, reclaiming the topsoil once construction is finished, and the use of standard erosion controls.[17]

Source: rechargenews.com

Bird and bat fatalities can occur at poorly sited turbine locations. For example, the Altamont Pass Wind Resource Area (APWRA) in Altamont, California was known for a high bird mortality rate—in fact, Altamont's poor siting led to between 880-1330 bird fatalities annually.[18] These fatalities stem from a variety of sources, including damage from flying into

[13] Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming.
[14] Bureau of Land Management Wind Programmatic Environmental Impact Statement. Chapter 5, page 2. Table 5-1. http://windeis.anl.gov/documents/fpeis/maintext/Vol1/Vol1Ch5.pdf
[15] Ibid. Appendix A, pages 11-13.
[16] Ibid. Chapter 5, pages 1, 5.
[17] Ibid. Chapter 5, page 6.
[18] Center for Biological Diversity. "Altamont Pass Wind Resource Area." April 6, 2006. http://www.biologicaldiversity.org/swcbd/Programs/bdes/altamont/altamont.html

poorly visible fast-moving blades and nesting at turbine sites. However, fatalities can be reduced through careful siting and construction to discourage bird nesting.[19]

Another issue encountered with wind turbines is noise. Turbines create a wide range of volumes and pitches (from less than 2 Hz to 8000 Hz). One Canadian study concluded that low frequency noise from turbines "is normally not a problem, except under conditions of unusually turbulent inflow air."[20] Noise from wind facilities can come from construction, mechanical facilities, transmission lines, and turbine aerodynamics.[21] Mitigation measures include sound-control devices on equipment, sound-proofing and noise insulation, and continued engineering improvements.[22]

Aesthetic Impacts

A major complaint about wind turbines is their aesthetics: some dislike the unsettling shadow flicker from rapidly moving blades or the glint from reflective surfaces. The Cape Wind project off of Cape Cod in Massachusetts in particular is controversial precisely because of visual concerns by nearby residents.[23] While there are no satisfactory solutions to the shadow flicker problem, off white or grey turbines have been suggested to reduce complaints about reflective surfaces. However, this may lead to further problems, as the close color proximity between sky and turbine may disorient birds in flight and cause accidents.

Emissions

Life-cycle emissions of turbines include emissions from using conventional fuels during construction and servicing. Onshore turbines emit less than 1 percent of the carbon dioxide emitted by coal fired power plants on a lifecycle basis. Turbines emit around 9 g/kWh of CO2 during their life-cycles, while in comparison coal plants can emit 987 g/kWh during their life-cycles.[24] The actual emissions avoided when a wind farm is built depend on what type of power plant the wind displaces, as displacement of coal-fired power plants provide more emission reductions than displacement of natural gas fired or nuclear power plants.

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[19] Bureau of Land Management Wind Programmatic Environmental Impact Statement. Chapter 5, page 80. http://windeis.anl.gov/documents/fpeis/maintext/Vol1/Vol1Ch5.pdf

[20] Leventhall, Geoff. "Infrasound from Wind Turbines – Fact, Fiction or Deception." Canadian Acoustics, 34(2). 2006. http://www.wind.appstate.edu/reports/06-06Leventhall-Infras-WT-CanAcoustics2.pdf

[21] Bureau of Land Management. Wind Energy Final Programmatic Environmental Impact Statement. Chapter 5, page 23. http://windeis.anl.gov/documents/fpeis/maintext/Vol1/Vol1Ch5.pdf

[22] Ibid, pages 24 and 27.

[23] Cape Wind. "About photo simulations." http://www.capewind.org/modules.php?op=modload&name=Sections&file=index&req=viewarticle&artid=29&page=1

[24] Renewable Energy Foundation. "Reduction in Carbon Dioxide Emissions: Estimating the Potential Contribution from Wind-Power." December 2004. http://www.nortexwind.org/REF%20-%20Wind%20Power%20and%20CO2%20%20Emissions.pdf

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