CONSIDERATIONS RELATED TO INVESTING IN SMALL WIND SYSTEMS

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FOCUS OF PRESENTATION

- Review factors to consider when exploring whether to invest in small wind systems
- Use case studies to illustrate the key factors that impact the economics of small wind
SMALL WIND SYSTEMS

- Michigan has good opportunities
  - Good wind resources
  - Anemometer loan program data
  - New net-metering provisions encourage the use of this resource
  - Small industries that can make effective use of this power
    -- Farms
    -- Schools
    -- Greenhouses
WHY SMALL WIND?

- Reduce electricity costs over the long run
- Ease demand on the power grid
- Energy independence – produce your own!
- Clean energy source – no pollution
1.8 kW Skystream

L. Mawby Vineyards

Suttons Bay, Michigan
Zeeland West High School

10-kW Bergey XL-10 on an 85-foot tower

Mainly gift financed

School uses all of the electricity generated
Laker Public Schools
Three 65 kW
THREE BIG QUESTIONS

1. How much energy do I use?
2. Do I have enough wind?
3. Do I have enough space?
1. Energy Use/Energy Cost

- Need a year’s worth of electricity use
- Utility bills or call your utility for history
- Patterns of use - steady or heavy vs light use?
Example history....
Energy Efficiency....

- Can you reduce your electricity use?
- Cheapest kilowatt is the one you don’t use – think energy efficiency FIRST, renewable energy SECOND
2. Wind Resource

- Do you have wind of at least 10-12 mph?
- Check Michigan Wind Map
- See if anemometer data is nearby
- Check local meteorological data
BE SURE TO KNOW YOUR WIND POTENTIAL

Michigan Anemometer Loan Program
Zeeland Data

Frequency Distribution

- Relative Frequency %
- Wind Speed in mph
SUMMARY RESULTS FROM PROGRAM

<table>
<thead>
<tr>
<th>Wind Speed (MPH)</th>
<th>Percentage of Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 8</td>
<td>6</td>
</tr>
<tr>
<td>8.0 – 8.9</td>
<td>19</td>
</tr>
<tr>
<td>9.0 – 9.9</td>
<td>31</td>
</tr>
<tr>
<td>10.0 – 10.9</td>
<td>31</td>
</tr>
<tr>
<td>11.0 – 11.9</td>
<td>13</td>
</tr>
<tr>
<td>Average</td>
<td>9.7</td>
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</tbody>
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TOWER HEIGHT MATTERS

- Wind speed increases with height
- Small increases in wind speed result in large increases in power
- Tall towers often needed for clearance above obstacles (*turbulence*)
- May require a variance or a special use permit
3. Space considerations

* Most installers recommend at least one acre parcels

* Need space for setbacks from property lines (at least 1.25 times the turbine height) – also guy wires for towers

* Less chance of neighbor annoyance with more space
Turbulence issues – turbine should be 300 feet away from obstructions…
Example of Poor Turbine Siting....

- Tower is too short
- Too close to trees
- Trees are same height as tower
ADMINISTRATIVE ISSUES

4. Zoning – height or setback restrictions

5. Building permits

6. Insurance

7. Interconnection
4. Zoning

- Check with township, county or municipal government
- Main concern – height restrictions and setbacks
- Can request a variance
- Get sign off from neighbors prior to request
5. Do I need a building permit?

- Maybe – visit your township, municipal or county office to determine and what information is required.

6. Do I need insurance?
7. Interconnect to Utility

Most people will, unless using a turbine for an off-grid use.
Interconnection, continued…

- Utility acts as back-up system, and is much cheaper and more efficient than batteries
- For 20 kW or smaller turbines, interconnect fee is $100
- Expedited process for small wind turbines
WHAT WILL IT COST AND WILL IT PAY?

8. Can I net meter my turbine?

9. Are there grants/incentives to help offset the cost?

10. What will be the return on the investment?
9. INCENTIVE PROGRAMS

❖ USDA REAP Program
  ▪ 25% Cost sharing
  ▪ Loan program to 75% of cost

❖ Federal tax incentive
  ▪ 30% of cost can be used for a tax credit if installed and credit used by 2016.
10. WHAT WILL BE THE RETURN ON INVESTMENT

- Dairy farm considering a 20kw turbine on a 100 foot tower
  - System information:
    - Total cost of project is $83,500 ($4.18/watt)
    - Assumed life of investment = 20 years
    - Will get “true” net metering
    - Financing 40% of the cost
    - 25% cost share under REAP
    - Will take Federal Tax Credit at full 30% of cost
Average wind speed = 11.1 mph
Case 1 Results

- Analyzed with the Small Wind Investment Model
  - Used after-tax discounted flows
- Results (Case 1, Base Situation):
  - Before-tax internal rate of return = 12.5%
  - Payback period = 7 years
CASE 2

Average wind speed = 8.4 mph

-7.5% Return
OTHER IMPORTANT ISSUES (BEYOND THE SCOPE OF THIS PRESENTATION)

11. What type of turbine?

12. How to find an installer?
SMALL WIND SUMMARY

- Small wind systems will play a role in meeting Michigan energy needs
  - Distributed energy generation has many advantages
- Be sure you take time to evaluate your situation before you make a major financial commitment
  - Pay particular attention to your wind resource
A Vestas 1.65 Mw turbine being constructed in Minnesota
A MinWind project