Market Manager(MM) recommendations for changes to the 2012 REIP Wind program – 10-12-11

Background

Two safety-related incidents involving small wind turbines occurred in New Jersey earlier this year, prompting the Office of Clean Energy (OCE) to temporarily suspend the wind component of the Renewable Energy Incentive Program (REIP). These incidents were separate and unrelated – one occurred in January , 2011 at a home in Villas, NJ and involved a fire in a 10 kW unit manufactured by Xzeres Wind Corporation, and the other occurred in March, 2011 at a farm in Forked River and involved the separation of rotor blades from a 40 kW unit manufactured by Enertech. These incidents raised serious issues regarding the safety of small wind turbines, the role of the Market Manager (MM) and the OCE in evaluating the safety of individual wind systems accepted for eligibility, and other REIP wind rebate program design components such as consumer protections in the event of turbine failure.

On April 14, 2011, the OCE and MM conducted a Small Wind Working Group (SWWG) meeting to discuss these issues and gather feedback on suggestions for changes to the wind REIP program. The OCE also solicited written comments from stakeholders on future program changes from May 1,2011 through May 13, 2011. Appendix A of this document has the detailed comments. Ccomments were received from:

- Larry Sherwood, Small Wind Certification Council
- Kevin Schulte, Sustainable Energy Developments, Inc. and Distributed Wind Energy Association
- Joe Crecca, JBS Solar and Wind, LLC
- Roger Dixon, Skylands Renewable Energy, LLC
- Robert Olivio, current wind system customer and installer
- James H. Fry, NJSWWG Charter Member Wind Advocate
- Mateo Chaskel. Urban Green Energy
- Filipe Goncalves, Infinite Wind Energy
- Mike Bergey, Bergey Windpower Co.

During the last few months, the MM conducted extensive research on small wind turbine safety and equipment certification, working closely with National Renewable Energy Laboratory (NREL) and the Small Wind Certification Council (SWCC). Also, the MM requested documentation from each of the wind turbine manufacturers that currently have approved projects in the CORE or REIP program with regard to safety records, independent testing and product certification or plans for certification. This research helped the OCE make a decision to remove the hold on existing approved projects that were approved with turbines other than the Xzeres ARE 442 or the Entertech 44A.

The OCE has contracted with NREL to perform a third party investigation covering the two Enertech systems in Forked River and the Xzeres ARE 442 at the home in Villas, NJ. This investigation will take place over the next three months with a final report to include the cause of each incident, and steps that must be taken to prevent any such recurrence. These incidents raised serious issues regarding the safety of small wind turbines, the roles of the Market Manager and the OCE in evaluating the safety of individual wind systems ACCEPTED for eligibility under the REIP, and program design such as consumer protections in the event of turbine failure.

Recommendations to Revise the REIP Wind Program

After reviewing all the stakeholder comments, notes from the April 14, 2011 SWWG meeting and performing additional research on bonding, insurance, rebate calculation and safety, the MM recommends the following changes to the REIP Wind program. The recommendations are summarized into the following categories:

1. Certification/Safety/ Turbine Eligibility
2. Insurance and Bonding
3. Warranty Information
4. Program Inspection Process
5. Calculating Estimated Production for rebate determination
6. Rebate Payments and Rebate Structure
7. Paperwork Changes
8. Implementation of Program Changes

1. Certification/Safety/Turbine Eligibility

Customer and product safety is the number one concern of the BPU with regard to implementing changes in the REIP program. With new products and technologies entering the wind market and changes in ownership of manufacturers with existing products, the program needs greater focus on certification requirements as a critical factor in determining whether a turbine will qualify for a rebate. Additional documentation of performance, safety and durability will be required as necessary. The REIP program will have the ability to remove turbines from eligibility for safety, durability, performance, acoustic or other concerns at BPU staff discretion.

After reviewing the comments received by the stakeholders regarding certification, the MM agrees with the Small Wind Certification Council's (SWCC) recommendations for certification and will require that the REIP point to eligible turbines based upon the following certification criteria:

For a turbine to be eligible for an REIP rebate, a wind turbine manufacturer or authorized designee must provide technical information and specifications of the wind turbine model for BPU review and provide acceptable evidence demonstrating its safety, functionality and reliability through one of the following methods:

- For small turbines with a swept area of 200 square meters or less and within the scope of IEC-61400-2 or the American Wind Energy Association Small Wind Turbine Performance and Safety Standard (AWEA 9.1 – 2009), submission of:
  - Evidence of certification to IEC 61400-2 or AWEA 9.1-2009 by the Small Wind Certification Council (SWCC) or other independent certification body
  - Evidence that a power performance test conforming to AWEA 9.1-2009 or IEC 61400-12-1 has been certified by the SWCC or other Nationally Recognized Testing Lab (NRTL) or independent certification body

- For turbines with a swept area of more than 200 square meters and therefore outside the scope of IEC 61400-2 or AWEA 9.1-2009, submission of:
  - Evidence of type certification by an entity that is accredited to provide product conformity certification to IEC Standard 61400-1, IEC Standard 61400-11 and IEC Standard 61400-12-1
  - Evidence that a power performance test conforming to IEC 61400-12-1 has been certified by a Nationally Recognized Testing Lab (NRTL) or independent certification body

- For turbines that have not yet been certified, the New Jersey Department of Community Affairs (DCA) has authorized local municipal inspectors to require small wind energy systems satisfy a "field listing" of the wind energy generating system. The "field listing" tests will be performed by a Nationally Recognized Testing Laboratory (NRTL) at the expense and arrangement of the installer, manufacturer, or customer. A list of NRTL's can be found at: http://www.osha.gov/dts/otpca/nrtl/nrtllist.html. For turbines that do not have certification, an installation can not pass the local inspection without a passed report from the NRTL.

- The MM spoke with the NJ DCA and learned that the field listing requirement is effective immediately and will focus on reviewing the installation's compliance with the NEC electric codes and making sure each of the major components installed are UL listed by a UL certified testing facility.
- The MM met with a local NRTL to learn more about field listing tests, timeframes and costs. The NRTL shared their approach to a wind turbine inspection:
  - It takes about one month to schedule a field listing with their company
  - Prior to the on-site inspection, this NRTL would request from installer/manufacturer critical documentation so that the NRTL could perform a **Wind Turbine Product Design Review.** This includes a **r**eview of wind turbine design documentation, including electrical component information, schematics, and control and safety functions. This could take a week to review and receive all necessary documentation.
  - During the on-site inspection this NRTL would perform a **Wind Turbine Product Construction Review** which includes a detailed review of all of the electrical standard requirements as applied to the specific wind turbine construction. Also while on-site if there were some labeling issues, this NRTL would identify any actions needed to be taken to pre-qualify for field labeling and the actions required for certification. If this NRTL found that some of the critical components were not UL listed they would identify what component evaluations are required either for field labeling or certification.
  - After the on-site inspection, if there were issues with labeling or components they would develop a test plan for the wind turbine assembly and the plan would specify requirements for proper field labeling and certification. Other on-site and off-site testing would need to occur to satisfy the test plan.
  - Lastly, they would issue a passed or failed **certification report** which would detail the construction/components that have been evaluated and certified, including testing that was performed and any production line or site testing required for compliance.
  - The process from start to finish could take from two to six months depending on what is learned during the on-site inspection.
- This NRTL explained that field listing fees are dependent upon the scope of the testing and any remediation. If there are small or no issues and the site passes the field tests, the costs would be about $3K. If there were issues and this NRTL needs to test the components or assist to make sure the installation is correct costs could be upwards to $10K – $25K.
- All costs that occur during a field listing are the responsibility of the customer, installer, or manufacturer.

2. Insurance and Bonding

Insurance

The MM will require evidence of the following insurance coverage for manufacturers and installers participating in the REIP Wind Program with each individual rebate application. If the manufacturer does not have a US company, this insurance will also be required for the distributor.

General Commercial Liability Insurance

Installers, distributors and manufacturers of turbines used in each project requesting a rebate in the REIP must have standard comprehensive General Commercial Liability Insurance that includes both Completed Operations and Product Liability Insurance. Commercial General Liability insurance for bodily injury liability, including death,

and property damage liability, incurred in connection with the performance of contract, with minimum limits of $1,000,000 in respect of claims arising out of personal injury or sickness or death of any one person, $1,000,000 in respect of claims arising out of property damage in any once accident or disaster and Commercial automobile liability insurance in respect of motor vehicles owned, licensed or hired by the installation company for bodily injury liability including death and property damage, incurred in connection with the performance of this contract with minimum limits of $500,00 in respect of claims arising out of personal injury, sickness or death in any one accident or disaster and $500,00 in respect of claims arising out of property damage in any once accident or disaster.

- **Completed Operations Insurance:** Covers injuries or property damage suffered by third parties as the result of the contractor completing an operation. The contractor must take reasonable care in rendering a project safe and free from all reasonable hazards.

- **Product Liability Insurance:** Covers the manufacturer's or seller's liability for losses or injuries to a buyer, user or bystander caused by a defect or malfunction of the product, and, in some instances, a defective design or a failure to warn. The damages awarded in these claims include medical costs, compensatory damages, economic damages, and, in some instances, attorneys' fees, costs and punitive damages. This policy includes the three types of products "claims" a company may face:

    - Manufacturing or Production Flaws- A claim that some part of the production process created an unreasonably unsafe defect in the resulting product.
    - Design Defect- A claim that the design of the product is inherently unsafe.
    - Defective Warnings or Instructions- The claim that the product was not properly labeled or had insufficient warnings for the consumer to understand the risk.

Through research, the MM learned that although installers would carry Product Liability Insurance, any claims based upon a wind turbine product failure would likely go through the manufacturer's Product Liability Insurance. Or, if the manufacturer does not have a US company, a claim would likely go through the distributor's Product Liability Insurance. We learned there is an exclusion clause in a Product Liability Insurance policy that states that a policy owner can only claim the damage if it is the policy owner's product or "work" that has the flaw or defect.

The insurance policy must include an automatic additional insured provision. The MM will require that the BPU and the customer be named as an additional insured on these policies. Currently, NYSERDA requires that they be named on all policies for vendor participants in their programs.

To ensure compliance with this new requirement, the program would require a Certificate of Insurance for each REIP wind application; one from the manufacturer/distributor and one from the installer. Since the BPU will be named in each policy, program staff must receive any notifications regarding any changes with either policy.

<u>Bonding</u>

The MM researched bonding and determined that a reasonably priced construction bond/performance bond would only be available for a few types of customers/contractor situations. Product Liability Insurance and Completed Operations Insurance does cover the types of financial losses that resulted from the turbine failures in NJ. MM spoke with three bond/insurance companies. MM learned that a performance/construction bond can be issued, but there are some major concerns:

1. The minimum cost would be 5% of the contract price (For example, on a typical 20kW turbine at a cost of about $100,000 for the products and installation – the bond cost would be $5,000.)
2. In addition to the cost, the contractor will need to put up money for collateral and this amount would be based upon the following:
    a. The contractor company's credit rating – the minimum collateral for a contractor with a very good credit rating to a large commercial or public entity is 5% of contract price.
    b. The type of client that the contractor will take out the bond for– a government entity would require less collateral from the contractor but a homeowner would require approximately 30% - 50% collateral because, as these bond companies indicate, the "emotional" nature of a homeowner. (For example, if a small installer needed a bond for a $125K residential project, they may have to put up $37,500 in collateral to bond that one project)

The MM also learned that any claims issued for equipment failures or damage to the customer or property from completed "work" would be handled through the Completed Operations and Product Liability Insurance policies. We were told during our discussions that the performance bond covers the time period during construction. These companies said it is mostly used for ensuring that the project gets built to written specifications and are issued to ensure that if the general contractor cannot finish the project; the bond would cover acquiring the services of the appropriate resources and purchasing the appropriate materials to finish the construction of the project. A performance/construction bond would not be required for participation in the REIP Wind program.

3. Warranty Information

The REIP Wind program requires that turbines, inverters and the system installation include a minimum five year warranty. The MM will require a copy of the customer's equipment warranties (turbine and inverter) that indicate the warranty is at minimum five years. If the manufacturer or installer has provisions that would void the warranty, this must be included in the warranty documents or customer contract. Also, the five year installation warranty must be described in the contract between the installer and customer or, in the case of a PPA, the contract between the system owner and customer.

4. Program Inspection Process

The intent and role of program inspection process is the following:

- Confirm that the equipment that was approved for a rebate is what is was actually installed at the site and is on list of eligible turbines
- Verify the parameters indicated in the REIP paperwork are still valid. (For example, tower height, voltage and other siting requirements) Any discrepancies found could change the rebate and the new rebate will be calculated based upon the NJCEP program inspector's findings
- Verify the capacity of the products and ensure that the system is installed under warranty specifications
- Ensure that the system is operational
- Ensure the project meets the program requirements regarding siting, wind swept area and other program requirements and therefore still qualifies for rebate
- Confirm that an ANSI C12 meter and anemometer are installed at the site

Since the program inspection currently does not inspect for safety and relies on the local inspection for electrical and local code concerns, the MM does not recommend any major changes to the activities performed during the program inspection process. The local inspector will be reviewing system paperwork for certification or if the system has not been certified, the inspector will be requesting the results of the field listing. The MM may also request a copy of the field listing prior to program inspection.

The MM will continue to perform a program inspection of all wind systems that are approved in the REIP. The program inspection would be performed after the project has been inspected by the local authority having jurisdiction and received the authorization to energize by the EDC. The MM will be using an optical range finder during the program inspection to measure accurately the trees and the wind swept area and will be encouraging all installers to use this type of tool.

The MM will request that all parties listed on the application be present for the program inspection.

5. Calculating Estimated Production for Rebate Determination

The MM agrees with many of the stakeholder comments that the current methodology used by the program to estimate production for rebate calculation purposes is over estimating the production of most of the wind systems listed in the program database. The MM also agrees with a stakeholder comment that there are three components to obtaining a more realistic production prediction for a wind turbine and that we should simplify and improve our current process to include these three components:

1. Accurate Power Curves
2. An estimated performance calculator using appropriate inputs specific to NJ
3. A realistic long-term average wind speed at the top of the customer's tower

1. Accurate Power Curves: The REIP program will require power curves tested per AWEA 9.1-2009 and certified by the Small Wind Certification Council (SWCC, or a Nationally Recognized Testing Laboratory (NRTL) for turbines with rotors up to 200 square meters in area (the scope of the AWEA standard). For larger turbines the appropriate standard is IEC 61400-12. This will ensure a level playing field and provide the most accurate representations to consumers.

2. An estimated performance calculator: The US DOE has provided a grant to the Cadmus Group to develop a web-based Distributed Wind Site Analysis Tool (DSAT) that will be freely available on the DOE website. The free license allows each user to save up to three projects in the tool. Users can upgrade to save an unlimited number of projects and receive an economic analysis module for an annual license fee of $300. This tool will include the NREL 2003 validated wind maps and requires site analysis inputs with the intent to determine a better estimate of the performance of the system at that site. Availability of the tool is expected to be announced during the October 26, 2011 Community Wind Across America Conference in Albany NY. The NJCEP program will require use of this tool for all REIP wind participants and the output report will be required in the REIP application package. Appendix B includes a sample copy of the output report created from the DSAT tool. Since the tool input values are based on local observations, this provides all parties with *transparency* into the estimated performance calculation. Proper siting observations will change the Turbulence Intensity Values and Wind Shear Values to better represent the NJ terrain. Listed below is a table that outlines the values that would be similar to the NJ terrain. Previous tools used in the REIP wind program defaulted to values that indicated the terrain was well exposed and the surface was level with very limited trees.

Turbulence Intensity Values:

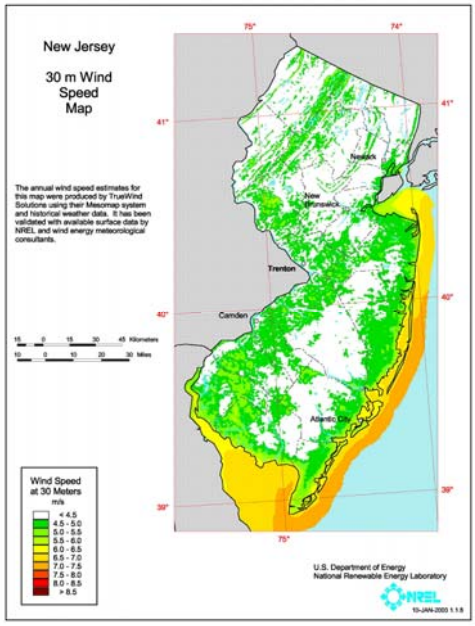
Terrain	Factor	Site Quality
Well Exposed	15%	Good
Some Ground Clutter, Scattered Trees, buildings	20%	Average
Many Trees or Buildings, lower elevation than surroundings	25%	Poor

Wind Shear Values:

Surface Description:	Wind Shear (α):
Smooth, hard ground, lake or ocean	.14
Short Grass on untilled ground	.17
Level country w/ high grass, occasional tree	.21

For extremely compromised sites add 5 - 10% more	30% - 35%	Very Poor	Tall row crops, hedges, a few trees	.23
			Many trees and occasional buildings	.25 - .27
			Wooded country, small towns and suburbs	.35
			Urban areas with tall buildings	.5

3. Average Wind speed determination: The wind speed maps all have their inconsistencies. Developing a consistent average wind speed calculation methodology to be used for all projects is essential. Having all projects use the DSAT tool that uses the NREL 2003 validated wind map (see below) will ensure consistency within the program. Additionally over time the MM can also review the data gathered through the anemometer loan program to see if more accurate wind speeds can be determined. The tool can derate the wind speeds if the anemometer data is different. As discussed further in the rebate section, focus for the wind program should be in areas on the map below that represents good wind resource areas.



6. Rebate Payments and Rebate Structure

Rebate Payment

Per feedback from the OCE staff, the MM recommends that rebate payments be paid under the following schedule:

a. 50% of the rebate paid upon project completion (defined as installation, inspection, and demonstrated compliance with all program requirements)
b. Up to the remaining 50% of the rebate paid upon demonstration of actual 1st year system production (kWh) via an ANSI C12 meter.

This new structure would allow the NJCEP to have one rebate program that would cover all wind systems that meet the appropriate eligibility as defined in the certification section. Eligible products include both horizontal

and vertical axis wind turbines with power curves certified by NRTLs as defined earlier. Therefore the Innovative Wind Technology Incentive, (IWTI) will be terminated.

Rebate Structure

The MM agrees with some stakeholders that having more realistic performance estimations for wind projects under the current rebate structure would reduce the rebate calculated for many projects. For example, in the past a 10kW system proposed for the most productive site had received a rebate of $51,200 based upon an estimated annual production of 17,250 kWh. If a more realistic performance estimation for this project were around 13,000 kWh, it would result in a rebate calculation of $41,600. Regardless of the rebate amount, it is critical that individual project financial justifications include an accurate estimate of production in order for the customer and the state to determine the attractiveness of the investment. A large rebate should not be the reason to install a wind turbine.

The MM developed a Financial Analysis for wind systems in NJ using 8 different sample wind projects and two rebate structures; the current rebate structure and the recommended rebate structure which adds an extra incentive for projects that are sited in the areas in NJ with the better wind speeds. Appendix C includes this analysis. The financial analysis indicates, larger rebates for projects in the optimal wind areas do help further enhance the financial justification for developing a wind project.

However, much of the project justification comes from net metering via the electricity generation afforded by the actual system performance. Systems with better wind speeds and better siting will produce more energy and therefore show a more positive financial picture. It will be important for customers to see an accurate financial analysis of their wind system prior to purchase. The upgraded version of DSAT is expected to include financial analysis and NREL also offers a free tool for this that the NJCEP can make available on the website. In an effort to see more growth with wind systems in areas with better wind speeds, the MM is recommending a new rebate structure for the program:

Current Rebate		**Proposed New Rebate Structure**	
Production	**Rebate Amount**	**Production**	**Rebate Amount**
1-16,000 kWh	$3.20/ kWh	1-15,000 kWh	$2.50/ kWh
16,001-1,000,000 kWh	$0.50/ kWh	15,001-1,000,000 kWh	$0.50/ kWh
		Project with greater than or equal to 13.4 mph or 6.0 m/s and project production is less than or equal to 500,000 kWh	Additional $0.50/kWh
Max rebate for residential is $51,200 & non-residential is $543,200		Max rebate for residential is $45,000 & non-residential is $530,000	

7. Paperwork Changes

At Initial Application

All existing 2011 REIP wind rebate program paperwork requirements will still be in effect. In addition to the warranty documentation and certificate of insurance discussed previously in this proposal, an additional form will be developed regarding the payment structure of the rebate. Since rebates are being paid in two payments, this new form for customer and installer signature would reiterate the payment structure. It would also state that estimates in production are used for determining maximum rebates and that the rebate payment calculation is an estimate. The rebate payment issued at project completion will be paid at one half the estimated rebate and the project will receive the final payment based on actual production during the first 12 months of system production. This form will include information on reasons why actual production may vary from estimated annual production for the site and also state that the BPU does not guarantee the performance of any renewable energy systems. The Initial Application approval process will require sign off from the wind turbine manufacturer on the estimated annual performance number that was used to calculate the rebate. This requirement will be further defined in the Market Manager's compliance filing for 2012.

With Final As-Built

The program inspection will take place after the system has been demonstrated to have received a passed inspection by the local authority having jurisdiction to inspect to the state's Uniform Construction Code (UCC) and has been demonstrated to be interconnected to the NJ electric distribution system. The REIP wind program will continue to require the Final As-Built Paperwork currently required in 2011. This includes:

- The Final Application Form signed by the applicant and installer.
- A revised REIP Wind Equipment Technical Worksheet with the correct rebate if the system size, installation costs, or any other data has changed since the initial application submittal.
- A copy of a New Jersey Tax Certification Certificate (only for commercial, non-profit, or farm projects), available at www.njcleanenergy.com/misc/renewable-energy/tax-clearance-certificate.This is not required for residential or public sector projects.
- A one-page final site map (if the site map has changed from initial application submittal).
- Representative digital photographs of the system. The photos shall be a minimum of 5" x 7" at 300 DPI and must include 1) the turbine , 2) inverter(s), 3) site changes if any from original application or registration and 4) the ANSI C12 meter and 5) the anemometer
- Copy the UCC from the local municipality inspection
- EDC Notification - Interconnection completion documentation from the utility
- ANSI C12 Certified Meter Worksheet

8. Implementation of Program Changes

There are currently 2 wind rebate commitments extending back to the original CORE wind rebate program and 27 wind rebate commitments with current rebate commitments made under the REIP wind rebate program. The Market Manager recommends that no extensions be granted for projects under the previous rebate programs and that any project with an existing commitment that does not complete within its previous commitment length submit a new application under the improved rebate design to ensure that all projects and program participants enjoy the protections of the proposed program design.

In conclusion, we feel our recommendations support the comments received from the public and the previous discussions between the OCE staff and the MM. We also feel these recommended changes do take positive action to protect the public, protect the BPU, restore confidence in both the technology and the REIP and minimize risk to ratepayer dollars.

Appendix A: Stakeholder comments on REIP wind program changes:

Small Wind Program Change Request for Comments Summary:

The Small Wind Working Group met on Thursday, April 14, 2011 from 11:00am to 1:30pm. Discussions centered on developing program changes that will restore confidence in the program and better address safety and performances concerns. During the meeting the BPU staff requested that installers, manufacturers and other industry stakeholders share their comments and thoughts regarding program changes as well as what currently is in place in the industry regarding customer protection in the event of a failure. The BPU staff and the market managers will be developing a straw proposal for public comment incorporating stakeholder program changes that will be addressed to the Board for approval as part of the compliance filing prior to opening the wind program. Please e-mail your suggestions to OCE@bpu.state.nj.us <mailto:OCE@bpu.state.nj.us> by Friday May 13, 2011. The notice was sent to both the small wind working group and the RE committee e-mail list service on May 4, 2011.

The comments received were summarized into the following categories:

1. **Wind Performance Calculator**
2. **Rebates, Incentives and Turbine eligibility**
3. **Certification/Safety**
4. **Insurance and Bonding**
5. **General Concerns**

Wind Performance Calculator:

Kevin Schulte, Sustainable Energy Developments, Inc. and Distributed Wind Energy Association

Concerns:

Seventh Generation Energy Systems, Seventh Wind performance calculator currently used to estimate performance in NJ has documented inaccuracies relating to the modeled power curves with results in distorted price signals.

Recommendations:

I feel there are three components to obtaining a more realistic performance prediction for a wind turbine. 1. Accurate power curve 2. A "bins method" calculator with appropriate inputs 3. A realistic long-term average wind speed at the top of the customer's tower:

4. Accurate Power Curves: The program should move towards requiring power curves tested per AWEA 9.1-2009 and certified by the Small Wind Certification Council (SWCC_or a Nationally Recognized Testing Laboratory (NRTK) for turbines with rotors up to 200m2 in area (the scope of the AWEA standard). For larger turbines the appropriate standard is IEC 61400-12. This will ensure a level playing field and provide the most accurate representations to consumers. Until there are sufficient numbers of small wind turbines in AWEA or IEC certifications we recommend requiring third-party verified power curves to AWEA or IEC standards.
5. A "Bins Method" calculator: BPU should contract with a company that can provide both in an integrated package NYSERDA, for example, requires the use of the AWS/Truepower Small Wind Explorer (www.nyswe.awstruepower.com). The industry is generally pleased with the accuracy and ease of use of

the Small Wind Explorer tool. Another possible vendor is New Roots Energy, with their "Wind Report" www.newrootsenergy.com, which integrated with a 3Tier wind database. Several small wind manufacturers subscribe to Wind Report and provide access to it for their dealers and customers. Alternatively you can allow manufactures to provide performance predictions using their own "method of bins" spreadsheet or a generic one generated by BPU.

6. Average Wind speed determination: The state to provide an integrated package that has everyone drawing wind resource data from the same database.

DWEA believes that doing the performance predictions and rebate calculations right is critically important and we encourage the BPU to make the investments necessary to restore the faith in this aspect of the program.

Joe Crecca, JBS Solar and Wind, LLC

Recommendations

Suggest that the BPU allow who they believe is qualified or by justification in proofs, installers to derate in the Seventh Wind performance calculator either by the alpha coefficient, turbulence intensity or both which is specific to the site project.

Mike Bergey, Bergey Windpower Co.

Recommendations

Stop purchasing Seventh Wind performance calculator or any other companies wind turbine performance calculator. Instead utilize the free generic version of the WindCAD spreadsheet small wind performance calculator written in 1984.

Update Seventh Generation's 10kW power curves in the Seventh Wind model because they are out of date and 25% low for Bergey and overly generous for at least one competitive model

James H. Fry, NJSWWG Charter Member Wind Advocate

Recommendations

Should continue using the Seventh Wind performance calculator as this was researched by the NJSWWF and it does use both objective and subjective information.

Roger Dixon, Skylands Renewable Energy, LLC

Recommendations

The Seventh Wind performance calculator is the estimated performance calculator that is used to calculate the NJ BPU REIP funding payments for wind turbine installations in NJ.

It is a calculator and as such has a few inherent facets that need to be understood.

- Certain variables are under the control of the individual filling in the blanks. These variables include:
  - Annual energy use in kWh's
    - Annual energy use in kWh's is derived from the customer's electric bill. This number is easily obtainable and verifiable.

- Site wind speed from map
  - Site wind speed is derived from wind data mapping sources. Wind speed numbers vary depending on the source of the data and when that data was last updated. In the past, NJ has used the average of the data from AWS Truewinds, 3 Tier/Firstlook and NASA. All three of these data sources were free when the initial decision to use them was made. However, not only are AWS and 3 Tier no longer available as free reports, but they also have not been formally replaced with any other data sources. These are variable numbers that change as data is updated.
- Map wind speed height (m)
  - Wind speed height will vary with the map being used. The NJ REIP program uses a 50 meter height from wind maps. Not all wind mapping data has a 50 m height. These are variable numbers.
- Recommended tower height (ft)
  - Recommended tower height is determined by using the industry standard for small wind turbine siting, adopted by the NJ REIP program, which is to have the bottom arc of the blades at their lowest point a minimum of 30' above the tallest obstruction within a 500' radius of the tower location. This is a variable number. It should also be changed to include "or the neighboring tree line, whichever is higher".
- Site altitude
  - Site altitude comes from topographical maps or Google Earth type programs. These numbers are easily obtainable and verifiable.
- Wind shear
  - Wind shear is a judgment call by the person inputting the data, and as such is a highly variable number. Additionally, the industry standards for calculating wind shear have been rapidly changing over the last 3-5 years due to the collection of actual recorded field data. More aggressive standards are now the norm.
- Weibull K
  - Weibull K is typically left at "2.00", but is a number that is variable in more sophisticated wind modeling and performance programs. This can potentially be another judgment call by the person supplying the input.
- Turbulence intensity
  - The applied turbulence intensity number is based on the interpretation of the person inputting the data and as such is a highly variable number. Like wind shear, the industry standards for turbulence intensity have been rapidly changing over the last 3-5 years due to the collection of actual recorded field data. More aggressive standards are now the norm.

- For illustrative purposes, I have attached three versions of the Seventh Wind performance calculator for your review.
  - The first attachment is Version 10.5, the first version adopted by NJ for wind turbine estimated performance calculations. I include it here in order to demonstrate its use by me for site assessments in the summer of 2008, which in part, led to subsequent wind turbine installations in Dec. of 2009.
  - The second attachment is Version 10.81 of the Seventh Wind performance calculator, which was updated in March of 2010. In this update, the turbines that had just been installed 3 months earlier were de-rated resulting in a 26% decrease in the estimated performance of the turbine (see red highlighted areas in attachments).
  - The last attachment is Version 10.81, using the more recent industry standards for de-rate calculations (instead of those in place in July 2008.) Using updated de-rate inputs, the overall difference in productivity estimates for these particular installations is 48% less than the original calculations. All of this due to different internal changes and external inputs in the Seventh Wind performance calculator. While the span is not as large for all the turbines listed in the Seventh Wind performance calculator, this particular span of variability is substantial.

    - A point of note is that this is the same wind turbine (WTIC/Jacobs) that I believe represents the majority of the small wind installations in NJ. It follows that the actual data from these installations and the customer's performance expectations will be disparate, especially when viewed against site calculations done 3-4 years ago.
- The industry is constantly refining and updating its data and site assessment tools. Changes and adjustments need to be viewed, understood and incorporated correctly. This doesn't imply that the current system is broken or that the current calculator is inadequate, but perhaps in need of a tune up instead.
- To my knowledge we have not had an update to the Seventh Wind performance calculator since March 2010, thirteen months ago. NJ previously received updates every 6 months. When I had inquired this past fall about the lack of recent updates to the calculator, I was told that there was "no budget" to incorporate these updates.

Other calculators are currently available -- some fairly simple and others fairly complex. Here are a few of them:

- NY Small Wind Explorer (AWS True Power)
- New Roots Energy
- RETScreen
- WI version of Seventh Wind
- Wind Products, Inc.

Some of these other calculator options were discussed with the Market Managers during the spring/summer of 2010, but "no budget" was available to make any of needed changes.

Contrary to statements made during the 4/14/11 meeting, as I understand the current REIP program requirements, it does not require an individual to be an "MREA Certified Site Assessor" in order to make an adjustment to the estimated wind turbine performance that is calculated using the Seventh Wind performance calculator. The program stipulates that only a "*Certified Site Assessor or an engineer*" are authorized to override the NJ BPU Market Manager's estimated performance calculations. This criteria was specifically put in place to target and prevent performance estimates that *exceed* the Market Manager's estimated performance calculations. Hence only a Certified Site Assessor or an engineer can calculate a higher amount and they would need to be able to justify that calculation to the Market Managers. It was purposefully and thoughtfully set up this way to protect the rate payers and the SBC (Societal Benefits Charge) that is paid to fund the REIP program. A *downward* adjustment to estimated performance would not require a Certified Site Assessor or an engineer. No rate payer protection would be warranted for calculations that were de-rated further than the Market Managers calculation, since a further de-rate results in a lesser REIP payment.

Additionally, the REIP program did not, at any time, stipulate the "MREA" specifically as the only legitimate source of certification (as was repeatedly stated by the same meeting attendee who misunderstood the certification requirements for the override feature of the program). It is important to note here that in addition to serving as the former and current chair of the NJSWWG Siting and Zoning Committee, I also currently serve on the JTA (Job Task Analysis) Committee for the NABCEP (North American Board of Certified Energy Practitioners) Wind Site Assessor Certification. The NABCEP Wind Site Assessor certification was already being developed at the time of the implementation of the NJ REIP estimated performance based funding program. The NJSWWG Siting and Zoning Committee concluded that the REIP program should include the broader language of "*Certified*" Site Assessor, rather than limiting the program by naming a certification from a specific entity. This broader language would allow the NABCEP certification and/or *any other valid industry certification* to be accepted without requiring a re-write of the program.

The NABCEP Site Assessor Certification process has now moved out of the completed Task Analysis phase and into the commencement of work on the Resource Guide. Upon completion of the Resource Guide, the Exam Committee will develop and write the exam questions, and the test will be formulated and launched. Successful completion of the test would enable a candidate to achieve NABCEP Certified Site Assessor status, thereby meeting the criteria to be considered a Certified Site Assessor under the NJ REIP program. It is notable that the requirements to sit for the NABCEP exam are stringent and include classroom training, field experience and practice site assessments. The NABCEP Wind Site Assessor Certification will be a welcome addition to the current wind site assessor curriculum that is currently available within the industry -- and to be perfectly clear, the new certification is expected to meet the NJ REIP program requirements.

The current MREA Wind Site Assessor certification requires 40 hours of instructional class room and field activity, two practice site assessments that are graded pass or fail and a 5 or 6 hour

(+ or –) exam with a minimum passing grade. For more details about this certification, please visit www.mreacsa.org.

Rebates, Incentives and Turbine Eligibility

Robert Olivio, current wind system customer and installer

Recommendations

Financial values for the wind RECs to be similar to the SRECS and Off-shore wind incentives.

Larry Sherwood, Small Wind Certification Council

Recommendations

Base the incentive levels on the power performance curve certified by the SWCC or other independent certification body.

For funding designed to support inventions or new, unproven wind turbine designs, continue basing payments on actual kWh production, and require evidence that a power performance test conforming to AWEA 9.12009 – IEC Standard 61400-2 has been certified by an independent certification body such as the SWCC.

Rebate applications based on a substantially inflated performance or reliability claim should not be awarded.

Kevin Schulte, Sustainable Energy Developments, Inc. and DWEA

Recommendations

Rebate should be enhanced to promote more wind energy development.

Proposed incentives for Wind Systems

Production	Rebate Amount
1-16,000 kWh	$3.20/kWh
16,000-250,000 kWh	$1.25/kWh

250,001-1,000,000 kWh $0.50/kWh

Mateo Chaskel. Urban Green Energy

Recommendations

A portion of the incentive (50%) should be paid up-front based on nameplate power, with the remainder to be paid after verified one year energy output.

James H. Fry, NJSWWG Charter Member Wind Advocate

Recommendations

One of the agreed ways for being added to the NJ approved list is if the turbine is already on the Wisconsin or the New York Approved Lists, The NY list is what NYSERDA has qualified.

Filipe Goncalves, Infinite Wind Energy

Recommendations

As a recent start-up and manufacturer of wind turbines in NJ, we are strongly opposed to limiting the REIP to turbines with proven track records. The wind turbine industry is growing rapidly, and a great number of advancements in the field are being made by small businesses, with limited resources, and no prior track record. Such a rule would prevent small manufacturers from competing with larger corporations. The market needs more wind turbines and more competition in order to bring the prices down and make this technology more assessable. Therefore we strongly suggest the REIP and the IWTI do not adopt a proven track record clause as it would be devastating for innovation, competition, local jobs and ratepayers.

<u>Certification/Safety</u>

Larry Sherwood, Small Wind Certification Council

Recommendations

SWCC recommends the following eligibility language for the BPU to replace the existing eligible list and transition to certification requirements.

To be eligible for incentives, a wind turbine manufacturer or authorized designee must provide technical information and specifications of the wind turbine model for BPU review and provide acceptable evidence demonstrating its safety, functionality and reliability through one of the following methods:

- For small turbines with a swept area of 200 square meters or less and within the scope of IEC-61400-2 or the American Wind Energy Association Small Wind Turbine Performance and Safety Standard (AWEA 9.1 – 2009), submission of:
    - Evidence of certification to IEC 61400-2 or AWEA 9.1-2009 by the Small Wind Certification Council (SWCC) or other independent certification body; OR
    - For time-limited eligibility through December 31, 2011, evidence that a power performance test conforming to AWEA 9.1-2009 or IEC 61400-12-1 has been certified by the SWCC or other independent certification body.
- For turbines with a swept area of more than 200 square meters and therefore outside the scope of IEC 61400-2 or AWEA 9.1-2009, submission of:

- Evidence of type certification by a certification body that is accredited to provide product conformity certification to IEC Standard 61400-1, IEC Standard 61400-11 and IEC Standard 61400-12-1; OR
- For time-limited eligibility through December 31, 2011, evidence that a power performance test conforming to IEC 61400-12-1 has been certified by an independent certification body.

BPU may require additional documentation of performance, safety and durability, including reported production from a retail installation in North America where an owner/operator is available for interview. Listed turbines may also be removed for safety, durability, performance, acoustic or other concerns at BPU staff discretion.

Section N.5 of SWCC's Certification Policy describes grounds for sanction and corrective action. If a deficiency or violation is found, the SWCC Certification Commission has a list of possible actions it can take ranging from private or public reprimand to certification revocation.

Likewise the BPU staff should be authorized to rescind eligibility for products experiencing failures or poor operational performance, reliability, or warranty support.

The following optional provisions could be considered for small turbines that fall under the scope of AWEA 9.1-2009 to allow flexibility during a limited transition period.

- Alternative interim requirements for the remainder of 2011 include submission of:
  - Evidence of certification under the UK's Microgeneration Certification Scheme www.microgenerationcertification.org/mcs-consumer/product-search.php)
  - Evidence of type of certification by a certification body that is accredited to provide product conformity certification to IEC Standard 61400-2, IEC Standard 61400-ii, and IEC Standard 61400-12-1
  - Evidence of designation as eligible for incentives by the New York State Energy Research and Development Authority
  - Evidence of designation as SWCC "Under Test" status level and one year of reliable operation (12 months of wind speed data coupled with monthly energy production information maintaining operational availability of atleast 96% of the model of equipment at retail installation in North American with wind speeds of at least 12 mph at hub height and owner/operator is available for interview
- Base incentive levels on the power performance curve certified by the SWCC or other independent certification body
- For funding designed to support inventions or new, unproven wind turbine designs, continue basing payments on actual kWh production, and require evidence that a power performance test conforming to AWEA 9.12009 – IEC Standard 61400-2 has been certified by an independent certification body such as the SWCC.

Rebate applications based on a substantially inflated performance or reliability claim should not be awarded.

Kevin Schulte, CEO of Sustainable Energy Developments, Inc. and DWEA

Recommendations:

<u>Safety – Setbacks:</u>

DWEA recommends that setback requirements be set prudently and in line with actual risks. Our recommendation is for no setback restrictions beyond what is in place for other structures on the property such as a setback in reference to the nearest neighboring occupied dwelling rather than the neighboring property

line. No matter how many small wind turbines are installed, they will never equal the magnitude of the risk posed by trees, which have no set back restriction.

Turbine Certification:

To increase the likelihood of safe and reliable distributed wind turbine systems in NJ, DWEA recommends the following for system certification to qualify for a rebate:

1) For Turbines with rotors up to 200m2 in area, require SWCC certification to AWEA 9-1-2009 after either January 1st or July 1, 2012.
2) Allow "Provisional Eligibility" in the interim if:
    a. Turbine is UK MCS or IEC 61400-2 certified or
    b. Turbine in under contract with SWCC, under field test with an accredited or SWCC-audited (specific to turbine set-up)
    c. The "Provision Eligibility" would expire based on the dates noted above in #1.
3) For larger turbines, require a power curve NRTL certified to IEC 61400-12.

Installer Eligibility:

DWEA strongly supports safeguards for NJCEP that regulate companies who wish to install quality distributed wind energy systems. The following recommendations are meant to assist the NJ BPU in establishing standard industry guidelines.

Institute a Code of Conduct for Installers. At a minimum, the Code of Conduct needs to contain:

1) Installer eligibility based on a specific size-range of wind generator systems, depending on the types of wind generators systems the installer has experience installing, which also may include generators or towers depending on the training and experience demonstrated. Past performance under BPU programs should be critical criteria for determining eligibility and the conditions of eligibility under this solicitation.
2) The right of NJBPU to refuse to grant eligibility for any reason, such as inadequate training, inadequate experience, poor references, failure to act professionally, fairly and in good faith with NJ BPU or customers, providing false information to NJ BPU or customers, poor performance in previous BPU programs and committing actions that would be subject to disciplinary actions by the State.
3) Include eligibility determination on factors such as acceptance of all program terms and conditions, training, extent and type of installation experience, customer references, and meeting the insurance requirements of the program.
4) Include eligibility standards that apply to all installer employees and subcontractors
5) Installers must meet and maintain all insurance requirements, both commercial general liability and commercial automobile liability insurance. Proof of insurance must be provided before rebates are paid.
6) Installers must demonstrate adequate competency installing wind energy conversion systems, for example – provide proof of installing three wind energy conversion systems or participated in hands –on training and /or manufacture's training for the installation of a wind energy conversion system within the previous two years. Customer references that verify competence on installing at least three wind systems must be provided. Site assessment skills, wind resource and energy estimation skills, and professionalism will also be evaluated.
7) Unless the installer can demonstrate sufficient wind installation experience in addition to the classroom and hands-on-training, their eligibility will be contingent on having an Eligible Installer present for the pouring of the foundation, wind energy conversion system assembly and erection. This condition will be removed once the installer demonstrates competence through references and inspections.

8) Rebates will not be paid before eligibility of any installer has been approved and stated in writing by the NJ BPU
9) Such eligibility of NJ BPU will not in any way mean endorsement of or guarantee, warrant, or in any way represent or assume liability for an y work proposed or carried out by an Eligible Installer. Additionally, the NJ BPU is not responsible for assuring that the design, engineering and construction of the project or installation of any wind generator system is proper or complies with any particular laws, regulations, codes, licensing, certification, and permit requirements or industry standards. The NJ BPU does not make any representations of any kind regarding the results to be achieved by the wind generator systems or the adequacy or safety of such measures.

James H. Fry, NJSWWG Charter Member Wind Advocate

Recommendations

The wind industry has developed certification for small wind turbines which will help with the safety and reliability of the units. Talking with some tower manufacturers, I have been told that they also now have certification criteria for towers. These certification criteria for towers should be considered and invoked in the NJCEP to further ensure the safety of small wind installations. Towers and Foundations are a critical part of the systems.

Mateo Chaskel, Urban Green Energy

Recommendations

Safety should be addressed by testing up to the standard safety and standard guideline, IEC 61400-2. This is the widely accepted standard for wind turbine safety, and is also what the SWCC will use to ensure safety.

Filipe Goncalves, Infinite Wind Energy

Recommendations

Public safety and health are of the utmost concern to our organization, and we support rulemaking that protects the consumer and makes them whole in the event of a turbine failure, as a result of manufacturer or installer negligence. However, when the end user has tampered with the equipment any protections should be void, provided the proper disclosers and warning signs were used. Furthermore, we would like to emphasize that the word “failure: needs to be clearly defined and limited. For example we believe that regular maintenance and other related services should not be considered “failures”

Insurance and Bonding

James H. Fry, NJSWWG Charter Member Wind Advocate

Recommendations

At the SWWG meeting in April, some comments made by the attendees were not as accurate as they could be. The insurance issue was one of them. The costs quoted were exaggerated by a large factor. The insurance costs should be pro-rated over all the work that the contractor accomplishes not just a wind installation.

Kevin Schulte, CEO of Sustainable Energy Developments, Inc. and DWEA

Recommendations

DWEA recommends the standard company insurance for any eligible wind energy installer. While DWEA supports requiring adequate insurance, it does not support any action by the BPU that would dissuade small businesses from not entering the market or will cause the small business to close its doors. An example of suitable insurance coverage is:

Commercial General Liability insurance for bodily injury liability, including death, and property damage liability, incurred in connection with the performance of contract, with minimum limits of $1,000,000 in respect of claims arising out of personal injury or sickness or death of any one person, $1,000,000 in respect of claims arising out of property damage in any once accident or disaster and Commercial automobile liability insurance in respect of motor vehicles owned, licensed or hired by the installation company for bodily injury liability including death and property damage, incurred in connection with the performance of this contract with minimum limits of $500,00 in respect of claims arising out of personal injury, sickness or death in any one accident or disaster and $500,00 in respect of claims arising out of property damage in any once accident or disaster.

Joe Crecca, JBS Solar and Wind, LLC

Recommendations

My company is an offshoot of a general contracting firm whose primary business is general construction. We appreciate first hand the necessity for appropriate insurance coverage.

Bonding: While bonding is used in the construction business its general use is in the form of a performance bond. This type of bond by definition is for the completion of a construction project only, that the contractor will built out the project. I do not think this is a matter of concern from the standpoint of the NJCEP nor do I think this type of bonding is the answer.

Insurance:

General Liability, Product Liability and Completed Operations are what I think the BPU should focus. It was discussed at the meeting that Product Liability and Completed Operations insurance are not available to small wind turbine installers. Atleast for us this is not the case we have all three. We are limited at this point to turbines at a hub height of no more than 200 feet and the name plate generation turbines of less than 100kW. We can by the job pay for additional insurance should we exceed the parameters. This not only protects our clients but us as well should an incident occur.

Roger Dixon, Skylands Renewable Energy, LLC

Recommendations

Bonds

I contacted the South Bay Risk Management & Insurance Services company and I sent in a letter from them stating that Performance Bonds do not cover a product mishap, performance bonds are used to assure the project owners that if a contractor defaults on completion of the project that the Surety Company will step in and hire a new contractor to complete the project.

Insurance:

Contrary to what was stated during the April 14th SWWG, it is not necessary to pay $20,000-$25,000/year for this coverage, nor would it be appropriate to mandate that this particular program and its related cost be incurred by small wind installers in NJ. The coverage my company, Skylands Renewable Energy, currently has is adequate under the HIC mandates in NJ ((Home Improvement Contractor licensing is required to install wind turbines in NJ) and also meets the requirements of the NYSERDA wind turbine funding program in NY. Skylands has also installed turbines in PA, MD and will be in NC in a couple of weeks installing a wind turbine. My existing insurance coverage meets or exceeds the requirements in these states as well.

Typically, there aren't any differing "standards" that would affect insurance coverage and underwriting between the states, except for periodic regional issues that occur when a State's Legislature enacts broadened laws that make it difficult for carriers to operate profitably. NJ, NY & CA have been, and still are, more restrictive than most states in their requirements for carriers to be admitted to write coverage in these states. According to my broker, Colorado presents as a recent example of this and the insurance marketplace reacted, as is typical, by cutting off new business.

The cost for the type of insurance coverage in question always depends on the level of exposure and the claims history of the individual company applying for coverage. Historical industry data can also be a factor. I want to be clear that I have no knowledge of the company referencing the $20,000-$25,000/year premium, but it is possible that their exposure and/or claim history is a factor in their unusually high premiums. Or perhaps it is that high because they are also a general construction company and that small wind turbine installations is not their only "exposure".

Coverage for my company, which specifically notes liability coverage for wind turbine installations, as well as professional liability for wind site assessments, seminar and teaching venues, etc., is approximately 20% of the cost stated in the room, and is more in line with expected coverage and premiums for the small wind industry. The coverage and premium is affordable for my company, as well as for many other small wind installers in the US. Mandating an expensive insurance program would limit the available wind turbine installer base, dissuade future companies from entering the market, benefit larger companies with deeper pockets (or a willingness to blindly pay exorbitant premiums), and would likely cause many highly skilled & experienced small wind installation companies to close their doors.

My broker and the insurance carrier I use currently insure 14 small wind turbine installers in nine states; CA, CO, IA, NJ, NY, PA, TX, WI and MD. The coverage that is afforded meets or exceeds those state requirements for installing wind turbines. It also meets or exceeds the insurance requirements for the 18 or so wind turbine manufacturers that I have dealer/installer relationships with. If you would like my broker's contact info to further discuss the details or to entertain a state "wind installer insurance program", as was noted during the NJSWWG meeting, I would be happy to provide you with his info.

General Concerns with changing the program

James H. Fry, NJSWWG Charter Member Wind Advocate

Concern

In NJ both the tower and foundation require a Professional Engineer to certify their design and integrity. Even though you work with stamped certified designs, accidents can still happen. I would hope the OCE would not hold up or discontinue the REIP based on just this one incident. The small wind marketplace has just started to

catch on in NJ and it would be a shame that this one incident to stall many years of effort by many dedicated people to get us to where we are today. Wind turbines in general have been a very safe scenario and most of the failures have been caused by human error.

Kevin Schulte, Sustainable Energy Developments, Inc. and Distributed Wind Energy Association

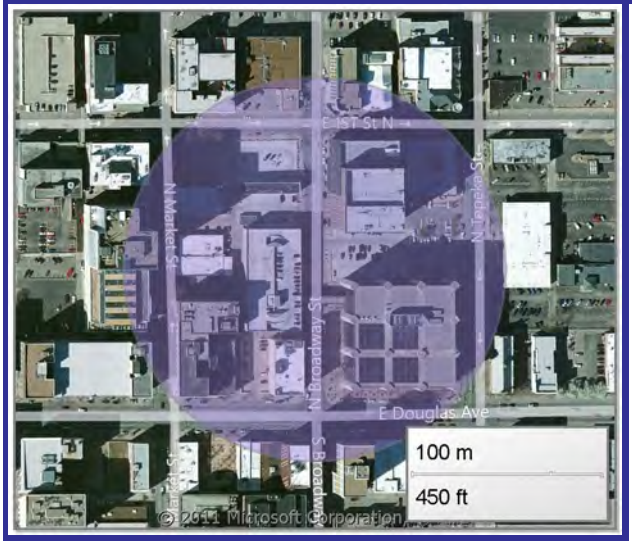
Concerns:

There are no documented instances of small wind turbine-related injury or death of a "civilian" in the US in the past 33 years. Well documented practices that can be followed to help ensure the safety of small wind turbines. When proper practices are not followed during construction or when regular maintenance is neglected, any inherently safe technology can become unsafe. DWEA understands the importance of proper installation and maintenance of small wind turbines and supports the reasonable requirements to follow building and electrical codes consistent with other construction projects. DWEA also supports the inclusion of a reasonable decommissioning clause in the zoning ordinance or conditional use permit should the small wind turbine fall into disrepair. Turbine systems that pose legitimate safety hazards should be promptly repaired or removed, just as any other public hazard.

Distributed Wind Site Analysis Tool

The Distributed Wind Site Analysis Tool (DSAT) is a powerful online tool for conducting detailed site assessments for single turbine projects, from residential to community scale. DSAT, created by a partnership between The Cadmus Group, Inc., Encraft, and the National Renewable Energy Laboratory (NREL), is made possible through funds from the U.S. Department of Energy.

Aerial View



Report Date: 9/9/2011

Report Author:	John Lindquist
Company:	The Cadmus Group, Inc.
Author Email:	john.lindquist@cadmusgroup.com
Prepared For:	John Lindquist
Project Name:	April21
Site Name:	ME2
Proposed Site Address:	139 N Broadway St, Wichita, KS 67202
Turbine Manuf/Model:	Bergey Windpower Co./Excel-S

Disclaimer: This tool was developed by the Cadmus Group Inc. on behalf of the Department of Energy. It is intended to provide a coarse estimate of wind resource and no guarantee is made as to the actual resource availability for specific locations. Users enter site condition parameters such as terrain and obstacles and other variables that affect the model's resource estimation. The tool provides a preliminary rough estimate of what the likely wind resource is for the area of interest. If the resource estimate appears sufficient to warrant further consideration please contact a qualified wind turbine installer for a detailed site assessment and system design.

Site Summary

Project Information

Report Date: 9/9/2011

Report Author: The Cadmus Group, Inc.

System Owner: John Lindquist

Owner's Email Address: john.lindquist@cadmusgroup.com

Proposed Site Address: 139 N Broadway St, Wichita, KS 67202

Turbine Location (Decimal Degrees)

Latitude: 37.6870 °

Longitude: -97.3356 °

Elevation (m): 395.2002

General Terrain Category: Urban

Terrain Roughness, Wind Shear & Porosity

Direction	Terrain Type	Wind Shear Exponent	Canopy Height (m)	Solidity
N	Urban	0.44	20.0	1.00
NNE	Urban	0.44	20.0	1.00
NE	Urban	0.44	20.0	1.00
ENE	Urban	0.44	20.0	1.00
E	Urban	0.44	20.0	1.00
ESE	Urban	0.44	20.0	1.00
SE	Cut grass	0.15	0.0	0.00
SSE	Urban	0.44	20.0	1.00
S	Urban	0.44	20.0	1.00
SSW	Urban	0.44	20.0	1.00
SW	Urban	0.44	20.0	1.00
WSW	Urban	0.44	20.0	1.00
W	Urban	0.44	20.0	1.00
WNW	Urban	0.44	20.0	1.00
NW	Urban	0.44	20.0	1.00
NNW	Urban	0.44	20.0	1.00

10 Most Significant Obstacles at Site

Obstacle Type	Distance to Turbine (m)	Bearing	Obstacle Height (m)
Two Storey House Pitched Roof - Wind on Broad Side	60.7	68	20.0
Deciduous Tree 1 (less porous)	40.5	68	50.0
Rounded conical hill	85.2	158	20.0
Evergreen Tree 2 (conifer more porous)	72.7	180	20.0
Deciduous Windbreak	99.6	180	20.0
Rounded conical hill	70.6	225	20.0
Evergreen Windbreak	76.7	225	20.0
Square High Rise/Large Office - Wind on Corner	46.2	293	50.0
Two Storey House Pitched Roof - Wind on Corner	77.3	293	20.0
Three Storey House Pitched Roof - Wind on Broad Side	48.7	293	20.0

Notes

This is the Site Description Field.

Wind Resource

Wind Resource Information

Wind Map Reference Height (m): 100

Wind Map Wind Speed (m/s): 6.93

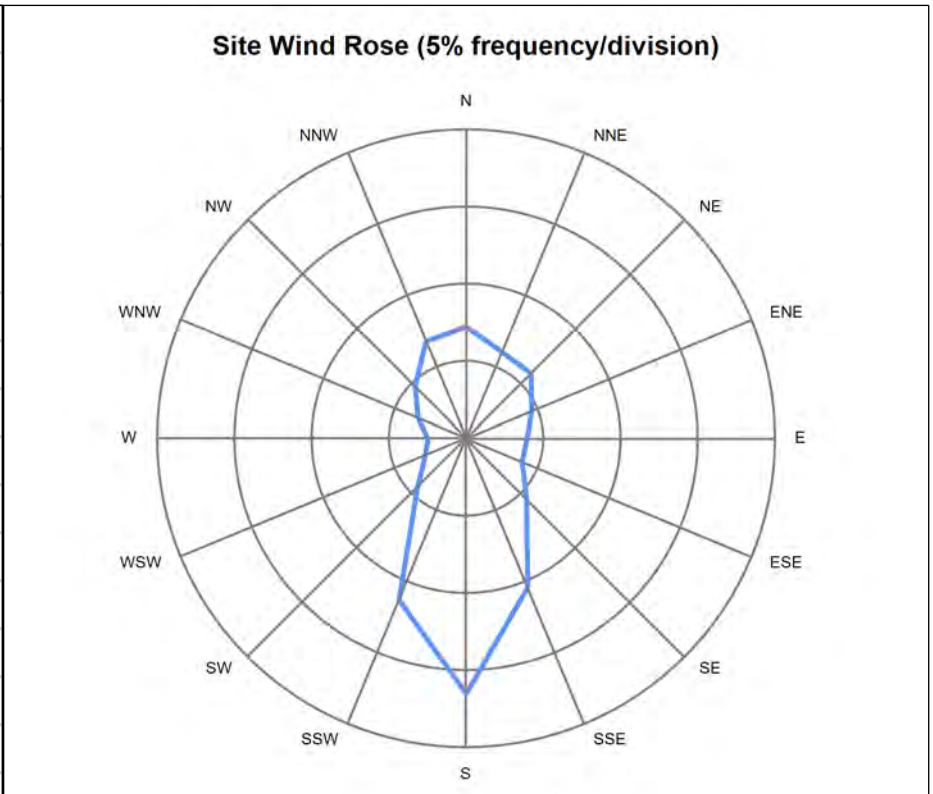
Wind Speed Corrected for Site Factors (m/s): 5.46

Data Source: NREL Data

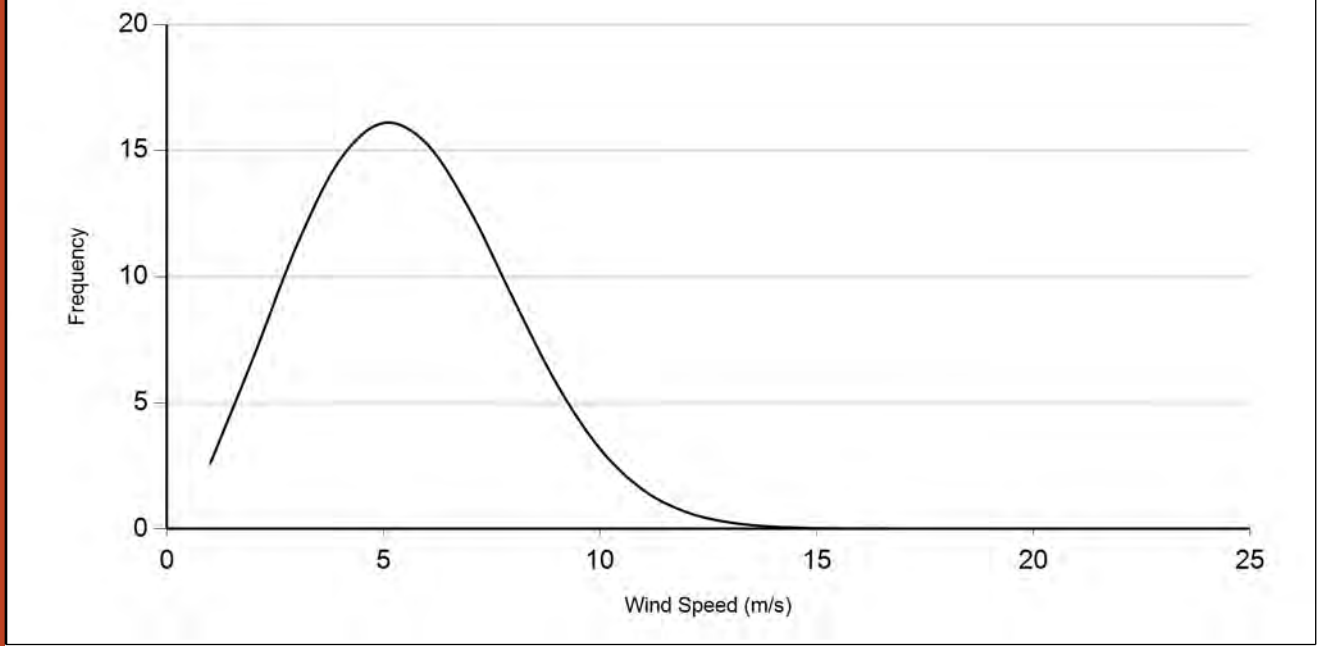
Weibull k Value: 2.45

Site Wind Rose

Direction	Frequency %
N	115.00
NNE	115.00
NE	115.00
ENE	115.00
E	115.00
ESE	115.00
SE	132.00
SSE	115.00
S	115.00
SSW	115.00
SW	115.00
WSW	115.00
W	115.00
WNW	115.00
NW	115.00
NNW	115.00



Projected Annual Wind Speed Distribution



Electricity Generation and Environmental Benefits

Turbine Specifications

Manufacturer:	Bergey Windpower Co.
Model:	Excel-S
Bldg./Tower Height(m):	80.00/100.00
Building Type:	N-S Oriented Sloped Roof
Rated Power (kW):	8.20
Warranty:	

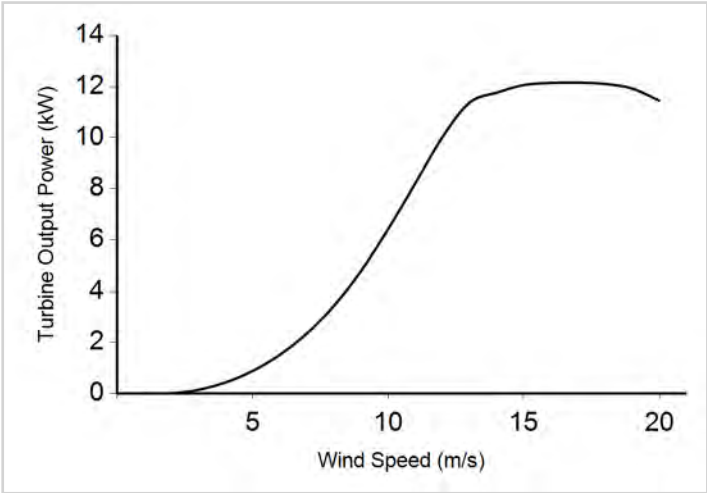
System Performance Information

Mean Annual Hub Height Wind Speed (m/s):	5.46
Typical Annual Electricity Generation (kWh):	13,398

Miscellaneous Losses

Conversion/Equipment Losses:	0.14
Inverter/Converter Efficiency:	0.00
Voltage Drop:	0.00
Blade Wear/Roughening:	0.00
Standby Power Draw:	0.00
Availability:	0.00

Power Curve



ENVIRONMENTAL BENEFITS

Annual Pounds of CO2 (Carbon Dioxide) Emissions Offset:	25,389
Annual Pounds of NOx (Nitrogen Oxides) Emissions Offset:	52.57
Annual Pounds of SO2 (Sulfur Dioxide) Emissions Offset:	79.77
Annual Pounds of CH4 (Methane) Emissions Offset:	0.31
Annual Pounds of N2O (Nitrous Oxide) Emissions Offset:	0.42
Annual Pounds of Hg (Mercury) Emissions Offset:	0.00
Equivalent Acres of Trees Planted:	TBD
Equivalent Cars Taken Off Road:	TBD

Visual and Sound Impacts

Visual Impact of Turbine in Surrounding Area

Map of Zone of Visual Influence

Sound Impacts Near the Area of the Turbine

Map of Sound Impact near the turbine site

Economics

Turbine Manufacturer:	Bergey Windpower Co.	**Annual Energy Production:**	0.00
Turbine Model:	Excel-S	**Annual System Maintencance Cost:**	$0.00
Total Installed Cost:	$0.00		

Economic Parameters

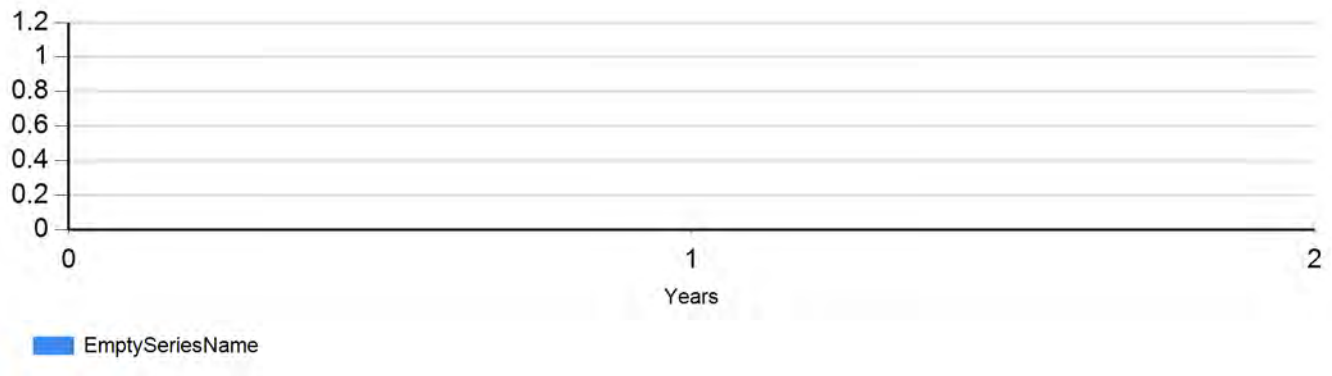
Loan		Incentives	
Loan Down Payment:	$0.00	**State Rebate (%):**	0.00%
Down Payment:	$0.00	**State Rebate ($):**	$0.00
Principle:	$0.00	**State Tax Credit (%):**	0.00%
Interest Rate:	0.00%	**State Tax Credit ($):**	$0.00
Loan Term (Years):	0	**Federal Tax Credit (%):**	0.00%
Month Installed:	0	**Federal Tax Credit ($):**	$0.00

Economic Analysis

Adjusted Installed Cost			
Cost after Incentives:	$0.00	**Year 20 ($):**	$0.00
Loan Payments:	$0.00	**Year 30 ($):**	$0.00
Monthly Payment:	$0.00	**Internal Rate of Return:**	$0.00
Value of Interest Deduction:	$0.00	**Years 1-30:**	$0.00
Net Monthly Payment:	$0.00	**Simple Payback:**	$0.00
Ave. Monthly Savings on Bill:	$0.00	**Before Incentives:**	$0.00
Year 1 ($):	$0.00	**After Incentives:**	$0.00
Year 10 ($):	$0.00	**Breakeven Point:**	$0.00

Site Energy Usage Profile			
Electricity Rate:	0.00	**Annual Energy Cost:**	$0.00
Annual Energy Use:	0.00		

Annual and Total Cash Flow



About DSAT

Distributed Wind Site Analysis Tool

The Distributed Wind Site Analysis Tool (DSAT) is a powerful online tool for conducting detailed site assessments for single turbine projects, from residential to community scale. DSAT, created by a partnership between The Cadmus Group, Inc., Encraft, and the National Renewable Energy Laboratory (NREL), is made possible through funds from the U.S. Department of Energy.

This tool was developed in response to the acceptance of a proposal to develop site analysis tool for distributed wind technologies. The solicitation was DOE Funding Opportunity Announcement #DE-PS36-09GO99009, Topic Area 2C.

Disclaimer

This tool was developed by the Cadmus Group Inc. on behalf of the Department of Energy. It is intended to provide a course estimate of wind resource and no guarantee is made as to the actual resource availability for specific locations. Users enter site condition parameters such as terrain and obstacles and other variables that affect the model's resource estimation. The tool provides a preliminary rough estimate of what the likely wind resource is for the area of interest. If the resource estimate appears sufficient to warrant further consideration please contact a qualified wind turbine installer for a detailed site assessment and system design.

Links

Links to DSAT User Guidebook
Cadmus/help more information
Sources of Data and Assumptions used

Appendix C: Financial Analysis

The MM reviewed a sample of projects. We calculated a financial analysis using two different rebate structures.

1. The current rebate structure but revising the turbulence intensity and wind shear for projects given that the default for these values does not represent the NJ terrain.
2. Additionally revising the rebates to further reduce the rebate for projects that are located in the less than 6.0 m/s wind speed areas, while further increasing the rebate for projects that are located in the 6.0 m/s or greater wind speed areas. (Using the NREL 2003 30 meter wind map) This was used as an example of how to change the rebate to incent areas with better wind speeds and siting.

The financial analysis indicates, larger rebates for projects in the optimal wind area do help further enhance the financial justification for developing a wind project. However, much of the project justification comes from net metering via the electricity generation afforded by the actual system performance. Systems with better wind speeds and better siting will produce more energy and therefore show a more positive financial picture. It will be important for customers to see an accurate financial analysis of their wind system prior to purchase. The upgraded version of DSAT is expected to include financial analysis and NREL offers a free tool for this that the NJCEP can make available on the website. The MM can also list the examples below on the website.

The MM prepared the following financial analysis using eight sample wind projects.
The following assumptions were used in the analysis:

- Residential projects have no depreciation benefits
- Commercial projects will follow a 5 year MACRS, 50% depreciation bonus and 30% tax credits
- Public projects will purchase using a PPA so they will follow the same assumptions as commercial projects
- For projects > 100kW there is no MACRS or 30% tax credit; using 20 year depreciation
- Projects are not financed
- Residential electricity rate is 16.39 cents per kWh and Commercial rate is 13.36 cents per kWh
- Discount Rate is 6%
- Analysis was completed for 25 years – which is the expected life of a turbine
- Projects did receive the full rebate amount
- New method output assumes 25% for turbulence intensity and .30 for wind shear for all projects with wind speeds less that 13.4 mph or 6.0 m/s. It also assumes 20% for turbulence intensity and .25 for wind shear for all projects with wind speeds equal to or greater than 13.4 mph or 6.0 m/s.

The analysis evaluated two rebate structures:

Current Rebate		**Proposed new rebate structure**	
Production	**Rebate Amount**	**Production**	**Rebate Amount**
1-16,000 kWh	$3.20/ kWh	1-15,000 kWh	$2.50/ kWh
16,001-1,000,000 kWh	$0.50/ kWh	15,001-1,000,000 kWh	$0.50/ kWh

		Project with greater than or equal to 13.4 mph or 6.0 m/s and project production is less than or equal to 500,000 kWh	Additional $0.50/kWh
Max rebate for residential is $51,200 & non-residential is $543,200		Max rebate for residential is $45,000 & non-residential is $530,000	

Examples:

				Annual Output (kWh)			
Site	Est. Mean Wind Speed (mph)	Cap. (kW)	Type	Old method	New method	Installed Cost ($)	Cost per Watt
Englishtown	11.6	10	Res	15,496	12,862	$90,000	$9
Cape May	14.0	10	Res	22,493	20,445	$90,000	$9
Old Bridge	12.6	20	Com	21,086	17,334	$110,000	$5.50
Waretown	13.9	50	Com	142,716	135,956	$333,500	$6.70
Glassboro	11.9	100	Com	126,759	103,661	$565,000	$5.70
Atlantic City	14.4	100	Com	210,642	191,889	$590,000	$6.00
Vernon	12.4	1500	Muni/PPA	3,521,612	3,399,300	$4,000,000	$2.70
Bayonne	15.0	1500	Muni/PPA	4,235,718	4,131,535	$3,200,000	$2.10

			Existing Incentive, new method output				Proposed Rebate change, new method output			
Site	Est. Mean Wind Speed (mph)	Current REIP rebate	Rebate ($)	Rebate % of project cost	Simple Payback (years)	NPV	Rebate ($)	Rebate % of project cost	Simple Payback (years)	NPV
Englishtown	11.6	$51,200	$41,158	46%	22	($25,255)	$32,155	36%	> than 25 yrs	($34,437)
Cape May	14.0	$51,200	$51,200	57%	8	$1,266	$50,445	50%	9	$38,233
Old Bridge	12.6	$53,743	$51,867	47%	> than 25 yrs.	$3,761	$38,667	35%	> than 25 yrs	($1,643)
Waretown	13.9	$114,858	$111,178	33%	7	$75,648	$165,956	50%	6	$114,931
Glassboro	11.9	$106,579	$95,031	17%	> than 25 yrs.	($228,278)	$81,831	15%	> than 25 yrs	($237,739)
Atlantic City	14.4	$148,521	$139,145	24%	11	($37,437)	$221,889	38%	9	$21,889
Vernon	12.4	$543,200	$543,200	14%	8	$2,996,834	$530,000	13%	8	$2,982,834
Bayonne	15.0	$543,200	$543,200	17%	5	$5,443,447	$530,000	17%	5	$5,430,244

From the analysis it becomes clear that regardless of the rebate, areas with poor wind and siting will not see positive simple paybacks regardless of the rebate. An improved rebate structure for areas with good wind resources does help the NPV and simple payback of those small and midrange systems.