

Wind Energy Workforce Development: A Roadmap to a Wind Energy Educational Infrastructure



Photo from Judi Sigler, NREL/PIX16254

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20% Wind Energy by 2030



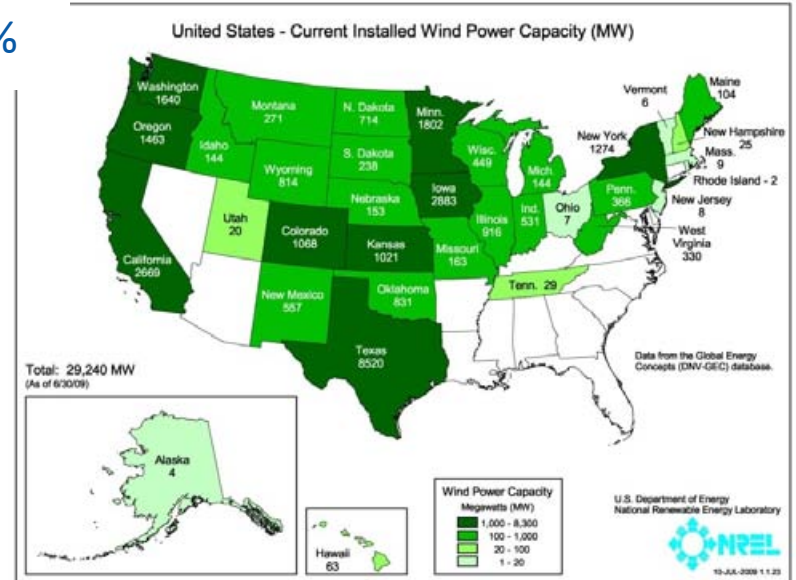
U.S. Department of Energy
Energy Efficiency and Renewable Energy
 Bringing you a prosperous future where energy is clean, abundant, reliable, and affordable



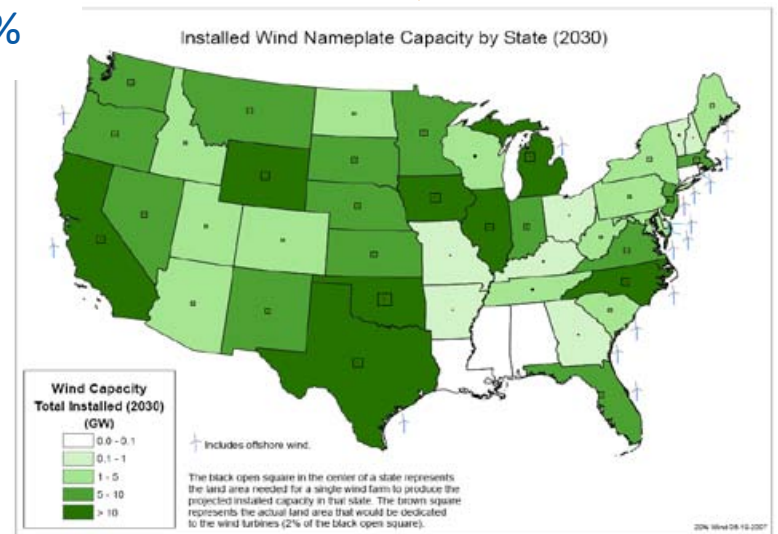
20% Wind Energy by 2030
 Increasing Wind Energy's Contribution to U.S. Electricity Supply

July 2008

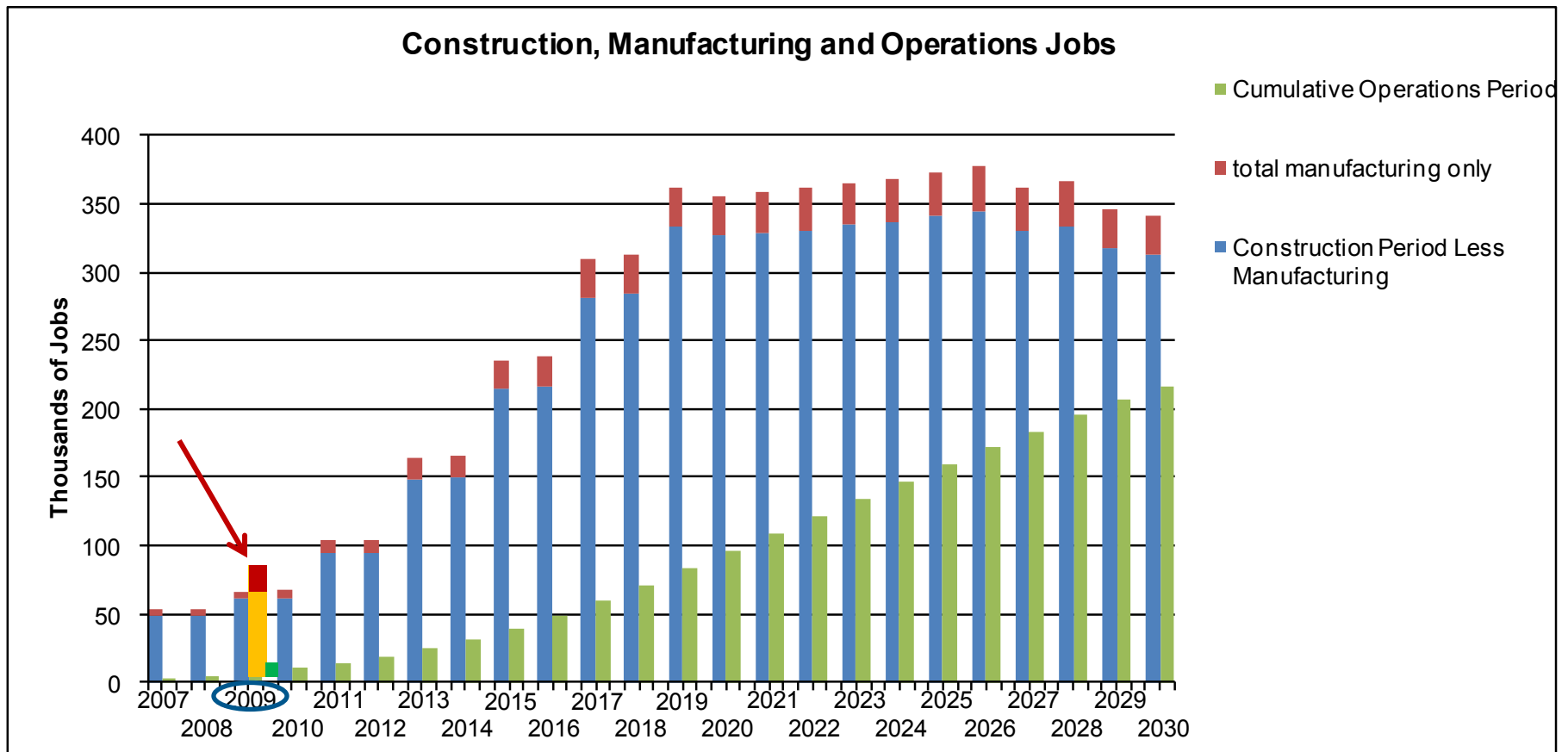
2 %



20 %



Direct Jobs Per Year



- More than 50% of U.S. turbine components are manufactured domestically (job numbers assume 75% domestic content)
- Project deployment only (does not include R&D, education, advocacy, government, NGOs, etc.)
- Domestic market only (a great deal of international potential).

The Education Challenge

Infrastructure:

- Schools focused on mineral extraction have existed for many years (example: the state-supported Colorado School of Mines started in 1866).
- New energy education systems are not developed every day (examples: NG '80s, nuclear '60s).

Varying assumptions of federal roles:

- DOE provides \$9.2 million for university educational infrastructure and student-focused support in the nuclear industry; the Wind Program provides less than \$1 million.
- Funding from DOC and DOI is generally “locally” driven and technology agnostic.



Center for Technology and Learning Media building at the Colorado School of Mines in Golden, Colorado. Photo from Anderson, Mason, Dale Architects, NREL/PIX12815

Large need, smaller pool:

- Center for Energy Workforce Development estimates ~46% of all engineering jobs in the utility sector could be vacant by 2012 while the number of people entering technology fields is trending down.
- Most of the engineers in the power sector are men, but the rate of men entering higher education has leveled off or is decreasing.
- The number of women and minorities at universities is increasing, but they are not entering the sciences and engineering.

So the Question Is...

Where do we go from here?



Photo from iStock/15047146

As with many things, it will require silver BBs rather than bullets.

Where We Stand

Many efforts are underway...

- Various industry groups/sectors (AWEA, Wind Alliance, industry)
- Educational organizations (universities, community colleges, NABCEP, NEED)
- Department of Energy (WWPP, EERE, OE, Science)
- National laboratories (NREL, INL, ORNL)
- State programs (state or federally funded)
- National Science Foundation (I/UCRC, Centers)
- U.S. Department of Labor
- U.S. Department of Education
- NGOs (ACORE, WoWE)
- Labor/trade organizations.

**Few of these efforts are coordinated.
Building national agreement takes time
– time that people don't have.**



www.windpoweringamerica.gov/schools/projects

National Challenges and Paths Forwards

- Teacher training programs
- Program development support
- Coordinated educational pathways
- Lack of defined career ladders, pathways, and training programs directed at industry; understanding
 - the remote nature of the wind industry (technical skills)
 - that people enter the field with experience from other energy sectors (advanced skills)
- Expand wind energy skills analysis – who will be needed when
- Lack of standards and skill categorization to understand which skills are needed for different personnel and job types
- Need stronger industry alignment & collaboration with academia at all levels
- Cross-disciplinary advisory group and support structure (the NWCC of wind education).



Photo by David Parsons, NREL/PIX05566



Photo by Warren Gretz, NREL/PIX11255

Primary and Secondary Educational Programs

Progress:

- Good standards-based curricula (NEED Project, KidWind, 4-H, Energy for Educators, Wind Wise)
- High student interest levels in wind, RE, and the environment
- National focus (STEM, MESA)
- State-based programs targeting RE and wind (Michigan, Wisconsin, and New York)
- National-level programs (Wind for Schools)
- BLS “Careers in Wind Energy.”



The South Dakota Wind Application Center sponsored a wind workshop as part of the Wind For Schools Project. *Photo from South Dakota Wind Application Center, NREL/PIX18283*

Challenges:

- Lack of energy literacy with few students entering the energy, engineering, and science fields
- Shortage of science teachers
- Student tracking (as low as 6th grade)
- Lack of engagement of women and minorities at appropriately young ages.

Potential Paths Forward: K-12 Education

- Implement K-12 wind energy education
- Expand K-12 teacher-training programs
- Expand efforts to coordinate and support K-12 curricula development, including technical review
- Expand K-12 school partnerships with industry and higher education, providing examples to students
- Expand the implementation of turbines at schools
- Spotlight programs, opportunities, and successes
- Implement state and national wind competitions
- Provide group-specific support directed at young women and minorities
- Develop secondary-school vocational training programs.



Colorado Wind Applications Center director Mike Kostrzewa attends the first official project turbine at a Colorado school (Walsh in southeast Colorado). *Photo by Becki Meadows, NREL/PIX16957*



Dedication of a 900-kW Americas Wind Energy wind turbine installed in Wray, Colorado by the Wray School District RD-2. *Photo by Ian Baring-Gould, NREL/PIX15461*

Community College, Vocational, and Direct Organizational Training

Progress:

- Industry need is driving development
- AWEA is developing the core skill requirements and a seal of approval for wind technician training programs
- DOL Green Job Training Grants
- State support for program development – in states that recognize the importance.

Challenges:

- Limited opportunities
- Many organizations trying to capitalize on the need – not many with the experience to actually provide it
- Wide degree of need (short courses to 2-year programs)
- Limited funding to start expensive programs
- Poor common understanding of the skills needed for different professions.



Iowa Lakes Community College offers a Wind Energy and Turbine Technology Program that prepares students for skilled entry-level jobs in the growing wind industry. *Photo by Ian Baring-Gould, NREL/PIX17387*

Potential Paths Forward – Community Colleges

- Define additional training needs, identify critical skills, and develop course outlines and offerings for other specialty skills
- Formalize a process to identify interested technical and community colleges
- Support equipment and program start-up costs
- Support expanded training opportunities for teachers and staff
- Support cross-fertilization among organizations
- Provide better documentation of the programs' impacts and achievements
- Consider better coordination with 4-year schools, K-12 outreach, and community college preparatory organizations
- Develop secondary and non-traditional vocational training programs
- Support active industry job development via industry green workforce integration/internships/job placement programs/jobs.



Students enrolled in Iowa Lakes Community College's Wind Energy and Turbine Technology Program learn hands-on skills that prepare them for skilled jobs installing, maintaining, and servicing modern wind turbines.
Photo by Ian Baring-Gould, NREL/PIX17386

College and University Programs

Progress:

- Several strong university programs
- DOE WWPP curricula development support
- DOE scholarship programs
- DOE WWPP Wind for Schools project
- Initial meeting of the American Academy of Wind Energy
- Burgeoning industry support for the sector
- AWEA University Summit: Iowa, June 28-29
- Strong European programs.



James Madison University students installing a meteorological tower in Quinby, Virginia. *Photo from Jonathan J. Miles, NREL/PIX16246*

Challenges:

- Limited opportunities with a small number of universities
- Most programs are informal and based around 1 or 2 faculty
- Graduates have knowledge gained primarily through research projects
- In almost all cases, existing programs are in engineering
- Funding largely provided through task or research-specific projects; limited funding for program support/development.

University-Sector Critical Needs

- Better define needed general skills, specific knowledge, and pathways for people to enter the industry at all levels
- Support the development of educational programs, especially in states without established wind interest/support, including some method to provide baseline program funding
- Support challenges and competitions to build interest in wind energy
- Develop a university consortia; less redundancy and better communication
- Develop better collaboration among universities and industry, including with Europe
- Support an expanded national information clearinghouse for university-level programs.



Wind turbine installed at Hope Street Academy in Topeka, Kansas. Photo from Ruth Douglas Miller, NREL/PIX17336



Group of Research Participant Program summer students at the National Wind Technology Center. Photo by David Parsons, NREL/PIX 05565

The Wind Workforce Roadmap

http://www.windpoweringamerica.gov/pdfs/wpa/2010/workforce_roadmap.pdf

Roadmap contents:

- Identifies current workforce activities in three sectors
- Reviews workforce needs
- Identifies challenges
- Recommends potential solutions
- Provides an overview of current programs.

Next steps:

- Incorporate comments from request for information
- Release new draft document in summer 2011
- Build industry, government, and stakeholder acceptance of the recommendations
- Move strategically to implement elements of the roadmap.

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Review Draft

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Groundbreaking for wind turbine at Sanborn Central School in Forestburg, South Dakota. *Photo from East River Electric Power Cooperative, NREL/PIX16030*

<http://www.windpoweringamerica.gov/schools.asp>