Challenges of Wind

Presented by Kevin Lampo
Sunlion Energy Systems
Turbine Types

• Horizontal
  – Propeller style
  – 2-4 blades
  – Generator located in nacelle
  – Spans all size profiles

• Vertical
  – Egg beater/DNA style
  – Generator at base
  – Typically small scale
Three Tenants of Wind

• Resource
  – 20m/s min average wind (44.7MPH)

• Location
  – Ridges vs. Fields
  – Micro climates

• Hub Height
  – Ground disturbance
Classes of Turbines

• Large Wind (Power plant scale)
  – 1.5-5MW

• Medium Wind (Neighborhood Scale)
  – 50kW-1.5MW

• Small Wind (Individual Scale)
  – <20kW
Commercial Wind Farms

- Size between 10MW-500MW
- Most efficient due to size, height
- Precise location of turbines based on wind studies yields output closest to projections
- Often have budget, time, socio/political to reduce external compromises
Neighborhood Wind

- Typical size between 50kW-1.5MW
- Not as common as other 2 classes
- Socio/political pressures dictate whether efficiency is similar to large or small wind
- Often output does not meet expectations
Wind for Ag and Residential

- Typical size between 800W-20kW
- Least efficient due to size, height
- Has largest complications due to external socio/political pressures
- Often output does not meet expectations
Misconceptions of Wind

• Migratory Birds
  – New designs vs. old
  – More birds killed by domestic cats then by wind turbines

• Noise
  – dB of turbine ~ dB of trees @ given wind speed

• Decreased Property Value
  – No comprehensive study proves/disproves
  – Hail Mary of excuses by neighbors

• Safety
  – Mechanical equipment unsafe to be exposed
  – Towers present climbing attraction
The Real Challenges of Wind

- **Appropriate location**
  - Correct height
  - Socio/Political compromises

- **Industry itself**
  - Confusing or misrepresented performance data
  - Little third party verification of output data

- **Customers**
  - Measured vs. perceived wind resources
  - Willingness to accept marginal
Appropriate Implementation of Wind

• Allow wind on appropriate sites
  – Appropriate lot sizes
  – Freedom of location on lot (within reason)
  – Height to reach clear wind

• Minimize impact
  – dB levels at property line
  – Setback as function of height
  – Tower Safety
Special Concerns

• Electrical and mechanical equipment
  – Difference for large wind vs. Small
  – When to perimeter fence, when not to

• Liability insurance

• FAA (Title 14 subpart B section 77.15)
  – 200’ above Ground level
  – Inline of landing way
  – Other restrictions if within 20,000’ or airport
Prior to Writing Ordinance

• Review others
  – Mount Joy twp
  – West Hempfield twp

• Visit sites
  – Review mechanical equipment
  – Note structure, electrical and point of interconnection

• Review EDC guidelines for interconnection
  – Application process
  – Inspection requirements
Small Wind VAT
Small Wind Horizontal
Large Wind
Upcoming Wind
# Future Wind

<table>
<thead>
<tr>
<th>Wind Turbine Type</th>
<th>Vertical Axis (VAWT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output Voltage (AC)</td>
<td>120V</td>
</tr>
<tr>
<td>Max Current (AC)</td>
<td>3.2A</td>
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<tr>
<td>Mounting</td>
<td>Wall or Roof Mounted</td>
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<tr>
<td>Installation</td>
<td>1-2 Hours</td>
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<tr>
<td>Dimensions</td>
<td>48” x 36” (1.2m x 0.9m)</td>
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<tr>
<td>Module Weight</td>
<td>30 lbs (13.5 kg)</td>
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<tr>
<td>MSRP</td>
<td>$399-$699</td>
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</tbody>
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## Wind Turbine Output

- **Output**: 400W (@28 mph)
- **Energy Output**: 40kWh/month (@12 mph)
Contact:
717-898-8700
KevinL@SunlionEnergySystems.com