

# 20% WIND ENERGY BY 2030

In May 2008, the U.S. Department of Energy issued a report entitled *20% Wind Energy by 2030: Increasing Wind Energy's Contribution to U.S. Electricity Supply* (see <http://20percentwind.org>). The report examined in-depth the feasibility of wind generation increasing from about one percent of U.S. electricity supply to 20% over the next two decades, and found no technical obstacles and many potential benefits, including substantial job creation and reduced greenhouse gas emissions.

This 2009 Report Card examines the nation's progress toward the 20% wind by 2030 objective. In summary, wind farm installations were very strong in 2008, and remain somewhat strong in 2009 compared to historical levels, especially in light of the difficult environment facing the U.S. economy.

However, if installation rates do not revert quickly back to 2008 levels, the U.S. could fall behind the trajectory to its goal in the early part of the next decade. The U.S. wind industry needs a policy that will provide the near-term boost to development that we would expect from a national renewable electricity standard (RES) with strong near-term targets for renewable electricity generation.



## 2009 REPORT CARD

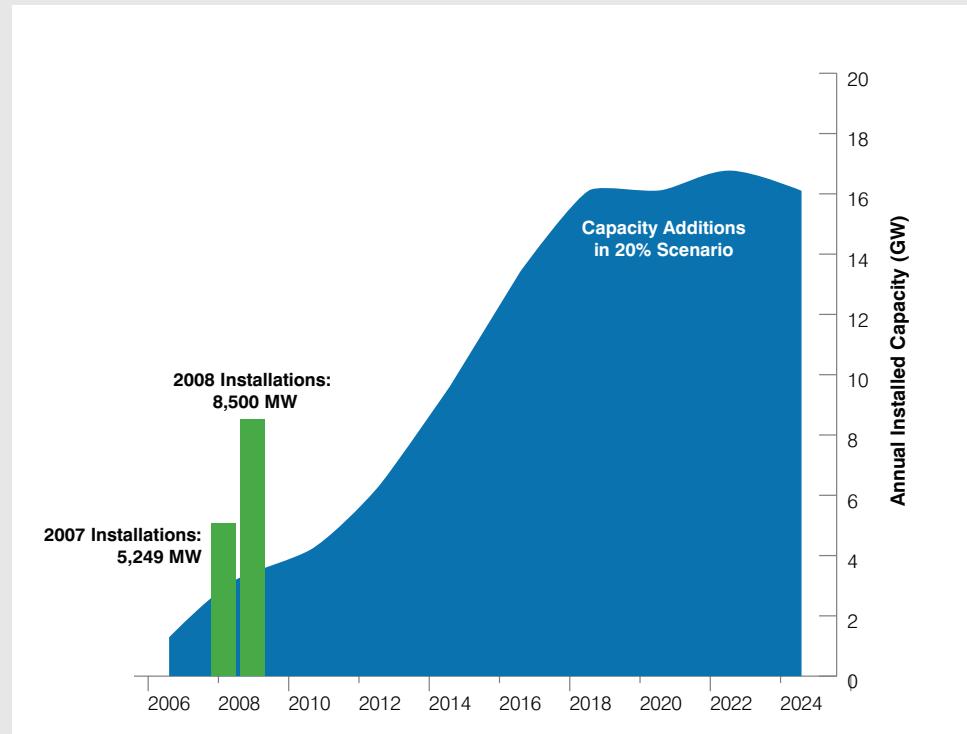
SUBJECT	COMMENTS	GRADE
TECHNOLOGY	In recent years, turbine capacity factor and performance have continued to improve as turbine size and tower height have steadily increased. These factors, coupled with an increase in funding for research and development and component testing, have helped to enhance turbine reliability. The ongoing study of offshore wind turbines will likely see development due to renewed commitments from various government agencies.	A-
MANUFACTURING	U.S. wind manufacturing was in a boom cycle in 2008 when over 55 new manufacturing facilities came online, were announced or expanded, equaling tens of thousands of new manufacturing jobs and billions in investment. Still, unclear market signals and a lack of consistent policy create an unstable investment environment for the future. Establishing a demand incentive, such as a strong federal renewable electricity standard (RES) in 2009, will allow the U.S. to compete globally and fully capture the opportunity to build out a new manufacturing industry and add thousands of new green jobs to the economy.	B+
TRANSMISSION & INTEGRATION	Isolated positive developments occurred in 2008 and 2009 that reflect a significant change from transmission policy in 2007 and 2008, but given the urgency and scope of changes outlined by the 20% Report, the changes still fall well short of what is needed.	C-
SITING	The wind industry has made great strides in working with federal agencies to improve siting processes and strategies. There has also been progress in collaboration with other groups to study effects on wildlife and the environment and to develop offshore wind projects.	B
OVERALL	20% WIND ENERGY BY 2030	B

# ACTUAL ANNUAL INSTALLATIONS COMPARED TO 20% WIND SCENARIO

Under the 20% wind scenario, installations of new wind power capacity would need to ramp up to more than 16,000 megawatts (MW) per year by 2018, and continue at roughly that rate through 2030. That would lead to a cumulative total of 300,000 MW of land-based and offshore wind power capacity installed through the end of 2030.

The report required annual installations of 3,260 MW in 2008, bringing the cumulative total at the end of 2008 to 17,970 MW. In actuality in 2008, the U.S. wind energy industry brought online over 8,500 MW of new wind power capacity, increasing the nation's cumulative total by 50% to over 25,300 MW.

The report required annual installations of 4,180 MW per year for 2009 and 2010 and 6,350 MW per year for 2011 and 2012, bringing the cumulative total by the end of 2012 to 39,030 MW. AWEA expects over 5,000 MW of new capacity to be commissioned in 2009, lower than last year, but still 20% higher than the report projected.



# TECHNOLOGY

A-

SUBJECT	CHALLENGES	STATUS
<b>TURBINE PRODUCTIVITY</b>	<p>Improve performance and capacity factor through increased rotor diameter and taller towers, advanced materials, controls and power systems</p> <p>Reduce capital costs through learning and other efficiencies in manufacturing, as well as advanced drivetrain concepts</p>	<p>Turbine productivity has consistently increased in recent years with use of larger wind turbines on taller towers capturing better winds, increased availability of turbines, improved reliability. In 2008, average turbine size of turbines continued to rise with multi-megawatt machines becoming norm, and a number of 3-MW turbines being installed on 100-meter towers. Hub heights of installed turbines now range from 45 to 105 meters, rotor diameters from 57 to 99 meters. Turbine performance has improved consistently with capacity factors of less than 30% in late 1990s increasing to average 35% for new projects today, with some projects achieving over 45%. Issues such as production curtailment due to lack of transmission could dampen output production if transmission is not expanded. As performance improves, annual operation and maintenance requirements have also decreased, reducing cost of operations.</p> <p>In recent years, capital costs continued to increase for wind turbines, a similar trend across all energy technologies. For wind, this increase is due to a variety of factors, including steel prices, transportation costs, exchange rates. Prior to economic downturn, wind turbine supply/demand imbalance also impacted cost due to strong turbine demand and lag in manufacturing development absent a national commitment to renewable energy.</p>
<b>OFFSHORE WIND</b>	<p>Bring down cost of offshore, develop technology pathways</p>	<p>Department of Energy entered into cooperative research and development agreement with American Superconductor in 2008 to study economics of 10-MW direct-drive offshore turbine.</p> <p>Minerals Management Service conducting study on environmental effects of subsea power cables to transfer power from offshore renewable energy projects to shore.</p> <p>Department of Energy has designated \$25 million in stimulus funds to build Wind Technology Testing Center in Charlestown, Massachusetts will be able to test blades up to 90 meters long, including blades for larger offshore turbines.</p>
<b>SMALL TURBINES</b>	<p>Advance small-wind turbine technology, enhance compliance with standards</p>	<p>Viable new U.S. small wind turbines have been introduced into marketplace. Annual market for small wind turbines in U.S. increased 78% in 2008. Consensus standards for testing small turbines, national small turbine certification program nearing completion. Program to develop guidelines for certification compliance in U.S. launched.</p>
<b>COMPONENT RELIABILITY</b>	<p>Reduce risks with standards for reliability, testing</p>	<p>Recent turbine reliability initiative through Department of Energy's Sandia National Laboratory identifying root causes of component reliability issues, working through industry/government collaboration to reduce downtime, failures.</p>
<b>RESEARCH, DEVELOPMENT, AND DEPLOYMENT (RD&amp;D)</b>	<p>Increase industry, government RD&amp;D program to support necessary efforts</p>	<p>President's budget includes \$75 million for wind, up \$20 million over FY2009. President's budget also includes \$20 million for renewable systems integration; \$118 million in grants and R&amp;D funding provided through American Recovery and Reinvestment Act for wind energy R&amp;D. DOE has active major blade testing facility and gearbox facility is underway. AWEA has asked for research, development, and deployment budget increase to \$201 million to better match funding for other sources, meet industry needs to simultaneously improve performance, lower cost, improve reliability.</p>

# MANUFACTURING

**B+**

SUBJECT	CHALLENGES	STATUS
<b>INVESTMENT IN AMERICAN MANUFACTURING FOR THE WIND INDUSTRY</b>	Providing stable, consistent market to encourage investment, create jobs	<p>Over 55 new facilities came online, were announced, or expanded in 2008, equaling thousands of new manufacturing jobs. Still, unclear market signals, lack of consistent policy make continued investment risky.</p> <p>Many companies invested in domestic wind manufacturing based on expectations of strong market under the current administration, now face some uncertainty without strong federal Renewable Electricity Standards (RES) in place.</p>
<b>INCREASING DOMESTIC CONTENT IN WIND TURBINES INSTALLED IN U.S.</b>	Sufficient domestic manufacturing of key components	In recent years, many turbine manufacturers, tier one component manufacturers, suppliers have opened U.S. facilities or broken through into wind industry. These investments have increased domestic content in wind turbines based on cost from less than 25% prior to 2005 to approaching 50% when manufacturing facilities reach full output. Without stable federal policy, minimal signal to increase percentage further.
<b>WORKFORCE DEVELOPMENT</b>	Ensuring proper training to expand labor force	Over 100 educational institutions have created or are in the process of developing programs specific to wind and renewable energy, ranging from certificate programs to graduate degrees. Federal agencies such as Department of Labor, Department of Energy have released several funding opportunities for workforce development.
<b>OVERCOMING SUPPLY BOTTLENECKS</b>	Encouraging investment in new manufacturing facilities to address bottlenecks	While some bottlenecks have been alleviated with new manufacturing capability and temporary reduction in demand due to the economic downturn, increasing component needs from expected increase in demand are not entirely addressed. Domestic manufacturing capability in all areas must continue to increase to meet wind turbine demand. RES is critical to send a market signal, encourage more suppliers to enter wind industry.
<b>COLLABORATION BETWEEN STATES, FEDERAL ENTITIES, BUSINESSES</b>	Overcoming obstacles to investment	Some of the most successful states in attracting manufacturing are those that have clear commitments to renewable energy through state policy along with recruiting companies to get involved with the wind industry. In a burgeoning market under RES, other states can use their best practice as model to grow manufacturing.

# TRANSMISSION & INTEGRATION



SUBJECT	CHALLENGES	STATUS
<b>TRANSMISSION POLICY</b>	Policies for planning, paying for, and permitting transmission need updating to effectively promote grid expansion	Very little progress on reforming policies for planning, paying for, and permitting transmission; federal leadership needed and certainty provided by federal RES will help drive transmission construction as well. A few regions have made very modest progress on updating transmission policies; others moving in wrong direction.
<b>TRANSMISSION PLANNING</b>	Planning is reactive, complex and slow; processes need to be overhauled	Several regional, interconnection-wide planning studies have shown that regional proactive planning works. Transmission Open Seasons, increased use of cluster studies in interconnection queue reforms helping remove roadblocks to building transmission for renewables.
<b>TRANSMISSION COST ALLOCATION</b>	Broader cost allocation needed to fairly allocate costs with benefits	A few positive developments, like Southwest Power Pool's move to broader cost allocation, have occurred. Other regions, e.g. Midwest Independent Transmission System Operator (MISO), moving backward, seriously harming prospects for wind development.
<b>TRANSMISSION SITING</b>	Streamlined siting needed to allow grid to expand as required	Some efforts by Bureau of Land Management have helped streamline transmission siting; increased federal authority still needed to override "NIMBY" concerns, ensure that transmission is getting built to meet national energy needs.
<b>MORE EFFICIENT USE OF EXISTING TRANSMISSION</b>	Promoting adoption of Conditional Firm service, other innovative techniques for using existing grid more effectively	Bonneville Power Administration beginning to offer conditional firm service, but on the whole the offering and adoption of conditional firm and dynamic line rating has been underwhelming.
<b>LESS BALKANIZED GRID</b>	Making grid less balkanized through balancing area consolidation	Some regions have reduced grid balkanization, but most have not. The consolidation of MISO's 25 balancing areas into one early this year was major positive step, with estimates that benefits will exceed costs by up to 6:1. Virtual balancing area consolidation in western U.S. has also been successful. Still, some 125 balancing areas remain, many so small that they are major impediments to wind integration.
<b>UPDATES TO GRID OPERATIONS</b>	Moving from hourly to 5- or 10-minute power plant dispatch intervals	Very little progress made on this simple operational reform, which could reduce wind integration costs by more than half, yield significant customer savings even on systems without large wind penetration.
<b>ANCILLARY SERVICES MARKETS</b>	Greater use of ancillary services markets to provide needed grid flexibility at lower cost	MISO launching ancillary services market at the beginning of 2009 was a major positive step; other regions lacking.
<b>WIND ENERGY FORECASTING</b>	Increase use to reduce utility wind integration costs	Significant progress achieved in this area; wind forecasting firms now providing ongoing forecasts to almost all operators of systems with high wind penetrations, yielding significant benefits.
<b>INTERCONNECTION STANDARDS</b>	Address technical interconnection concerns	Wind turbine technology has continued to evolve; state-of-the-art wind turbines now capable of meeting same or tougher standards as conventional generators for voltage and frequency ride-through, output control, and reactive power output control.
<b>WIND INTEGRATION STUDIES</b>	Conduct more integration studies	Several new wind integration studies completed or ongoing, providing further evidence that there are no technical or reliability obstacles to high wind penetrations, and only very modest increases in operating costs which can be greatly mitigated through operational reforms.

# SITING

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SUBJECT	CHALLENGES	STATUS
<b>COMPARATIVE WILDLIFE IMPACTS</b>	Compare lifecycle effects of energy generation options	New York State Energy Research & Development Authority completed study comparing wildlife impacts in northeast from various electricity generation sources. Report from National Academy of Sciences underway on economic costs, benefits not internalized in energy prices.
<b>WILDLIFE RESEARCH</b>	Research wildlife and habitat effects	American Wind Wildlife Institute established. Collaborative research continues on minimizing impacts to species such as bats, prairie grouse.
<b>RISK ANALYSIS</b>	Define risks	Currently, no comprehensive effort to define, understand, and address full range of human, ecological, socioeconomic effects of wind project siting.
<b>REGULATION</b>	Engage national leadership	Congress and government agencies such as Bureau of Land Management have been working to more efficiently address backlog of wind projects proposed on public lands. However, minimal progress made on R&D for radar and military impacts or efficiently processing project reviews. Resources needed to accommodate expanded development; government leadership necessary to coordinate efforts with industry officials.
<b>APPROVAL PROCESSES</b>	Develop siting strategies	Siting strategies being developed, but streamlined nationwide plan for siting is lacking because there is insufficient data and many issues are heavily site-specific. Federal advisory committee will complete national recommendations to minimize wildlife and habitat impacts in Fall 2009.
<b>PUBLIC EDUCATION</b>	Address public concerns	Public understanding about the need for expanded renewable energy resources increasing, but more can be done to educate communities about the effects of wind energy projects.
<b>OFFSHORE WIND: FEDERAL</b>	Final regulatory framework to allow projects to move forward	Minerals Management Service released Final Rule for Renewable Energy on Outer Continental Shelf in April 2009, after almost four years of work. Rule outlines regulatory path for proposed projects, creates commitment needed for developers to properly plan for proposed projects.
<b>OFFSHORE WIND: STATE</b>	Building support for offshore wind energy at all levels of government	Many states creating initiatives to encourage offshore wind. New Jersey, Rhode Island, Delaware, New York have all advanced offshore wind proposals; other states investigating offshore wind resources, conducting feasibility studies.