AVEC’s Village Wind Projects

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Alaska Village Electric Cooperative

New turbines in Hooper Bay

Tribal Energy Conference
Denver, Colorado
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AVEC is a non-profit member-owned co-op

- 53 villages
- 22,000 population
  - Would be the 4th largest city in Alaska after Anchorage, Fairbanks and Juneau
- 44% of Village Alaska population
- Anvik (smallest) 94
- Hooper Bay (largest) 1,097
- Average population 420
- Anchorage 284,994
- 94% Alaska Native
System Information

- 48 power plants
- 9 wind systems serving 12 villages
- 165+ diesel generators
- 22 wind turbines, with 12 more underway
- 530+ fuel tanks
- 5 million gallons fuel burned
- 7,700 services
- 80 Anchorage-based employees
- 95 Village technicians
## AVEC Delivered Fuel Cost

<table>
<thead>
<tr>
<th>Year</th>
<th>Average 2002</th>
<th>Average 2003</th>
<th>Average 2004</th>
<th>Average 2005</th>
<th>Average 2006</th>
<th>Average 2007</th>
<th>Average 2008</th>
<th>Average 2009</th>
<th>Average 2010</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1.29</td>
<td>1.47</td>
<td>1.98</td>
<td>2.26</td>
<td>2.26</td>
<td>2.93</td>
<td>4.55</td>
<td>3.02</td>
<td>3.30</td>
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<tr>
<td>Increase</td>
<td>+.18</td>
<td>+.51</td>
<td>+.28</td>
<td>+.67</td>
<td>+1.62</td>
<td>+256%</td>
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**Increase between 2002 - 2010 $2.01 +256%**
AVEC 2009 Fuel Use By Village
AVEC
Board Goals

• Reduce diesel use **25%** in **10 Years**
  – 1,250,000 gallons
  – 77% of our fuel is used in Wind Class 4+ villages

• Reduce power plants **by 50%** in **10 Years**
  – Interconnect another 24 villages

• Reduce non-fuel costs **by 10%**
  – Plant costs, depreciation, interest...
  – Rate reduction of 2 cents/kWh as of 1/1/2010
Goal – Reduce Diesel Use 25%

- 80 100KW machines would displace 1,250,000 gallons
- 22 units now operational
- 12 scheduled for commissioning in 2010-11
- In 2009, 11 machines were operational
  - 2.8% of gross generation
  - Displaced 143,000 gallons of fuel
  - Worth $433,000.
AVEC has considered wind generation in the past, but there were challenges:

- Lack of small (100kw) machines
- Equipment reliability
- Too few machines to support service providers
- Difficulty in integrating intermittent wind with small diesel systems
The State and federal governments funded over 100 wind projects in Alaska in the 1980s.
Nearly all failed
Lack of maintenance and poor sites were factors
Often we have to be patient, learn and wait for the right conditions to come along.
Wind Potential for AVEC

- 39 villages are in Class 4+ wind regimes
- A diesel generator yields 14 kWh/gallon
- One 100-kW turbine could displace 15,000 gallons/yr (Class 6-7 regime)
- Three units = 47,000 gallons/yr
- Average village uses 113,000 gallons/yr
Current Challenges to Wind Development

- Remote locations
- Complex logistics
- Difficult environmental conditions
- Small electric loads
- Poor soils
- Complex foundations
- Turbulence
- Low temperatures/Icing
- Limited turbine options for remote villages

AVEC’s work truck got stuck and needed help!
Challenge:
Foundations in permafrost

• They must not settle, tilt or be uplifted

• Pile foundations (six to eight piles) may extend 1/3 to 2/3 the height of the tower into the ground (40-60 feet)
Challenge:
Access for specialty equipment required to place foundations and erect turbines
Poor roads, water and sewer lines, boardwalks and existing overhead power and phone lines present hurdles.
Transportation Issues
Hauling equipment between villages
And here’s the power pole!
Summer Tundra/ Permafrost
AVEC Wind Projects

2003  Selawik

2006  Kasigluk – with tie line to Nunapitchuk

2006  Toksook Bay - with tie lines to Tununak and Nightmute

2008  Hooper Bay and Savoonga

2009  Gambell and Chevak in construction, commissioning in process in 2010

2009  Mekoryuk erected, commissioning in 2010

2010  Quinhagak - in construction

2010  Shaktoolik and Toksook (one more)

2011  Emmonak/Alakanuk
Future Plans

• Meteorological towers are collecting information in several locations
• Evaluation of sites for future funding in several more western Alaskan village sites is underway
• Denali Commission and RUS funding is declining
• State funding is competitive and challenging to administer
• We are building local capacity by training wind technicians who live in the villages
• These trainees have worked in the construction and operation of the new systems
Training for several wind technicians underway at Kasigluk (March 2010)
Some of the equipment is complex
Safety is important
because it is a long way up
But the work and results are rewarding