VERMONT ANEMOMETER LOAN PROGRAM

Wind Power Resource Assessment Report

Site Location: Wayside Farm, Randolph Center, VT

Period: 07/21/05 – 10/15/06

Prepared By: John Kidder
Date: May 2007

Electronic data files are posted at www.vtc.edu/vtalp

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The Vermont Anemometer Loan Program is made possible through funding by the State of Vermont Department of Public Service.

I. General Site Information

Site Number	0001	Project Number	VTALP0001
Site Name	Wayside Farm	Project Name	VT Anemometer Loan
Site Location	Randolph Center, VT		
Latitude	43.97997	Time Zone	-5
Longitude	072.61597	Magnetic Declination	14W
Datum	WGS84	Prevailing Winds	WSW
Elevation	1485'		
Installation Team	W. Cobden J. Kidder	Installation Team Phone/Fax number	Phone: (802)728-1783 Fax: (802)728-1390
Obstruction(s) to the tower/air flow and distances	Treeline to N approx 100'.		
Site Description (Topography)	Top of gentle N – S ridge, drops gently to W.		
Soil Type	Undisturbed earth and rocks		

II. Anemometry Statistics for period 7/21/05 to 10/15/06

Variable	**Speed 30 m**	**Speed 20 m**
Height above ground (m)	30	20
Mean wind speed (m/s)	3.55	3.04
Median wind speed (m/s)	3.30	2.80
Min wind speed (m/s)	0.40	0.40
Max wind speed (m/s)	14.80	14.00
Mean power density (W/m^2)	61	43
Mean energy content ($kWh/m^2/yr$)	535	377
Energy pattern factor	2.278	2.567
Weibull k	1.636	1.501
Weibull c (m/s)	3.96	3.36
1-hr autocorrelation coefficient	0.823	0.822
Diurnal pattern strength	0.210	0.246
Hour of peak wind speed	16	15
Mean turbulence intensity	0.247	0.301
Standard deviation (m/s)	2.18	2.03
Coefficient of variation (%)	61.4	66.8
Frequency of calms (%)	6.91	9.64
Actual observations	65,952	65,952
Missing observations	0	0
Data completeness (%)	100	100

III. Data Plots

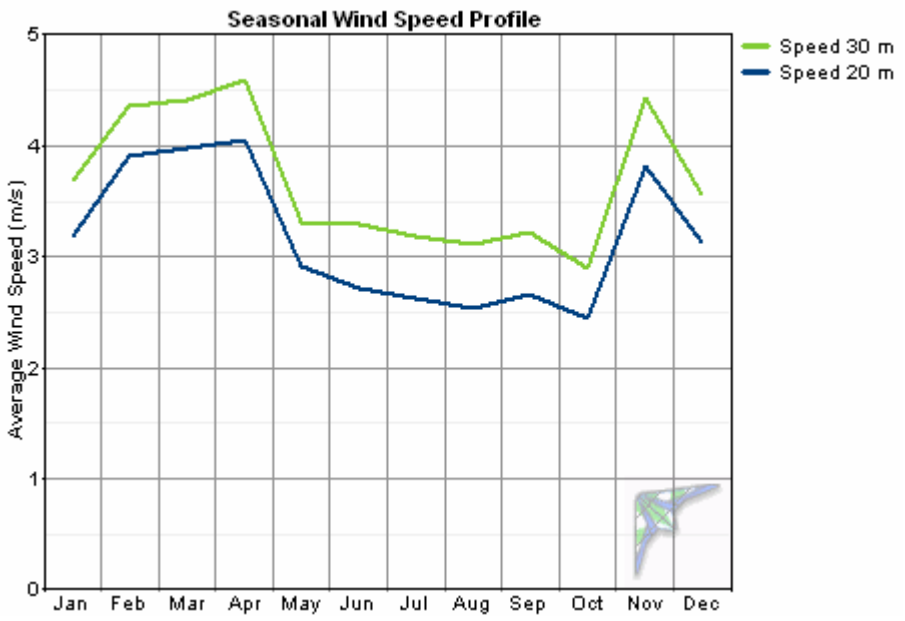

Figure 1 Monthly average wind speeds for sensors located at 30 m and 20 m heights.

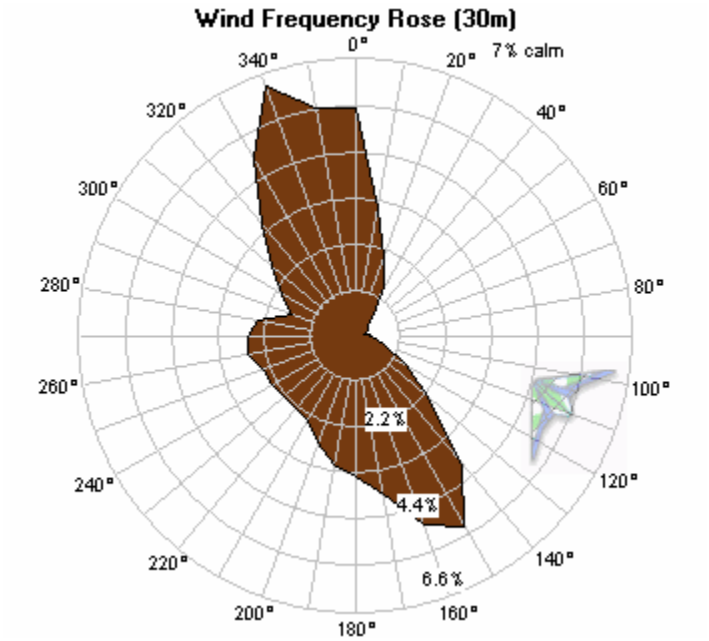

Figure 2 Wind frequency rose plot showing the wind directional probability. Labels on polar plot indicate probability values and calm percentage.

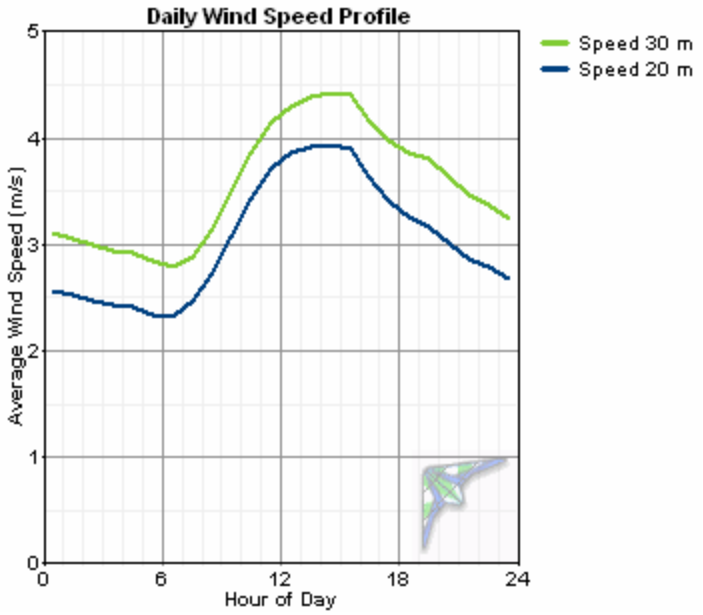

Figure 3 Daily wind speed profile indicating the average wind speeds at different times of the day.

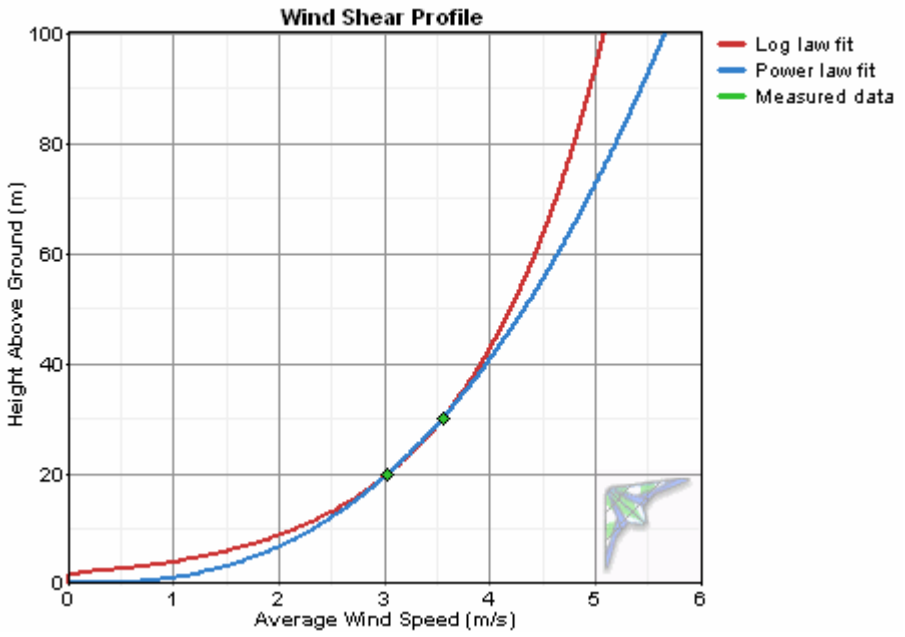

Figure 4 Wind shear profile: Plot of measured average wind speed at 20m and 30m heights (data points) along with fits to theoretical wind shear models (lines).

IV. Estimated Wind Turbine Output

Windographer software was used to calculate the predicted performance for wind turbines of various sizes up to 100 kW using the data collected at this site. The estimated performance data are based on the characteristics of commercially available wind turbines but they are not specifically identified and the Vermont Anemometer Loan Program does not endorse any company or turbine model. If you are considering purchasing a wind turbine you should have the installer or manufacturer provide a performance prediction based on the anemometry data.

The prediction of wind turbine output using anemometry data directly depends on the performance curve supplied by the manufacturer as well as assumptions such as the height of the hub, losses in the power lines and power conditioning components, and other installation specific parameters. Therefore, the wind turbine performance predictions are a very rough estimate of what you may expect from an installed turbine and actual performance may differ significantly from modeled predictions. Furthermore, wind resources will change from year to year so that 9-12 months of anemometry data, while providing a reasonably accurate assessment of the wind resource, will not necessarily provide an accurate prediction of how much energy a turbine will produce over many years.

These predictions are for educational purposes only and are provided to present a general estimate of how much energy production might be expected from various models and sizes of wind turbines that are or have been on the market.

All the turbine outputs shown below were calculated based on a hub height of 30 m and an overall loss factor of approximately 13%.

	Rated Power (kW)	**Rotor Diameter (m)**	**Estimated Annual Net Energy Output (kW-hr)**
Windturbine A	1	2.5	730
Windturbine B	1	2.7	807
Windturbine C	1.8	3.7	1541
Windturbine D	4.5	4.5	2636
Windturbine E	10	6.7	5202
Windturbine F	100	19.1	36,100
Windturbine G	100	20	54,972