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FIELD VERIFICATION PROJECT FOR SMALL WIND TURBINES

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4th Quarter, Issue #7

This quarterly report provides updates on the five recipients of the U.S. Department of Energy's (DOE's) Field Verification Project (FVP): Windward Engineering, LLC; Endless Energy Corporation; Siyeh Development Corporation; Offshore Services, Ltd.; and AWS Scientific, Ltd. The FVP provides manufacturers of small wind turbines with opportunities to verify the performance and reliability of their turbines.

To meet the first goal of the FVP, the recipients are required to purchase, install, and test a small wind turbine at the National Renewable Energy Laboratory's (NREL's) National Wind Technology Center (NWTC) in Boulder, Colorado, for safety, performance, noise, and duration. The five recipients are using one of three wind turbines: Southwest Windpower's Whisper H40, Atlantic Orient Corporation's AOC 15/50, or the Bergey Excel-S/E. Testing of the Whisper H40 has been completed (Windward Engineering is using the Whisper H40). The NWTC already owned an AOC; therefore, Endless Energy Corporation, which is using an AOC turbine, was not required to purchase and install another turbine for testing. The AOC 15/50 is currently undergoing testing at the NWTC. The remaining three recipients are using Bergey turbines (AWS Scientific, Inc. purchased and installed the turbine at the NWTC for testing). A description of the completed Bergey duration test is featured in this issue.

The second goal of the FVP is to evaluate the applicability and effectiveness of small wind turbines that serve a range of distributed power needs in various regions of the United States under various ownership and operating scenarios. To accomplish this goal, recipients are required to install their turbines at a host site or sites (see Table 3). Their experiences with permitting, ordering, and installation, which are summarized in these quarterly reports, can provide helpful information to individuals interested in purchasing and installing their own systems.

Offshore Services, Ltd. Field Verification Profile

In this issue, we feature a profile of one of the FVP recipients, Offshore Services, Ltd. (Offshore), and its progress with the FVP monitoring task. Offshore's goal is to install five Bergey Excel wind turbines on Block Island, Rhode Island, to evaluate wind power under different types of ownership structure in a harsh marine environment.

Each of the turbines in this project uses the Second Wind Nomad data logger to record wind velocity, wind direction, and power output from sensors on each wind turbine. Also recorded are data from each turbine's kWh meter and the amount of electrical consumption and power sold back to the utility. A summary of the output data (Table 1) and a discussion of data collecting activities for the Block Island Goose and Garden Greenhouse, the Jonathan and Jo-An Evans residence, and the Dean Kaman residence follows.

Data monitoring for the battery-charging turbine at the Goose and Garden Greenhouse is accomplished in the DC system with a "field effect" current coil to measure current in amperes and with a voltage bridge to measure volts. These are multiplied in the final reporting spreadsheet to give turbine output power in watts. The system has worked well except for a few brief periods of power interruption during severe thunderstorms when the inverters were intentionally shut off to prevent damage to them. This power interruption caused a brief interruption in signal output from the AC-powered Ohio Semitronics, Inc. (OSI) power transducer channel from the wind turbine and a half-hour loss of data from this source.

During this quarter, two segments of data were lost. The data segment between October 1, 2001 and October 29, 2001 was recorded normally but lost when a computer virus attacked the hard drive and forced complete recovery from backups. To prevent this type of data loss in the future, all Nomad data readings are immediately copied to a backup floppy disk when they are collected from the field and imported into the main computer. The second missing data segment occurred November 23, 2001 to December 23, 2001. These data were written to a data card that was apparently scrambled in the November 15, 2001 lightning strike (when the card was removed for transfer to the computer on December 23, 2001, the card was unreadable). The data from November 5, 2001 to November 23, 2001 were recovered from the data buffer of the Nomad DAS. An improved grounding system should reduce the likelihood of this type of loss in the future.

Data for the turbine at Jonathan and Jo-An Evans' residence are monitored via an anemometer, wind vane, and current transducer to measure power output with the Nomad data logger. Offshore has experienced good meteorological readings but has had trouble with the power measuring equipment. In early September 2001, the current transducer was relocated away from the inverter to the residential power distribution panel. New measurements have been taken and are coincident with the wind velocity but require a scale factor of 1.675 to match the utility-type kilowatt-hour meter readings of power produced by this machine. Offshore is consulting with Second Wind to determine the cause of the discrepancy in the expected scale of these data. During this quarter, Offshore has good data for the entire quarter except for a few hours between November 8, 2001 and November 10, 2001, which were lost with a late data card transfer.

Data monitoring for the turbine at the Dean Kaman residence is via an anemometer, wind vane, and current transducer to measure power output with a Nomad data logger. The data cards are imported into Offshore's computers monthly. Data from this turbine were collected normally starting on July 18, 2001 when the turbine was commissioned. No data have been lost.

Table 1. Fourth Quarter 2001 Turbine Output Summary for Offshore Services' Host Sites

	Goose and Garden Greenhouse		Evans Residence		Kaman Residence	
	Average Wind Speed m/s	Power Output Kilowatt Hours	Aveage Wind Speed m/s	Power Output Kilowatt Hours	Average Wind Speed m/s	Power Output Kilowatt Hours
October	6.7	59*	6.15	1,004	6.75	1,469
Novemer	6.5	101*	5.99	907	7.06	1,396
December	6.7	297*	6.11	1,302	6.62	1,424
Quarter Totals			6.08	3,213	6.81	4,289

*partial sensor readings

Bergey Excel Duration Field Verification Project Test

During the fourth quarter, the NWTC staff completed the duration test for the Bergey Excel (Figure 1) under the Field Verification Project. A description of the turbine and summary of the test results are given below.

Turbine Description

The Bergey Excel wind turbine system consists of a Bergey Excel turbine connected to a Gridtek-10 inverter. The Bergey Excel is a three-bladed, upwind, variable speed wind turbine that uses furling for power regulation and overspeed control. NREL is conducting most tests on a blade set with a BW03 airfoil. This blade set has a rotor diameter of 7.0 meters. NREL will also conduct a power performance test and acoustic noise test on a turbine using a blade set with the SH3052 airfoil. This blade set results in a rotor diameter of 6.2 meters and has a different rotational direction (counterclockwise as seen from upwind). The turbine was installed on a 120-ft guyed lattice tower.

The turbine uses a direct drive permanent magnet generator to produce three-phase variable frequency variable voltage power. This "wild AC" is fed into the Gridtek-10 inverter, which feeds 240V, 60-Hz single-phase power into the NWTC grid. In case of loss of grid or inverter fault, the turbine is automatically disconnected from the inverter and the turbine will spin unloaded.

In order to manually brake the turbine, a furl winch is available at the base of the tower. Once the turbine is furled and the rotor speed is relatively low, the three phases upstream of the down tower disconnect would be shorted to bring the turbine to an idling state.

PIX13611

Figure 1. The Bergey Excel test turbine at the National Wind Technology Center, Boulder, Colorado.

Duration Test

The duration test began on March 12, 2001, and was completed on December 31, 2001. The Bergey Excel met all test requirements except the 90% operational time fraction. This was due to faulting of the inverter at high wind speeds. The results and the test requirements are given in Table 2.

Table 2. Duration Test Results

	Requirement	Actual
Total Operating Time	6 months	9.5 months
Total Power Production Time	1,500 hours	2,455 hours
Power Production in Moderate and High Winds (Vwind>10m/s)	250 hours	272 hours
Power Production in High Winds (Vwind >15 m/s)	25 hours	36 hours
Maximum 3-Second Gust	—	43.7 m/s

As part of the duration test, the turbine underwent a detailed tear-down inspection after the field testing was completed. The turbine was taken apart and inspected for hidden degradation, wear, etc. Some of the observations were:

- Cracks in the tail vane (Figure 2)
- Cracks around bolt holes of the nacelle cover
- Grease on the upper slipring track (Figure 3)
- Surface cracks at the root-to-airfoil transition on all three blades.

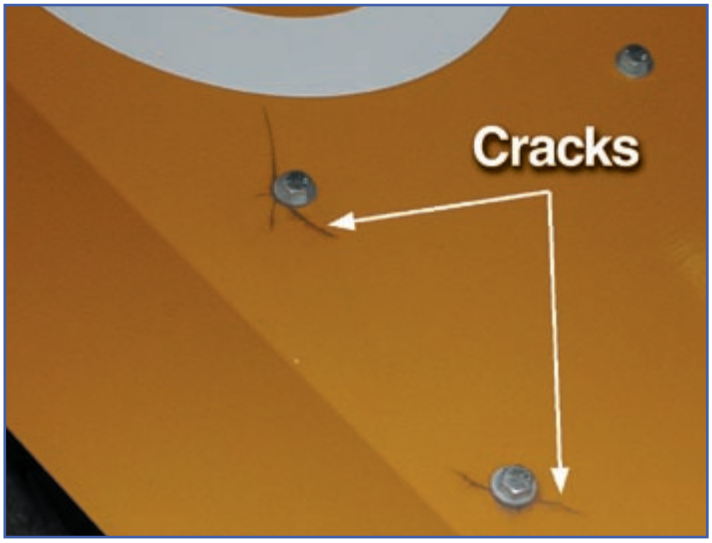


Figure 2. Cracks near the downwind bolts on the tail vane.

Figure 3. Lower yaw bearing and sliprings. Note grease track from yaw bearing to top slipring track.

Other Bergey Excel Tests Continue

The NWTC staff recorded a total of 2,455 hours of power production, with 271.7 hours above 10.3 m/s and 35.8 hours above 15.3 m/s. The maximum recorded 3-second gust during the test was 43.7 m/s, and the average turbulence intensity at 15 m/s was 17%. The overall operational time fraction was 86%, which is below the requirement of 90%. The main contributions to the low operational time fraction were the regularly occurring DC bus overvoltage fault and one circuit board failure. The test was not continued to achieve 90% because of time and budget constraints and the continuing inverter faults.

Power performance data are being collected.

Host Sites

The five recipient organizations manage 13 sites. Figure 4 and Table 3 show the names of the organizations and contacts, locations, turbine types, applications, and the dates the turbines were commissioned.

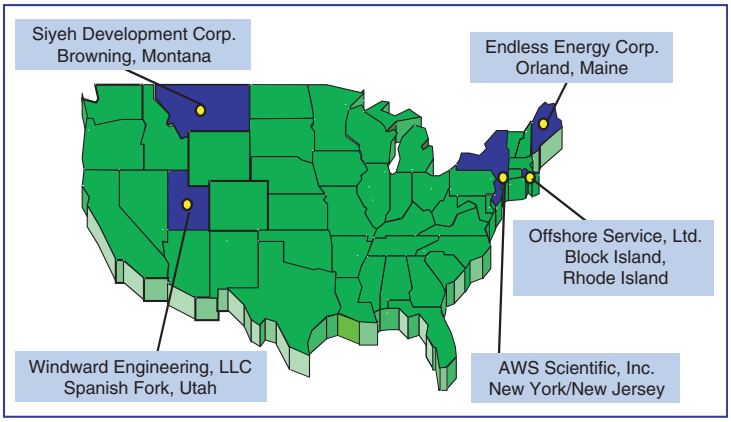


Figure 4. DOE Field Verification Project turbine locations.

Table 3. Field Verification Project Locations and Participating Organizations

Organization/Contact	SWT #	Turbine Location	Quantity/Type of Turbine	Application	Date Commissioned
Windward Engineering, LLC 4661 Holly Lane Salt Lake City, UT 84117 Contact: Craig Hansen/Dean Davis	Turbine #1	Spanish Fork, Utah	One Whisper H40 (previously named Whisper 900)	Grid Connected	February 26, 2000
Endless Energy Corporation 57 Ryder Road Yarmouth, ME 04096 Contact: Harley C. Lee/Michael Boice	Turbine #1	Allen Blueberry Plant, Orland Maine	One AOC 15/50	Grid Connected	February 14, 2001
	Turbine #2	Monhegan Island, Rockland, Maine	One AOC 15/50	Grid Connected	
Siyeh Development Corporation P.O. Box 1989 Browning, MT 59417 Contact: Dennis Fitzpatrick	Turbines #1–4	Waste Water Treatment Facility, Browning, Montana	Four Bergey Excel—S/E 10 kW	Pumping Purification	October 2000
Offshore Service, Ltd. P.O. Box 457 Block Island, RI 02807 Contact: Henry G. duPont	Turbine #1	Block Island Goose and Garden Greenhouse, Block Island, Rhode Island	One Bergey Excel/R 7.5 kW	Residential Consumption	June 2, 2000
	Turbine #2	Jonathan & Jo-An Evans Residence Block Island, Rhode Island	One Bergey Excel—S/E 10 kW	Residential Consumption	August 23, 2000
	Turbine #3	Dean Kaman Residence North Dumpling Island	One Bergey Excel—S/E 10 kW	Residential Consumption	June 20, 2001
	Turbine #4	TBD	One Bergey Excel—S/E 10 kW	Residential Consumption	
	Turbine #5	TBD	One Bergey Excel—S/E 10 kW	Residential Consumption	
AWS Scientific, Inc. 251 Fuller Road Albany, NY 12203-3656 Contact: Bob Putnam/Dan Bernadett	Turbine #1	Webster, New York	One Bergey Excel—S/E 10 kW	Distributed Generation	June 1, 2001
	Turbine #2	Liberty Science Center Jersey City, New Jersey	One Bergey Excel—S/E 10 kW	Distributed Generation	April 22, 2001
	Turbine #3	Southhampton College Long Island, New York	One Bergey Excel—S/E 10 kW	Distributed Generation	
	Turbine #4	Peconic Land Trust's North Fork Stewardship Center Long Island, New York	One Bergey Excel—S/E 10 kW	Distributed Generation	

Fourth Quarter Statistics Summary

Table 4 provides the summary statistics for all FVP host sites. No corrections have been made to these data for air density effects. These data are presented as they were reported by the host site organizations.

Table 4. Project Summaries

	Recipient Host Site	Cumulative since commission	Quarterly Statistics						
		kWh Total	kWh/m2	Capacity Factor	Unavailable Hours	Turbine Availability	Max Power (kW)**	Concurrent Wind Speed at Hub Height (m/s)†	Average Wind Speed (m/s)
Whisper H40	Windward Engineering Spanish Fork, UT	2,397.0	35.2	6%	1,543	100%	0.6034	12.6	5.82
AOC 15/50	Endless Energy Allen Blueberry Plant Orland, ME	22,859††	*	*	*	*	*	*	*
Bergey Excel	Siyeh Development Waste Water Treatment Facility, Browning, MT								
	Turbine #1	-327.5	-8.3	-11%	*	*	2.8188	*	*
	Turbine #2	55.3	1.4	2%	*	*	6.4568	*	*
	Turbine #3	-231.1	-5.8	-8%	*	*	0.00338	*	*
	Turbine #4	235.5	5.9	8%	*	*	5.9878	*	*
	Offshore Services Block Island Goose & Garden Greenhouse Block Island, RI	8,712.72	11.6	9%	0	*	4.5	16.4	14.0
	Jonathan & Jo-An Evans Residence Block Island, RI	6,779.9	81.1	20%	0	*	9.4	12.7	6.1
	Kaman Residence North Dumpling Island	5,321.5	108.3	26%	0	*	5.6	14.4	6.8
	AWS Scientific Webster, NY	5,300.0	89.8	15.6%	0	100%	10.1	14.5	5.6
	Liberty Science Center, NJ	2,420.8	32.6	5.7%	0	100%	6.6	12.9	4.0

* Data not available for reporting.

** Maximum power is the peak 10-minute average output.

† The concurrent wind speed is a 10-minute average wind speed.

†† As of December 22, 2001

Figure 5 shows the power curves for the seven Bergey Excel turbines currently installed under FVP while Figure 6 shows the wind speed distributions for these same turbines.

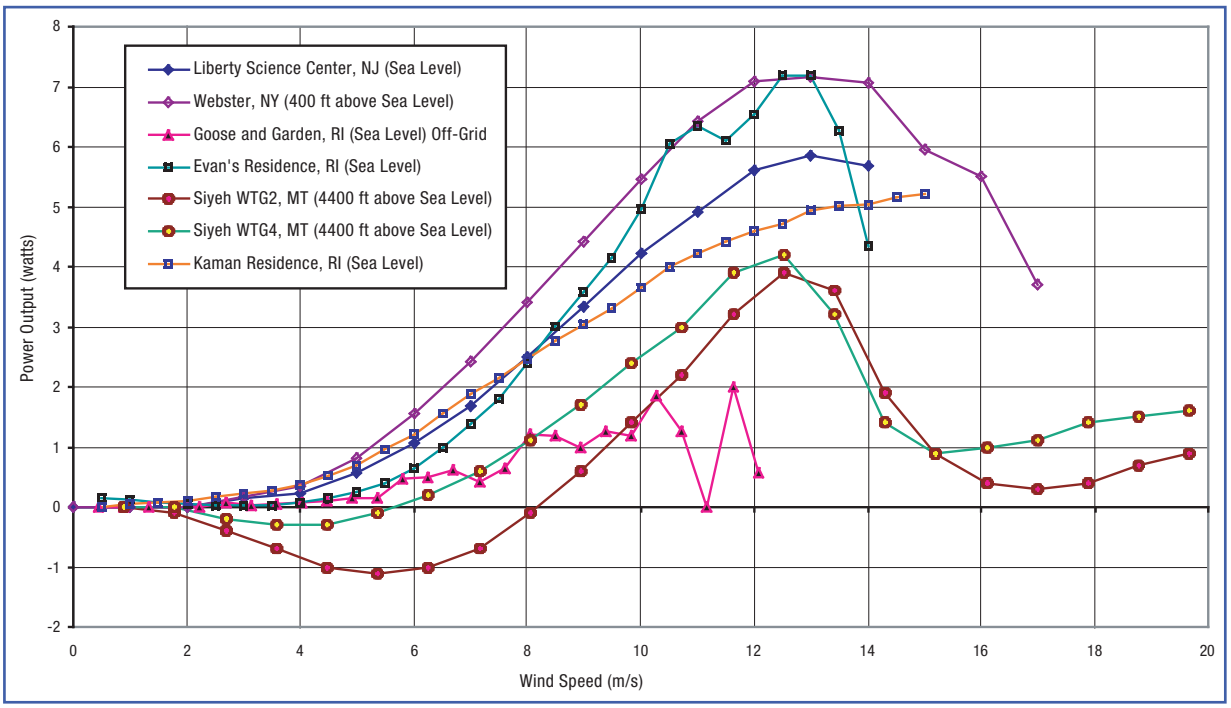


Figure 5. Comparative power curves for Bergey Excel turbines.

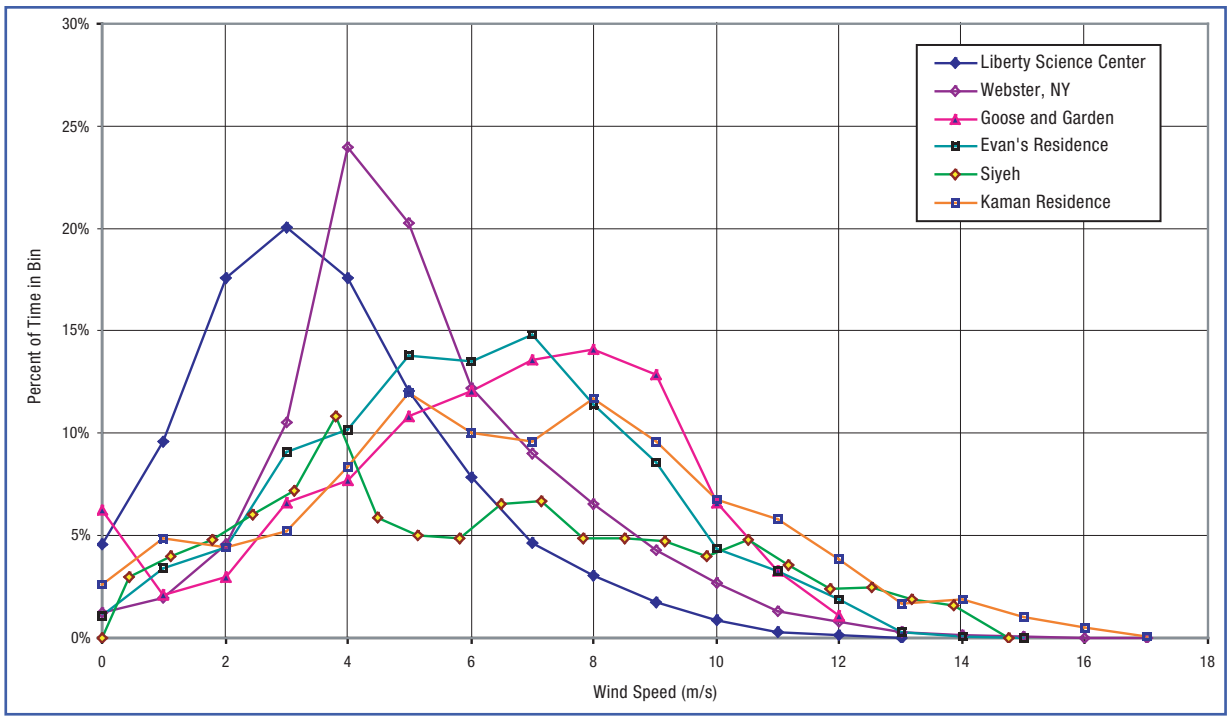


Figure 6. Wind speed distributions for Bergey XL turbines.

Figure 7 shows the power curve for the Whisper H40 located in Spanish Fork, Utah. This is the only host site using this turbine, so there is only one power curve. The corresponding wind speed distribution for the Spanish Fork site can be found in Figure 8.

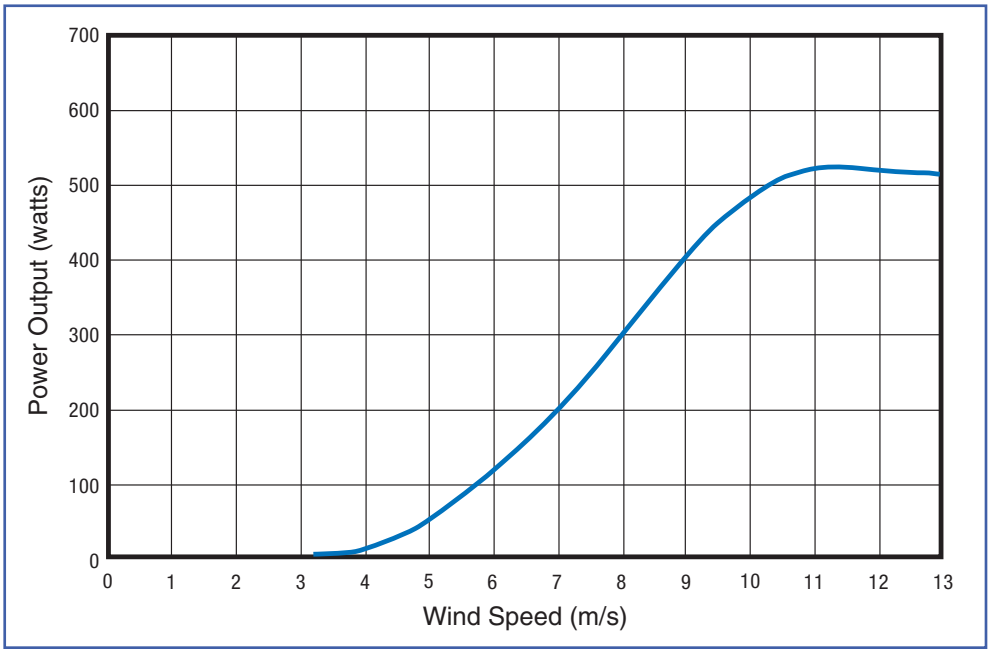


Figure 7. Whisper H40 power curve at site average air density of 1.021 kg/m^3.

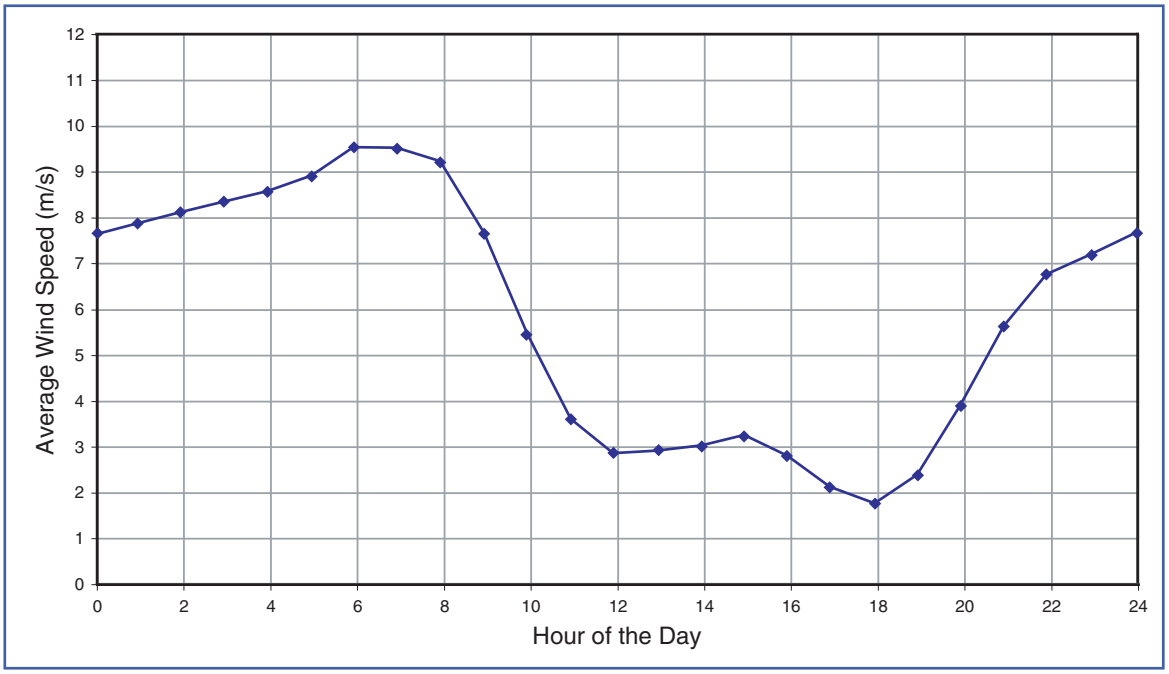


Figure 8. Wind speed distribution for Spanish Fork, Utah.

Fourth Quarter Status Summary
Windward Engineering, LLC

Spanish Fork, Utah

Windward Engineering's Whisper H40 turbine in Spanish Forks, Utah, operated with no known problems during the fourth quarter of 2001. Its data acquisition system (DAS) was operational for much of October 2001 but was shut down in November and December 2001 while new strain instrumentation was installed. The turbine showed a 100% availability because the shutdown was testing-related, not turbine-related. The system availability of 30.1% reflects the two months of down time.

The LabView system was not available this quarter to monitor the turbine for extreme wind events because of the system reprogramming in early October 2001 to monitor the new load channels and the turbine downtime in November and December 2001. The downtime was a result of removing the turbine from the tower to install instrumentation for measuring blade and tower loads. Windward staff completed an ADAMS model of the turbine, although they have not completely verified the model input data yet. They have started to measure blade and tower loads, and they plan to compare these measurements with the computer simulation results.

In an effort to understand the events that might cause extreme loading for a small furling wind turbine, Windward has been calculating and monitoring maximum yaw rate, furl rate, wind speed, and rotor rpm measurements on the LabView DAS.

During the extended downtime this quarter, most of the instrumentation has been recalibrated. There is a questionable data point in the calibration results for the watt transducer. The staff at Flexcore thinks it is a typographical error, but they can only be certain after a recalibration. Windward shipped the unit back for recalibration.

The time stamp on the NRG data logger was corrected early in November 2001 (as reported in Issue #6, during modifications to the LabView DAS, the time stamp was scrambled and was set back about 14 hours). October 2001 data have been corrected (shifted) during the data processing of this quarter.

Endless Energy Corporation

Allen Blueberry Plant, Orland, Maine

Endless Energy Corporation is using its turbine installation in Orland, Maine, to focus on the performance of the AOC 15/50 wind turbine under rugged coastal conditions. Endless Energy continued to collect data from the AOC controller this quarter.

Endless Energy has reported the following future action items:
- Purchase and install a new DAS
- Install a wind vane on the tower
- Complete fencing and signage at the installation when weather permits
- Enhance ongoing data reporting
- Analyze costs to date and estimate costs for a change of scope to the contract with DOE.

The turbine received some media attention during the fourth quarter. On November 22, 2001, the Ellsworth American, a weekly regional newspaper, published an article about the turbine called "Wind Power Comes of Age in Orland." On December 23, 2001, WLBZ-TV taped an interview at the site and aired it that evening and the next day.

Alternate Site 1-project still in planning process

Siyeh Development Corporation

Waste Water Treatment Facility, Browning, Montana

Siyeh Development Corporation's project is located in Browning, Montana, at the Town of Browning's Waste Water Treatment Facility. Siyeh, working in partnership with the Town of Browning, Bergey Windpower, the Indian Health Service, and the Blackfeet Indian Housing Authority, installed four Bergey Excel S/E 10-kW turbines.

At the conclusion of the last quarterly report, the following next steps in the project were proposed:

- Perform data collection of the site's wind conditions and the generating system output
- Repair the furling mechanism on turbine #4.

During the past quarter, Siyeh continued to monitor the project and coordinate the collection of performance data with the Town of Browning. Siyeh reported that the inverter equipment has performed poorly during this project, and the data it has collected reflect this poor performance. Siyeh expects that the installation of new equipment on the inverters by Xantrex technicians will increase the reliability of the data.

The furling mechanism on turbine #4 has not been repaired.

The goals for the next quarter are the same as the proposed goals for this quarter.

Offshore Services, Ltd.

Three of the five Bergey Excel turbines planned for the Offshore Services projects on Block Island, Rhode Island, are installed and operating at the following sites: Block Island Goose and Garden Greenhouse, which is the only project that also operates an electric vehicle, and the Jonathon and Jo-An Evans residence. A third Bergey Excel turbine is installed and operating at the Dean Kaman residence on nearby North Dumpling Island. Because of the serious difficulties encountered by Offshore Services in siting and permitting (detailed in past quarterly reports), two turbine projects remain in the planning process. These issues may have been resolved this quarter with the selection of new sites and the adoption of a revised zoning ordinance.

Block Island Goose and Garden Greenhouse, Block Island, Rhode Island

During the fall, the Goose and Garden Greenhouse site experienced favorable winds and more typical power output. Because of the good power availability, the 6.5-kW backup generator did not have to be used as frequently as in previous quarters. The turbine produced more power than the facility could use on a number of occasions.

Two 2.5-kW water-heating coils were installed in the wood/coal hot water furnace to keep the wind turbine "loaded" in windy conditions. The electric vehicle, however, used a sizable portion of the extra available power, so the coils were never used to produce any house-heating loads.

The new, more robust transducer that was installed last quarter has been a great improvement. In high winds, the new transducer is only a few degrees above ambient temperature (the old transducer became red-hot).

The only operational problem experienced by the Goose and Garden Greenhouse turbine was another lightning strike on November 5, which burned out a power module (one of the three rectifiers on the wind turbine AC to DC conversion circuit) and both main control cards in the power inverters. The power module cost $90 to replace, and the control cards cost $832 each to replace. The turbine was offline until November 23, 2001, while the power modules were sent to Bergey Windpower for testing. To reduce the further potential for costly lightning damage, the Bergey Windpower staff members recommended installing an underground copper bonding wire between the wind turbine grounding system and the house grounding system.

Review

The wind turbine installed at Block Island Goose and Garden Greenhouse in May 2000 is a Bergey 6.5-kW Excel/R (for DC battery charging) on an 18-m tower. This turbine is identical to the Bergey 10-kW machines used for generating power with a utility synchronous interphase with one exception: The battery-charging electronics do not have the range of power output that the utility synchronous model has (thus the 6.5-kW limit on the top end of the power production).

Offshore Services, Ltd.

Block Island Goose and Garden Greenhouse, Block Island, Rhode Island-Continued

The leased Ford Electric Ranger pickup truck adds flexibility to the wind/battery system by increasing the storage capacity of the entire system and providing an additional system load (and battery storage). The vehicle has been driven more than 8,000 miles since May 2000, displacing the approximately 550 gallons of gasoline and several tons of greenhouse gases from a conventional vehicle. The Ranger was not driven during times when the wind turbine was not operational.

Jonathan & Jo-An Evans Residence, Block Island, Rhode Island

The 10-kW Bergey wind turbine at the Jonathon and Jo-An Evans residence (Figure 9), which has a high power availability, generated 3,209 kWh this quarter. Of this total, 975 kWh was used by the residence (displaced from the utility at approximately $.30/kWh) and 2,234 kWh was sold back to the utility under the Public Utility Regulatory Policies Act (PURPA) at approximately $.10/kWh. The total estimated electrical cost savings this quarter was $516.

The Evans' neighbors on Block Island opposed the installation of the wind turbine, and they have complained about noise. Bergey Windpower has completed testing of a new blade design that will significantly reduce noise. The new blades will be installed this winter.

Henry DuPont/PIX10902

Figure 9. The Bergey Excel 10-kW wind turbine at the Evans Residence, Block Island, Rhode Island.

Dean Kaman Residence, North Dumpling Island near Fishers Island, New York

The calibration and commissioning of the DAS for this Bergey 10-kW turbine began on July 18, 2001.This turbine is running smoothly without any operational problems. During this quarter, the turbine generated 4,290 kWh, which Offshore Services considers remarkable because the installation uses an older, single-phase to three-phase transducer that uses about 7 kWh per day in parasitic load. Offshore staff members have spoken with the site owners about replacing the transducer with a buck/boost transducer that would be more efficient and experience a fraction of the losses of the present system.

Alternate Site 1, Block Island, Rhode Island-project still in planning process

The Town of New Shoreham Transfer Station site was one of the original sites proposed to DOE by Offshore Services. After the permitting failed because of a lack of support from the town administration, a group of five neighbors who collectively own 23 contiguous acres on the west side of Block Island expressed interest in siting a turbine. Richard Batchelder, the group's spokesperson, recently signed an agreement to participate, and a building permit was applied for and issued.

This turbine site presents a number of good opportunities for the program: 1) It has good resource exposure; 2) The site is not affected by the new, restrictive zoning ordinances; and 3) It will provide information about cooperative ownership of a wind turbine. Also, Offshore Services has applied to the Rhode Island Public Utilities Commission to allow the neighbors to share the power in a "neighborhood power system" by wheeling the excess generated power to the neighbors' residences through the local utility distribution network.

Now that permits have been secured, Offshore Services is changing its statement of work and planning to proceed with the installation.

Alternate Site 2, Block Island, Rhode Island-project still in planning process

After two false starts, a favorable turbine site may have been found in Perryville, Rhode Island. The original proposed site at the Block Island School failed to make it through the permitting process because of a lack of support from the school administration. Planning for the second proposed site at the Block Island Airport stalled when the airport planning staff could not decide on a location for the turbine.

The Perryville site, which is located on 26 sparsely populated acres, seems promising. Offshore Services is currently investigating the permitting process. If all goes well, turbine installation on a 30-m tower should be completed in the spring of 2002.

AWS Scientific, Inc.

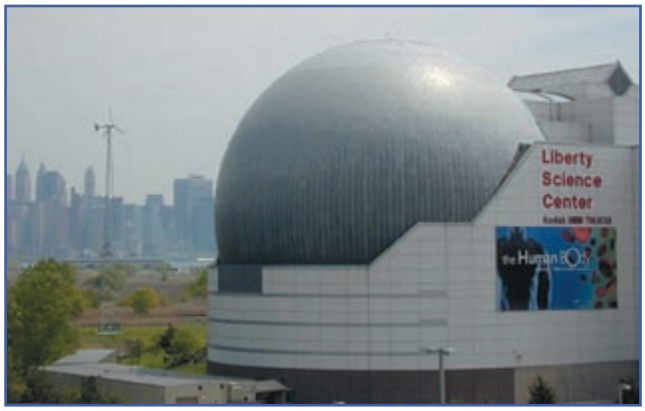
AWS Scientific currently operates two projects with Bergey Excel 10-kW wind turbines: one in Webster, New York, and the other at Liberty Science Center in Jersey City, New Jersey. AWS is involved in negotiations to install a third turbine at Southampton College and a fourth at Peconic Land Trust's North Fork Stewardship Center, Long Island, New York.

Webster, New York

During the fourth quarter of 2001, the Bergey turbine in Webster was in service for 2,208 hours. It achieved a system availability of 100% and avoided unavailable time events. The total energy production recorded during the quarter was 3,454 kWh, for a capacity factor of 15.6%. Please see Table 4 for more details. AWS reported no technical or management issues for this quarter.

Liberty Science Center, Jersey City, New Jersey

Like the Webster turbine, the Bergey turbine at the Liberty Science Center (Figure 10) was also in service for 2,208 hours, achieving a system availability of 100% and avoiding unavailable time events. The total energy production recorded during the quarter was 1,254 kWh, for a capacity factor of 5.7%. More details are listed in Table 4. AWS reported no technical or management issues for this quarter.



Jim Green, NREL/PIX12341

Figure 10. The Bergey Excel 10-kW wind turbine at the Liberty Science Center in New Jersey helps reduce the Center's electricity bill and feeds excess power to the utility grid.

Alternate Site 1, Southampton College, Long Island, New York-project still in planning process

During the fourth quarter, significant progress was made on obtaining approvals for the Southampton College wind turbine installation. On October 18, 2001, the Town of Southampton Zoning Board of Appeals issued a height variance for the proposed tower. The application for the project was deemed complete at a Planning Board meeting on December 6, 2001, and a public hearing was scheduled for January 10, 2002. The Town of Southampton Architectural Review Board unanimously approved the site plan on December 18, 2001, with two abstentions.

Ryan-Biggs Associates, P.C. completed a detailed design review, with calculations by a registered professional engineer licensed in the State of New York, certifying that the design of the structure (including footings, tower, rotor or blade system, and any other component of the wind energy conversion system) complies with the wind load requirements of the NYS Building Code. The design review was submitted to the town's building inspector in December 2001. Long Island Power Authority covered the cost of this review ($4,000) because it is outside of the original budget.

AWS will attend the planning board meeting in Southampton in January 2002. The project team anticipates questions from the board regarding the noise issue. Background information, including field tests of the new Bergey blades, has been requested. After a 10-day public comment period following the Planning Board meeting, planning approval is expected. After approval, Southampton College can apply for the building permit, and approval is expected in early February 2002. J-bolts for the foundation installation are scheduled to arrive on February 4, 2002, and the turbine and tower are scheduled for delivery on February 25, 2002. AWS expects that the turbine will be commissioned by mid-March 2002.

Alternate Site 2, Peconic Land Trust's North Fork Stewardship Center, Long Island, New York-project still in planning process

AWS continues to work with the Peconic Land Trust on a professional and technical services agreement and any permitting and approval issues at the North Fork Stewardship Center site. The Long Island Power Authority has agreed to provide the additional funding necessary to cover the incremental costs of the self-supporting tower, concrete and rebar (foundation), fencing, installation labor, and interconnection equipment for the project.

Testing at the NWTC

AOC 15/50

During this quarter, the AOC 15/50 turbine at the NWTC was taken down for inspection and refurbishment with help from the AOC staff. One of the main findings was wear on the plate in the low speed carrier in the gearbox. The wear was caused by the dislocation of the plate from its counterbore. Metal shavings were found in the bottom of the gearbox, and the oil samples contained a high metal content. The yaw bearing, which was suspected as one of the reasons for the occasional upwind operation, was in good shape.

Whisper H40

All testing of the Whisper H40 at the NWTC has been completed.

Additional data and information for these FVP projects can be found at www.nrel.gov/wind/verification_project_reports.html.

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