UVM Wind Turbine

Watts in the Wind @ UVM?

Campus Renewable Energy Project

August 10, 2006

“See the Need, Take the Lead”
UVM’s Wind Location & Team

• Located off of East Avenue – across from 284 East Avenue / UVM Physical Plant Department

• UVM’s “Turbine Team” consisted of:
  – Gioia Thompson; *Environmental Liaison*
  – Lani Ravin; *Campus Planning*
  – Doug Little; *Risk Management*
  – Richard Wolbach; *Energy Management*
  – Charles Ferreira; *Faculty Representative*
VT. Department of Public Service (DPS) obtained funds from a $1.5 million U.S. Department of Energy account.

A portion of this DOE fund was secured by Vermont Senator James Jeffords for wind projects across the State of Vermont in the form of small grants.

The UVM portion of this DPS grant is a “matching type”, not-to-exceed limit of $30,000.

The goal of this state-wide program is to demonstrate the benefits of wind energy with small scale, residential-type turbines at different locations (e.g., non-traditional types).

Governor Jim Douglas and President Dan Fogel were instrumental in making this project a reality for UVM.
Bergey Excel-S

- Bergey “Excel-S” Wind Turbine & associated “GridTek 10” Inverter
- NRG Systems’ Tower & on-site real time Data Logger
- 10.0 kW or 10,000 watts **maximum** power output rating
- Approximately 108 foot high, hinged tower – rotor diameter of 23.0 feet. 3 blade style weighing 1,020 lbs.
- Start-up wind speed required is **7.0 mph** with a “Furling” wind speed of **35.0 mph**. Rated wind speed is **28.0 mph**.
- Engineered installation by *Dufresne-Henry Engineers*
- Wind Tower & Turbine installation by *Vermont Green Energy Systems & Century Electric*
Project Specifics

- Modest reduction in campus CO2 output by 3,500 to 5,900 lbs. per year because of the wind turbine.
- Due to location specifics, it is estimated that the turbine will generate 3,000 to 5,000 kilowatt-hours which is enough to power an energy efficient home for 12 months. Purely, an educational tool!
- The data logger, at the base of the tower, will collect data on wind speed, wind direction and kilowatts produced. This will be “real-time” data.
Project Goals

- Supplement the existing electrical load for the exterior roadway lighting circuit near project site.
- Utilize the new *Elster* REX “bi-directional” Burlington Electric Department (BED) meter for monthly savings from the exterior lighting account (*Lumec* roadway metal halide / 175 watt, fixtures).
- Install an educational kiosk near the wind turbine site near Beaumont & Carrigan Drive intersection.
Elster digital, bi-directional meter, installed by BED, at the UVM campus’ wind turbine site.

Model name is REX. Located at the intersection of Beaumont Drive & Carrigan Drive.
Net Metering Example: Residential Type

Bi-directional set-up for Residential Wind Turbine System with “Net Metering”

courtesy of Vermont Wind Energy
http://www.vermontwind.com
“Before & After” Turbine Results

- **2004 / 2005 Figures (Before):**
  - Nov.: 1,545 kWh / $203.94
  - Dec.: 1,656 kWh / $223.76
  - Jan.: 1,687 kWh / $227.81

- **2005 / 2006 Figures (After):**
  - Nov.: 989 kWh / $133.14
  - Dec.: 1,375 kWh / $187.10
  - Jan.: 1,262 kWh / $172.30
Wind Turbine Generation Data (kWH)

- November: 1200 kWh
- December: 1600 kWh
- January: 1800 kWh

The data shows a steady increase in generation from November to January.

THE UNIVERSITY OF VERMONT
Cost Figures for Wind Turbine

- 25% average savings, to date, for 3 months
- Dependent on wind site – *not* ideal, demonstration site
- Project cost offset by **$30,000** State of Vermont DPS Grant
- UVM Educational Project
  - State of Vermont DPS Wind Turbine Web Site (**Phase I**)  
    - Middlebury College  
    - Vermont Technical College  
    - Danville School & Dover Elementary School  
  - On-site Educational Kiosk (**Phase II**)  
  - Integrated “data logger” via the Internet (**Phase III**)  
- **$50,000 total** cost (includes labor, materials & associated engineering) – less the VT. DPS grant
Educational Component

- Faculty & Academic Advisor is Charles Ferreira – *UVM Department of Community Development and Applied Economics in the College of Agriculture & Life Sciences*.

- Three (3) UVM courses to utilize the wind turbine:
  - 2 courses in the UVM Department of Community Development & Applied Economics
  - 1 course in the UVM Rubenstein School of Environment & Natural Resources.

- UVM Wind Turbine is “net metered”. Data is available for students evaluation on the BED bi-directional meter, as well. UVM will receive a *credit* for the generated power.
Renewable Project Summary

- State of Vermont DPS will host a global web site for all locations showing real-time information – due Spring / Summer 2006.

- UVM’s additional web site will feature real-time data and specific project updates. UVM student(s) to design and implement as part of curriculum.

- UVM wind site will be www.uvm.edu/wind

- Please check out the UVM solar site (5.0 kW) at www.uvm.edu/solar -- located on the CHP roof.
Wind Turbine Project Pictures

10.0 kW System
Other Wind Resources

- NRG Systems (Hinesburg, Vermont); [http://www.nrgsystems.com](http://www.nrgsystems.com)
- Vermont Environmental Research Associates (VERA); [http://www.northeastwind.com](http://www.northeastwind.com)
- American Wind Energy Association; [http://www.awea.org](http://www.awea.org)
- Renewable Energy Vermont (REV); [http://www.revermont.org](http://www.revermont.org)
Solar Array Project Picture

5.0 kW System
Questions ...?