



Wind for Schools: A Wind Powering America Project



Donna Berry - Utah State University/PIX13969



U.S. Department of Energy

Energy Efficiency and Renewable Energy

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What is the Wind for Schools Project?

Energy is largely taken for granted within our society, but that perception is changing as the economic and environmental impacts of our current energy supply structure are more widely understood. The U.S. Department of Energy's (DOE's) Wind Powering America program (at the National Renewable Energy Laboratory) sponsors the Wind for Schools Project to raise awareness in rural America about the benefits of wind energy while simultaneously developing a wind energy knowledge base in future leaders of our communities, states, and nation.

A wind turbine located at a school provides students and teachers with a physical example of how communities can take part in providing for the economic and environmental security of the nation while allowing exciting, hands-on educational opportunities. The Wind for Schools Project approach is to install small wind turbines at rural schools, initially replicating the Colorado pilot process in five Great Plains states. In the first year (spring 2007 to spring 2008), turbines will be installed at three to five schools per state. This number will increase in the following years to an additional four to six rural schools per year. Beginning in 2008, Wind Powering America expects to expand the Wind for Schools Project to four to six new states each year for 5 years.

The three primary project goals of the Wind for Schools Project are to:

- Engage rural school teachers and students in wind energy
- Educate college students in wind energy applications, which will equip engineers for the growing U.S. wind industry
- Introduce wind energy to rural communities, initiating a discussion of wind energy's benefits and challenges.



Who participates in the Wind for Schools Projects?

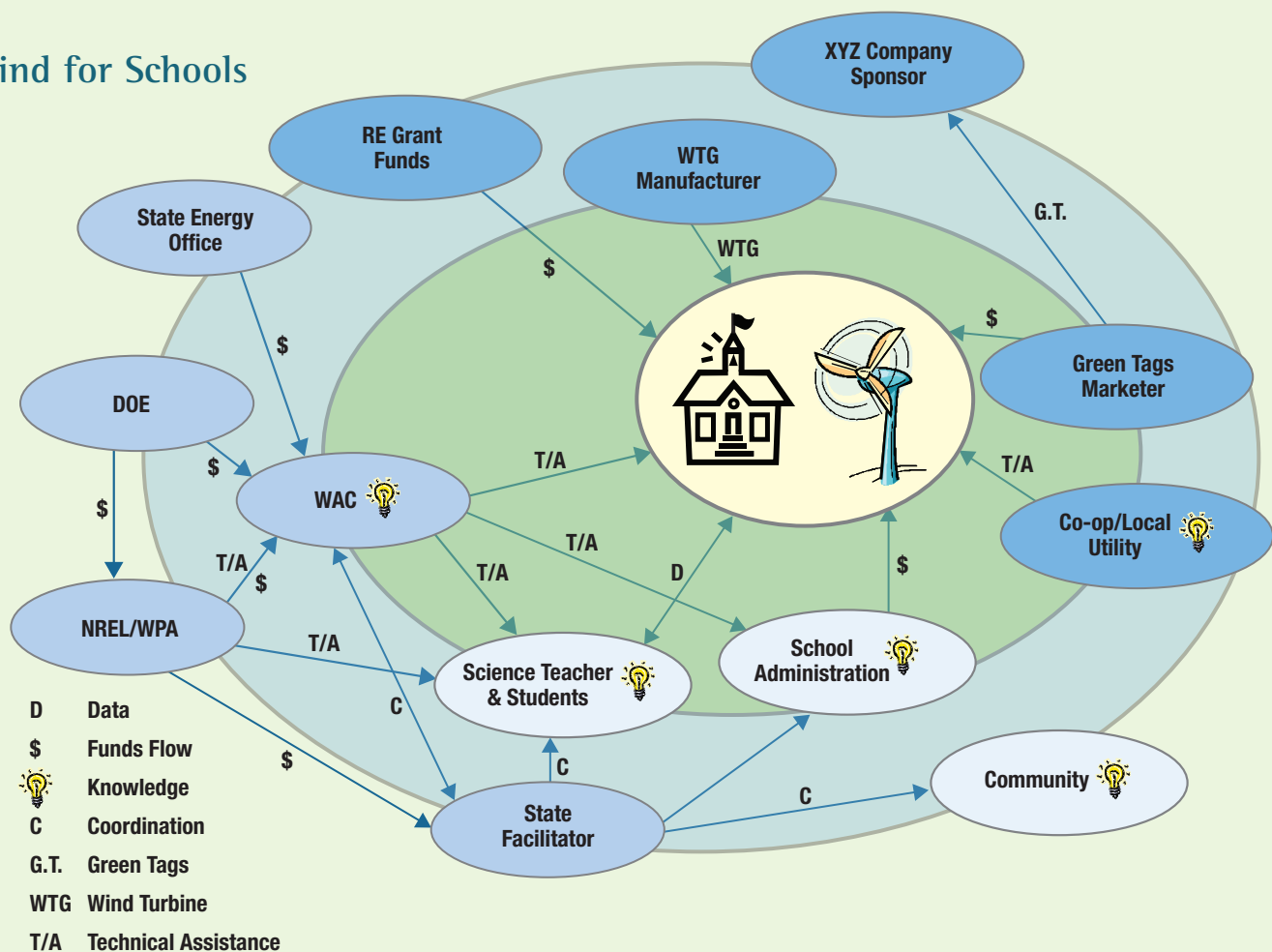
Eight entities are involved in each Wind for Schools Project: the school (which includes a science teacher, the school administration, and the community); a Wind Application Center (WAC); a state facilitator; Wind Powering America/NREL/DOE; a green tag marketer and sponsoring company; a wind turbine manufacturer; the local utility or electric cooperative; and the state energy office. The following section describes the roles and responsibilities of each entity in greater detail. The diagram on page 3 depicts the Wind for Schools program structure.

School, science teacher, school administration, and community: In order for a Wind for Schools project to succeed, people at all levels must support the concept: the science teacher, the school principal and administration, the district superintendent and administration, and the school board. The school provides land for the project, support for the interconnection of the wind turbine to the school electrical system, facilities support, financial support, and support for the project in community meetings or other organizational events. After the installation, the science teacher uses the wind turbine as a teaching aid in energy-related curricula and possibly as a source for science fair concepts. Although project financial structures will vary from state to state, the schools own and are responsible for the wind turbine system. The schools will save a minimal amount of money by offsetting power generation.

Wind Application Center (WAC): A WAC will be implemented at a state university or college under the leadership of an interested university professor. Fashioned after the Industrial Applications Centers, the WACs provide technical assistance to rural schools (analyzing the wind resource, energy usage, siting, permitting, land use, and financials, as well as overseeing the installation of the power system and the DAS and analyzing the performance data). After the first year, new K-12 candidate schools will be identified in the early fall. The WAC will conduct analysis and permitting during the fall academic semester and will install the turbines in the spring, possibly as a junior or senior academic project. The WAC will implement a wind energy curriculum and will graduate engineers and systems analysts knowledgeable in the wind application process and hopefully interested in pursuing wind energy as a career.

After the 3-year implementation period, the WAC will assume the responsibilities of the state facilitator and will become the primary repository of wind energy applications knowledge and expertise. Schools, small business owners, residential users, state policymakers, regulators, and other stakeholders will view the WAC as the source of information regarding wind energy applications. Although Wind Powering America/NREL

Wind for Schools



will provide technical and financial support to develop the WAC, it is anticipated that after 3 years the WAC will develop additional funding sources.

Facilitator: This individual or organization assists Wind Powering America in developing the Wind for Schools Project in each state. The facilitator's primary responsibility is to identify candidate K-12 schools and science teachers and support the project's development by working with the local communities and school administrations. The state facilitator is also responsible for working with Wind Powering America and the WAC to line up funding and implement each project. The facilitator's role is designed to last about 3 years, at which point the WAC assumes the facilitator responsibilities. Wind Powering America will provide initial funding for the state facilitators.

The success of the Wind Application Centers is one of the long-term goals of the Wind for Schools Project. The 20% Wind Energy by 2030 Scenario estimates that 3 million new positions will be created if the wind industry expands to provide 20% of the nation's electrical energy; therefore, there is an urgent need for colleges and universities to train future wind energy practitioners.

Wind Powering America/NREL/DOE: In each state, Wind Powering America will provide technical and financial assistance to the WAC and state facilitator over the first few years of the project, including:

- Conducting the annual wind energy applications training program
- Assisting in the analysis of Wind for School Projects
- Providing analysis models and other tools to support project development
- Providing turbine installation and commissioning procedures training
- Assisting in curricula development for the K-12 schools and the WAC
- Hosting students, professors, and teachers with summer projects at NREL.

Green tag marketer and sponsoring companies: The energy from the wind turbines will offset a modest amount of energy usage at the school. The green attributes for the energy produced by the Wind for Schools Project turbines will be sold to defray the wind turbine costs. Through a green tag marketer (e.g., Community Energy), a sponsoring company will pre-purchase the green tag production from the turbine over the first 10 years of operation.



Andy Swapp/PIX14991

Tyson Sherwood, a student at Milford High School in Milford, Utah, affixes an anemometer to a Skystream tower for a comparison on wind speed to power output. Tyson was in the eighth grade when the first 20-meter tower was installed on teacher Andy Swapp's farm for a school project. Now Tyson is a senior who hopes to work in the renewable energy field.

Wind turbine manufacturer: Southwest Windpower (www.windenergy.com) has joined the Wind for Schools Project as the initial supplier of all Wind for Schools systems. The standard system will incorporate a SkyStream 3.7™ wind turbine on a 70-ft guyed tower. This 1.8-kW wind turbine will produce about 3,600–4,000 kWh/year, depending on annual average wind speeds. Several tower options will also be available (including a monopole tower, or self-supporting tower without guy wires), although these tower options will incur an additional cost to the school. Other wind turbines or configurations will not be considered part of the Wind for Schools Project initial offering, although after a few years of operation this program may include other turbine options.

Local utility or electric cooperative: To ensure the success of a Wind for Schools project, the local electricity provider should be involved. The utility or cooperative should provide technical expertise (both in terms of installation and education) and assist in the installation of the wind turbine and associated hardware. The school and state facilitator (or the WAC after the initial years) will be expected to secure the support and assistance from the local provider.

Community education is one of the goals of the Wind for Schools Project, and the local electricity provider is a critical project partner. In most rural areas, the local utility or energy cooperative is one of the key community members, an entity that supplies the services that have expanded development and the quality of life. The Wind Powering America program supports an environmentally sustainable energy economy,

including the expanded use of wind energy, as a way to bring prosperity to rural communities. The local electricity providers play a special role in assisting this development opportunity, although many are hesitant because of lack of experience with wind technologies. The Wind for Schools Project hopes to help bridge this experience gap.

Also, partnering with the local schools and the Wind for Schools Project provides an opportunity for local energy organizations to highlight the importance of energy in our society.

State energy office: The state energy or development office provides technical, financial, and managerial support for the project as appropriate, generally through the WAC and state facilitator. The state energy office will also identify grants and other funding opportunities for Wind for Schools projects.

Who funds the Wind for Schools Project?

NREL, DOE, and state energy offices provide general support, especially during the initial project years. A Wind for Schools Project wind turbine costs approximately \$6,000 in out-of-pocket costs. NREL/DOE does not provide funds for turbine hardware, although it may contribute to the cost of data monitoring systems and other educational materials. The school will provide approximately \$1,500, the sale of the green tags will provide approximately \$2,000, and state-based grants or equipment buy-down will provide the remaining \$2,500. Many project participants donate their time, and the local utility or co-op hopefully will provide in-kind support for the turbine installation. Other funding options, such as low- or no-interest loans, a revolving loan fund, or other financial assistance, may be available from state organizations or local benefactors.

What is the basic system configuration for a Wind for Schools project?

The Wind for Schools Project basic system configuration incorporates a single SkyStream™ wind turbine, a 70-ft guyed tower, disconnect boxes at the base of the turbine and at the school, and an interconnection to the school's electrical system. The Wind for Schools system includes all of the disconnects and tower hardware associated with the project. For simplicity, the WACs will only install this basic power system configuration, although other tower options are available for special circumstances. If schools are interested in larger or different turbines, the state team may assist in the technical (but not financial) portions of the project.

A separate document, Wind for Schools Project Power System Brief, describes the specifications of the Wind for Schools Project system in greater detail. A PDF is available at www.windpoweringamerica.gov/pdfs/wpa/schools_wind_brief.pdf.

Basic Timetable for Wind for Schools Projects

Summer	Identify nine to ten candidate host schools; narrow selection to four to six for analysis
Summer	Convene training week at National Wind Technology Center
Early fall	Implement initial Web-based analytical training of WACs and host schools as needed
Fall	Perform analysis of candidate schools (WACs)
Fall	Secure financing for projects (including green tags transaction)
Winter	Permits and planning the installation of projects at host schools
Spring	Install systems at host schools
Spring/Fall	Institute host school K-12 curriculum

Depending on the requirements of a specific project, a foundation and guy wire anchors must be installed prior to turbine installation. Turbine foundations must be installed 1 month prior to the turbine installation. In some cases, fencing around the base of the wind turbine should be installed.

Early discussion with the local power cooperative or utility is essential because the wind turbine is a power generation device. The local power cooperative or utility should be an integral part of the Wind for Schools Project and should assist in the turbine installation and associated electrical interconnections. However, special electrical permits are not required because the turbine is not expected to produce enough energy to supply a large portion of the school's power needs, even at low-load periods during the summer or at night.

How do I learn more?

The Wind Powering America Web site offers a section devoted exclusively to wind energy and schools, including updates on the Wind for Schools Project: www.windpoweringamerica.gov/schools.asp.

Ian Baring-Gould leads the Wind for Schools Project:

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Summary

The U.S. Department of Energy's (DOE's) Wind Powering America program (based at the National Renewable Energy Laboratory) sponsors the Wind for Schools Project to raise awareness in rural America about the benefits of wind energy while simultaneously educating college seniors regarding wind energy applications.

The three primary project goals of the Wind for Schools Project are to:

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- Equip college students in wind energy applications
- Introduce wind energy to rural communities, initiating a discussion of wind energy's benefits and challenges.

Resources

U.S. Department of Energy
Wind Energy Program
Forrestal Building
1000 Independence Ave., S.W.
Washington, D.C. 20585
(202) 586-5348
www.eere.energy.gov/windandhydro
www.windpoweringamerica.gov/schools.asp

National Renewable Energy Laboratory
National Wind Technology Center
1617 Cole Blvd.
Golden, CO 80401
(303) 384-6979
www.nrel.gov/wind

American Wind Energy Association
1101 14th St. NW, 12th Floor
Washington, D.C. 20005
(202) 383-2500
www.awea.org