Wind for Schools: A National Data and Curricula Development Activity

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Wind for Schools

Project Objectives:
1. Engage America in the concept that wind offers an alternative energy and economic future for America, with a focus on rural areas.
2. Engage school teachers and students in energy education, specifically wind.
3. Equip college juniors and seniors in wind energy applications and education to provide the growing U.S. wind industry with interested and equipped engineers.
4. Establish community wind technical assistance centers.

Getting 20% of our electrical energy from wind will require on the order of 3,000,000 FTE job years and a sea change in the public’s understanding of the nation’s energy situation – we need to start training the people who will make this happen.

With the schools – goes the community. Long-term economic development in rural areas is tightly linked to schools.
Develop and then work through a Wind Application Center started at a state university to install small wind turbines and implement educational programs at K-12 schools using university students interested in a career in the wind industry.
Sample Project Costs (Skystream Turbine)
Cost depends greatly on the type of tower used – lattice, 60ft monopole or 45ft monopole
- Turn key system cost: ~$20,000
- Total equipment costs: ~$13,500
- Minimum equipment costs: ~$10,000

Expected Funding Arrangement
- $2,500 from the school
- $2,500 from green certificate sponsor
- $5,000 - $10,000 from a buy-down or other grant sources (USDA, State grants etc)
- $6,000 provided in-kind by the local utility/community

Payback - The real payback is in the education
- Skystream @70ft in a class 3 wind resource will produce about 6000 kWh/year
- At a retail rate of $0.05 / kWh this amounts to ~ $300 per year in reduced energy costs
- Simple payback to school ~ 8 years
The NEED Project

- Very wide curricula on energy
- Multi-level curricula with teacher and student work books
- Developed in conjunction with the American Wind Energy Association and KidWind
- Very hands on with class projects using Kidwind turbine materials
- All printed material available online
- Teacher training workshops available and supported for WfS states
- Classroom kits available
- Designed for standards
- http://www.need.org

Kidwind and WindWise being incorporated

- Wind Senators Series
Brining the Turbine into the Classroom

Data available to other WfS schools and schools that don’t have a local wind resource, but interest in teaching about wind.

• All WFS turbines sending data to a single database at Idaho National Laboratories.
• All schools able to access their own turbine data from any web-connected computer in their district!
• Other schools and educators can collect electricity production data and weather data to use in research and analysis activities in class
System Overview

**Zigbee Radio**
Skyview Wireless PC Interface works with the Skyview and Windinterface Software packages to send and receive data to and from Skystream.

**Dedicated Computer or Soekris Unit**
This device facilitates the communication between the Skyview Interface and the World Wide Web (WWW). This can be done with a dedicated personal computer (PC) running special software or a special communications unit called a Soekris, which is a low power Single Board Computer that functions as a dedicated router and USB to Ethernet hub.

**Data Collection Program**
The data collection program is called “windinterface”. A Java based application, it operates on the host computer and communicates directly to a Skystream wind turbine at an interval of 30 seconds and requests the most current data and status.

Each turbine is web enabled, allowing access to data from any web connected device including displays at the school as desired.
Data Collected

Idaho National Lab (INL) Database Server
The data is sent to a common database hosted at the wind-for-schools.caesenergy.org location.

Currently collecting the following parameters at 30 second intervals:

• System ID
• GMT time
• Local Time
• Current Power
• Daily Energy
• Total Energy
• RPM
• Wind Speed (from turbine)
• Volts
• Turbine Status
• System Status
• Grid Status

The database will store 2 years of historical data on each turbine.
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<tr>
<th>Name</th>
<th>Avg Power (W)</th>
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Click on a Turbine for more details
Widget Applications

PC – Yahoo Widget Engine
- http://widgets.yahoo.com/download/

Mac – Dashboard Widgets
K-12 lesson plans being developed by the NEED Project incorporate data from the wind turbines - integrating the turbine into the classroom.

Specific lessons under development include:

- Measuring wind speed
- How is electricity made
- Research wind turbines (sizes, potential output, requirements)
- Compare school model to other manufacturers’ models.
- How does data acquisition work?
- What are the design criteria for a wind turbine and the important variables
- Line diagrams and system drawings
- Job estimation skills and job flow charts
- Project presentation (power point)
- Why Wind? Why NOT Wind?
- Home energy use and expense (predicted vs. actual) leading to questions about the need for changes in home behavior, national behavior?

Data may be available to any organization interested in developing curricula for wind technologies.