

American Wind Power

FACTS AND FIGURES OF MODERN WIND ENERGY

By Elizabeth Salerno, Chief Economist, and Michael Goggin, Manager of Transmission Policy American Wind Energy Association

1. - In addition to having no fuel costs, wind power has very low operating costs. Wind facilities produce long-term stable and low cost power for 20 years or more, protecting ratepayers from fuel price volatility. Years of technological innovations and an influx of made-in-the-USA manufacturing have driven down the cost of wind energy.
2. - The Production Tax Credit directly impacts American wind energy investment and project development. The federal PTC is an effective tool to allow developers to raise private capital in the marketplace and bring renewable energy projects to completion.
3. - Due to the success of the PTC, 60 percent of a wind turbine's value is now produced here in America, compared to 25 percent prior to 2005. Additionally, more than \$75 billion of private investment has been made since 2005. A new study from Navigant Consulting finds that with stable tax policy, the wind industry can grow to nearly 100,000 American jobs in the next four years, and support 500,000 American jobs by 2030 as forecast by the George W. Bush administration.
4. - Numerous studies have shownⁱ that wind energy saves consumers money by reducing the use of expensive fossil fuels, thus driving energy bills down. When wind turbines generate electricity, other generators stop consuming costly fossil fuels. Better still, because of simple economics, the first plants to ramp down inevitably are those using the most expensive fuel. Even modest additions of renewable generation to the power system can drastically reduce power prices by allowing the most expensive generators to turn off.
5. Studies by the National Renewable Energy Laboratory have confirmed that when you combine wind resources over a moderately large geographic area, the output

becomes far more stable as wind resources in one region backup wind resources in another region. As a result, the majority of the energy output of the wind turbine can be relied on for meeting power system capacity needs and thus replace the need for conventional generating capacity.ⁱⁱ

6. Wind accounts for 35 percent of all new electric generation capacity in the U.S. since 2007 and is ahead of schedule to provide the 20 percent of all U.S. electricity by 2030. American wind jobs are poised to quintuple in 20 years.
7. The PTC applies only to actual electricity produced from utility-scale wind turbines. A wind project developer does not receive the credit until the wind turbine actually generates power. As a business tax credit, funding is based solely on project performance, not evaluation by government officials.
8. The wind industry PTC leverages as much as \$20 billion in private investment each year, creating jobs for American workers in one of the fastest-growing manufacturing sectors.

BASIC SCIENCE OF WIND

9. Only 2-5 percent of the land area of a typical wind plant is actually taken up by wind turbines and other equipment, while the remaining 95-98 percent can continue to be used for farming, ranching, or whatever its prior use was.
10. A 2008 report by the U.S. Department of Energy concluded that obtaining 20 percent of the nation's electricity from wind energy would use less land than is currently occupied by the city of Anchorage, Alaska.
11. Every year, coal mining consumes several times that amount of land, and that amount of new land must be consumed every year to obtain new coal. In contrast, wind plants do not use up their fuel and thus only need to occupy one piece of land in perpetuity.
12. The grid backs up all power sources. Wind plants' output varies slowly and predictably over many hours, allowing grid operators to use slower-acting reserves that cost a fraction of the expensive fast-acting reserves needed as backup for fossil and nuclear generators.

13. Through technological advances, today's state-of-the-art wind turbines can operate in lower wind speeds than early turbines required. A 2008 DOE report concluded that the U.S. possessed enough high-quality wind energy sites to power the entire country more than a dozen times over.ⁱⁱⁱ Recent analyses suggest that the real figure may be several times larger.^{iv}

14. In the U.S., the average amount of electricity produced by a wind turbine compared to how much that turbine could produce if it ran at full output 24/7 – the turbine's "capacity factor" – is about 30-35 percent. That is significantly higher than the average capacity factor for natural gas power plants in the U.S. (22.5 percent) and comparable to the capacity factor for hydroelectric dams (40 percent).

15. Electricity demand varies by a factor of three or more, depending on the time of day and year. On a daily basis, grid operators must deal with large factory equipment coming on and offline, millions of people turning air conditioners and other appliances on and off, and fossil and nuclear power plants breaking down. In contrast, changes in the output of wind plants are relatively easy for system operators to integrate, because changes in wind energy output occur slowly and are generally forecastable 4-24 hours in advance. Opposite changes in electricity demand often cancel them out.

EVOLUTION OF AMERICAN WIND

16. Regions of the U.S. that have experienced significant growth in wind energy over the last several years have also seen significant declines in wholesale power prices, according to Wall Street analysis firm Bernstein Research.^v They have also seen significantly smaller electric consumer rate increases than parts of country that are not using wind energy.

17. Wind turbines are remarkably reliable, with 25,000 to 30,000 wind turbines in operation in the U.S. alone, and very few failures. Should one turbine fail in a wind farm, the others continue to operate.

18. The concrete pads that form a solid foundation for wind turbines are poured from the same industrial-strength, steel-reinforced concrete as bridges, helipads, hydroelectric dams, and foundations for fossil-fueled and nuclear power plants.

19. The U.S. Departments of Interior and Energy unveiled a coordinated strategic plan in February 2011 that pursues the deployment of 10 gigawatts (GW) of offshore wind capacity by 2020 and 54 GW by 2030. This strategy targets a cost of 10 cents per kWh by 2020 and 7 cents per kWh by 2030.^{vi}

20. – Over the last six years, U.S. domestic production of wind turbine components has grown 12-fold, to more than 400 facilities in 43 states. That has shifted tens of thousands of manufacturing jobs to the U.S.

21. Since the days of Thomas Edison, grid operators have had to deal with changes in electricity demand and supply. In almost all cases today, changes in electricity demand and sudden losses of fossil and nuclear plants are larger and more costly challenges for grid operators than gradual changes in wind output.

22. Large coal or nuclear plants have suddenly shut down, forcing grid operators to scramble to find 1000 MW or more of replacement power to keep the lights on. By contrast, wind plant output changes very slowly and since these changes are generally predictable through the use of wind energy forecasting, slower-acting reserves that cost dozens of times less than the reserves needed for conventional generators are used.

23. A 2012 study from the Massachusetts Departments of Environmental Protection and Public Health stated that, "There is no evidence for a set of health effects from exposure to wind turbines that could be characterized as a 'Wind Turbine Syndrome.'" The detailed analysis noted that, "the strongest epidemiological study suggests that there is not an association between noise from wind turbines and measures of psychological distress or mental health problems."^{vii}

24. Wind power has modest impacts on birds compared to other forms of energy generation, and should be viewed in the context of vastly more significant sources of mortality, such as buildings, communication towers, or vehicle collisions, which are greater by a factor of more than 7,000. Further, the wind industry does more to voluntarily study, monitor, and mitigate for any wildlife impacts than any other energy sector. That's why leading national and international bird and wildlife conservation groups endorse wind energy.

25. The development of wind power and other renewable energy sources is important for the future of the country and the health of our environment. Wind bolsters America's economy through a supply chain of hundreds of manufacturing plants and more than 2,400 companies investing in all stages of American wind power. With stable tax policy, the wind industry will grow to nearly 100,000 American jobs in the next four years, including increasing the wind manufacturing sector by a third, to 46,000 American manufacturing jobs. Wind energy is clean, abundant, and homegrown, and its cost is dropping. The case for continuing to invest in it is very strong. Let wind finish the job.



202.383.2500 *main* | 202.383.2505 *fax* | 1501 M Street NW, Suite 1000 | Washington, D.C. 20005

Ms. Salerno is the Director of Industry Data & Analysis and Chief Economist for the American Wind Energy Association (AWEA) and has been with AWEA since 2005. She holds a master's degree in Environmental Public Policy from the George Washington University and graduated with honors from Boston University with a B.A. in Economics.

Mr. Goggin joined AWEA in February 2008. As Manager of Transmission Policy, Michael works to promote transmission investment and advance changes in transmission rules and operations to better accommodate wind energy in the power system while maintaining system reliability. Michael holds an undergraduate degree with honors from Harvard University.

ⁱ Order, Sept. 9, 2011, Alabama Public Service Commission Docket No. 31653; Colorado Public Utilities Commission, Decision No. C11-1291

ⁱⁱ <http://www.nrel.gov/wind/systemsintegration/ewits.html>

ⁱⁱⁱ <http://www.nrel.gov/docs/fy08osti/41869.pdf>

^{iv} <http://eetd.lbl.gov/ea/ems/reports/wind-energy-costs-2-2012.pdf>

^v Bernstein Research, "Power Prices Below Zero," webcast on May 21, 2009

^{vi} http://www1.eere.energy.gov/windandhydro/pdfs/national_offshore_wind_strategy.pdf

^{vii} <http://www.mass.gov/dep/energy/wind/impactstudy.htm>