Distributed Wind Energy Market in Minnesota – Final Report

Presented by:
The Minnesota Renewable Energy Society and Project Partners

Thursday, June 26, 2014
Distributed Wind Energy Market in Minnesota – Final Report

Agenda
Introduction: Lise Trudeau
Senior Engineering Specialist
Minnesota Department of Commerce
Division of Energy Resources

Presentation: John Dunlop
Principal
Renewable Energy Services

Q & A: please type in questions during the webinar to be answered at Q&A

Photo Credit: Minnesota Clean Energy Resource teams
Distributed Wind Background

Popular in Early 20\textsuperscript{th} Century

- Mechanical water-pumping windmills most popular
  - Over 6 million units sold in U.S. by 1930’s
- Over 10,000 systems operating in U.S. by 1936
  - Primarily 32 Volt DC systems with batteries used for lighting, radios
- Rural \textbf{electrification} that began in the 1930’s eliminated need for self-generation and wind was largely abandoned

Photo Credit: Jacobs Wind Electric, via earthtechling.com
Wind Background

Resurgence of Wind Power

- International oil crisis of 1970s
- Modern world-wide industry launched in California in late 1970s
- Availability of tax credits and ability to interconnect with utilities
- U.S. small wind installations by 2013:
  - 222 MW of capacity
  - 157,000 turbines installed
  - $30 million invested annually, on average, since 1980
- Current interest is strong
  - Self reliance
  - Domestic energy source
  - Reduction in greenhouse gas emissions

Photo Credit: Minnesota Clean Energy Resource teams
History of Minnesota DG Wind Policy

1981: Net metering up to 40 kW

1986: 5 year Accelerated Depreciation

1992: Sales tax exemption

1995: 10 year payment of 1.5 ¢/kWh (2 MW or less)

2013: First changes to net metering
Net Metering

All Utilities:

- Net metering <40 kW is unchanged
- Size independent of load
- Offset on-site electricity usage
- Utility pays average retail rate for excess generation
- Customer selects monthly check or credit carry-forward
Net Metering, cont’d.

Investor Owned Utilities (IOU):

• **Cap** raised to 1 MW
• Single-customer **meter aggregation** on contiguous property
  – Important for farmers *in IOU service territory*
• No **standby charges** < 100kW
  – PUC to review standby charges ≥100kW
• Systems 40 kW - 1,000 kW
  – Solar & other DG: sized to 120% of customer annual energy consumption
  – **Wind**: sized to 120% of customer *annual peak demand*
  – **12-month** energy balance allowed
  – Allows excess generation in windy months to offset high consumption in other months

Photo Credit: Simply Lets
2013 – Solar incentives adopted
- 1.5% solar electricity standard for IOUs
- Production-based incentive for MN-made solar panels
- Community Shared Solar
- Value of Solar Tariff
- other beneficial solar programs

2014 – What strategies will help the distributed wind industry grow?
The Need for Market Study

MN Dept. of Commerce is exploring ways to identify opportunities and barriers to distributed wind energy market

- Market Study Goals
  - Enhance outreach and communication with distributed wind energy market participants
  - Improve data on installation trends
  - Provide analysis of market activities, market participants, barriers to growth, and strategies to enhance consumer assurance
The Assessment Team

- Department of Commerce issued RFP competitive bid
  - selected Minnesota Renewable Energy Society and partners

- **Laura Burrington**, Minnesota Renewable Energy Society (project coordinator)
- **Brian Ross & Abby Finis**, CR Planning
- **Fritz Ebinger**, The Minnesota Project
- **Heather Rhoads-Weaver**, eFormative Options
- **John Dunlop**, Renewable Energy Services
Market Assessment Methods

• Develop a **database** of distributed wind turbine installations
• **Survey** market participants: installers, dealers, manufacturers, tradespersons
• Convene a **roundtable** of industry experts
• Conduct **interviews** with industry members
• Develop **case studies** of successful installations
• Conduct public **webinars** on market developments and best practices
Database

Sources of Data
- Utility lists
- FAA data
- REPI
- Treasury payments
- eFormative Options records
- USDA
- USGS
- MN Department of Commerce
- ARRA rebates
- County permits

Types of data collected
- Tower Height
- Manufacturer
- Capacity (MW)
- Location
- Owner
- Installer
- Year installed
- Power Purchaser

Geographic Coordinates
- Description of the location
- Confirm location visually using Google Earth
- Determine geographic coordinates from Google Earth
- FAA sites had identified the geographic coordinates
Database – As of June 2014

**Confirmed, On-Site Only Turbines (Does not include Community Wind)**

<table>
<thead>
<tr>
<th>Number of Records</th>
<th>Number of Turbines</th>
<th>Capacity (MW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>165</td>
<td>167</td>
<td>17.06 MW</td>
</tr>
</tbody>
</table>

**All Confirmed Turbines (Includes Community Wind)**

<table>
<thead>
<tr>
<th>Number of Records</th>
<th>Number of Turbines</th>
<th>Capacity (MW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>208</td>
<td>291</td>
<td>194.14 MW</td>
</tr>
</tbody>
</table>

**All Records (Unconfirmed and Confirmed, includes Community Wind)**

<table>
<thead>
<tr>
<th>Number of Records</th>
<th>Number of Turbines</th>
<th>Capacity (MW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>381</td>
<td>577</td>
<td>485 MW</td>
</tr>
</tbody>
</table>
Installation Distribution – Wind Resource

Distribution of Wind Turbines in Minnesota

Minnesota Wind Resource at 30 Meters

Source: Minnesota Department of Commerce, 2006
U.S. Distributed Wind Capacity 2003-2013

- Minnesota is #2 in nation for cumulative distributed wind capacity

- But ranks #11 for 2013 distributed wind capacity additions
Industry Survey

DG wind market and best practices

- Survey industry participants
  - 54 of 94 businesses responded
  - 57% response rate

- Jobs in the DG wind businesses who responded
  - 1,276 FTE jobs, 164 FTE jobs in Minnesota
  - Primary North American Industry Classification System (NAICS) occupations:
    - Turbine/tower installers
    - Technical consultants
    - Manufacturers
Survey Application

Snapshot of respondent activity.
(Portions of wind turbines installed or serviced in Minnesota since 2012)

- 51% Agriculture
- 26% Residential
- 12% Industry-Commercial
- 6% Government Institution
- 5% Educational Institution
Market Barriers

Lack of incentives and the need for zoning and permitting standards dominated the survey responses.

<table>
<thead>
<tr>
<th>Answer Options</th>
<th>Response Percent</th>
<th>Response Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zoning and permitting standards</td>
<td>43.4%</td>
<td>23</td>
</tr>
<tr>
<td>Need for incentives</td>
<td>67.9%</td>
<td>36</td>
</tr>
<tr>
<td>Lack of market parity with other forms of renewable energy</td>
<td>30.2%</td>
<td>16</td>
</tr>
<tr>
<td>Consumer confidence</td>
<td>30.2%</td>
<td>16</td>
</tr>
<tr>
<td>High soft costs</td>
<td>13.2%</td>
<td>7</td>
</tr>
<tr>
<td>Need for consumer education</td>
<td>24.5%</td>
<td>13</td>
</tr>
<tr>
<td>Other (please specify)</td>
<td></td>
<td>10</td>
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<tr>
<td><strong>answered question</strong></td>
<td><strong>53</strong></td>
<td></td>
</tr>
<tr>
<td><strong>skipped question</strong></td>
<td><strong>1</strong></td>
<td></td>
</tr>
</tbody>
</table>
Market Barriers

Two thirds of “additional comments” on survey suggested the lack of market parity for wind turbines vs. photovoltaics is due to the lack of incentives for DG wind systems.

Photo Credit: Minnesota Clean Energy Resource teams
Roundtable with Industry Leaders

Eleven industry representatives were present:

- Manufacturers
- Installers
- Maintenance providers
- Refurbishing turbines
- Component supplier
- Wind-only businesses
- Multi-technology businesses (e.g. solar, energy efficiency, engineering, etc.)
Roundtable with Industry Leaders, cont’d

Topics discussed:

• Current state of distributed wind market
  – Definition
  – Current size
  – Future opportunities
• Best practices (from component supply to siting turbines)
• Perceived needs to achieve robust business activity
• Trusted sources of information
• Methods of communication within the industry
• Effective policies
Roundtable & Interview Findings

**Primary Customers:**

- Agriculture and rural businesses
- Market also includes municipalities and utilities

**Additional Feedback**

- Universal agreement amongst installers on 3rd party certification and use of listed products
- Manufacturers view third party certification of Minnesota products as a critical component to growing the industry
- Interviewee manufacturers find that third party certification remains a cumbersome and expensive process that creates market barriers to expansion and growth, particularly for start up companies and innovators
Additional Feedback

• No single centralized source of information on distributed wind in Minnesota, for either consumers or industry participants

• Little opportunity for industry members to participate in state distributed generation policy discussion

• Consensus on need for educating subcontractors and consumers: visible failures hurt the industry.
Best Practices and Case Studies

Best Practices for Distributed Wind reflected in criteria for selecting sites for case studies:

- **Tower Height**
  - At least 30 meters
- **Wind Regime**
  - Sites over 5 m/s average wind speed
    - Such as found in southwestern half of Minnesota
- **Type of Interconnection**
  - “Behind the meter” offsetting customer load
  - Single turbine installation

Photo Credit: Minnesota Clean Energy Resource teams
Best Practices and Case Studies, cont’d

Best Practices for Distributed Wind reflected in criteria for selecting sites for case studies:

**Compliance with:**
- Electric codes
- Interconnection standards
  - IEEE 1547
- Inverter standards
  - UL 1741
- Follow National Electric Code Article 694
- Recent installation
  - < five years
Best Practices and Case Studies, cont’d

Best Practices for Distributed Wind reflected in criteria for selecting sites for case studies:

• Evidence of quality
  – Small Wind Certification Council Certification (or comparable)
  – SWCC has also granted its first Wind Turbine Power Performance Certification for medium sized turbines
    • Tested in accordance with IEC 61400-12-1
    – Listing by the Interstate Turbine Advisory Council (Clean Energy States Alliance)

• Sited property
  – Bottom of turbine rotor at least 10 m above obstructions within 150 m

• Installations not previously publicized

Photo Credit: Minnesota Clean Energy Resource teams
Case Studies: Camden State Park

- Bergey Excel 10
- 35 m (120 ft.) tower (set back from Information Center and trees)
- Complies with the 10/150 meter siting guideline
- Part of DNR’s Energy-Smart program
- Turbine offset all electricity consumed on site in 2012, close in 2013
Case Studies: Camden State Park, cont’d

Photo Credit: Fritz Ebinger

Image: Google Earth, KML Circle Generator

Bottom of rotor...

10 m above obstructions within 150 m
Case Studies: The Rohlik Farm

- Demonstration of value of due diligence
- Farm owner built tower for a TecWind 32 kW
- Owner later learned local authorities require UL-listed components
- TechWind electrical components were not tested and listed by UL
- Therefore: TechWind could **not** be installed
Case Studies: The Rohlik Farm

- Rohliks investigated the Ventera 10 kW turbine
- Components are all UL-listed and UL 1741 compliant
- Turbine manufactured in Duluth, Minnesota (which the owners liked)
- Installed turbine in W. Central MN – good wind regime
- Turbine produced above expected output in spring of 2014
- Owners are HAPPY

Photo Credit: Fritz Ebinger
Success Story

1. Energy Efficiency
2. Explore renewable options
3. Select wind power
4. Use tall tower

“After moving into their new home, they began thinking about ways to make the house more energy-efficient. They put 3 1/2 feet of insulation in the attic and started using LED light bulbs in their bathroom and for outdoor spotlights.

They wondered if they should put solar panels on the house, but soon considered the power of the southeastern Minnesota winds... with their [wind] tower they’re producing their own electricity and receiving a monthly bill from their utility that says they owe exactly nothing.”

Source: Stewartville Star, Producing Electrical Power of their Very Own, March 28, 2011
Webinars: Market Development & Best Practices

Two Webinars held previously:

- Or, go to [mn.gov/commerce](http://mn.gov/commerce) then search on “MN Distributed Wind Webinars”
Webinars Summary

Distributed Wind Market Overview and Opportunities

Presentations by:

- **Market Developments**: Alice Orrell, Pacific Northwest Laboratory
- **Best Practices in Turbine Selection & Marketing**: Val Stori, Interstate Turbine Advisory Council
- **USDA Grant Application Process**: Charles Newcomb, Endurance Windpower

Summary:

- DW market environment is challenging
  - 2013 drop similar to large wind due to expiration of ITC and 1603 program, ramp down of many state incentives
- Quality assurance of equipment critical to incentive agencies
  - Certification and firm warranties essential
- USDA REAP is an important funding source, confirmed for next 5 years
  - Annual deadlines expected each October and April
  - Important to contact local office prior to deadlines
Webinars Summary

Best Practices for Distributed Wind Project Development and Installation

Presentations by:

- **Performance Estimation**: Trudy Forsyth, Wind Advisor Team
- **Site Assessment Tools & Techniques**: Wes Slaymaker, WES Engineering
- **Guidelines for Installer Training**: Jenny Heinzen, Midwest Renewable Energy Association

Summary:

- High quality site assessment and training critical to successful DW projects
  - Numerous low-cost tools & resources available to assist
  - Publicly available maps
    - bins method can quickly screen many sites
- Potential buyers are advised to "do their homework" to ensure wind turbines will perform as expected
  - Plan for safe installation and ongoing maintenance by qualified personnel
Recommendations from Project Team

1. Business Support

• Assess and assist with streamlining wind permitting and zoning at the local level.
  – Establish a Helpdesk that would be available to developers of DG wind projects
  – Provide assistance to permitting and zoning officials in establishing and complying with siting and zoning requirements

• Establish a Minnesota Wind Industry Group
  – Meet regularly in person
  – Establish an electronic forum
  – Address best practices, issues, opportunities and barriers.
  – Perhaps initially supported by DER then transitioned to non-profit management
Recommendations

2. Evaluate the potential impacts of a Distributed Wind Subscription Program
   - Individuals and businesses would subscribe to a portion of production from a single wind turbine or small cluster of turbines
   - Subscribed electricity would be credited toward electricity consumption

3. Evaluate value of joint bulk purchases of turbines by multiple developers

4. Evaluate the stability DG wind brings to farmers experiencing the boom-bust agriculture market
Recommendations

5. Enhance data in existing DG Wind installation database & collect new install data

6. Develop policies and incentives comparable to those available for solar electric installations
   - Made in Minnesota for wind turbines
   - Incentives for wind installations

7. Publish success stories from other states demonstrating viable policy options for MN to consider
   - Incentives
   - Certifications
8. Develop assessment of opportunities for DG

- Demonstrate wind and solar production patterns are complementary
- Publicize high value DG wind applications
- Evaluate relationship between DG wind output and rural electric load profile
- Evaluate complementary DG wind output with resistive heating loads
  - Fund a pilot demonstration project with thermal energy storage
Recommendations

9. Assess the value of advanced inverter systems in addressing utility concerns

10. Present webinars on DG wind focused on:

- Utilities
- Local authority having jurisdiction (zoning official, city planners, etc.) responsible for permitting and zoning
- Assistance with applying for USDA grants
- Customers and potential customers
- Process for certifying small and medium wind turbines
Thanks for your interest in the distributed wind energy market in Minnesota!

John Dunlop
Renewable Energy Services
Minneapolis
612-377-3270
Jdunlop@RESMinn.com

For the Minnesota Renewable Energy Society
Discussion: Distributed Wind Energy Market in Minnesota – Final Report

Please type your question in the drop-down panel on the right of your screen, or “raise your hand” to be able to ask your question verbally.