

WIND AND WILDERNESS

POWERING RURAL ALASKA



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*New turbines in
Hooper Bay*



Who is AVEC?

- **Non-profit member-owned cooperative**
- **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) 101**
- **Hooper Bay (largest) 1,124**
- **Average population 420**
- **Anchorage 277,498**
- **94% Alaska Native**

Alaska Vs. Lower Forty Eight



System Information

- **48 power plants**
- **6 wind systems serving 9 villages**
- **160+ diesel generators**
- **500+ fuel tanks**
- **5 million gallons fuel burned**
- **7,500 services**
- **75 Anchorage-based employees**
- **95 Village technicians**

Cost of 700 Residential kwh in 2008

- Anchorage \$ 88
- Fairbanks \$135
- Juneau \$ 76
- Kodiak \$104
- Kotzebue \$158*
- AVEC Village \$232*
- MKEC Village \$375*
- Napakiak \$421*

– *After PCE

AVEC's Delivered Fuel Cost

• Average 2002	1.29	
• Average 2003	1.47	+.18
• Average 2004	1.98	+.51
• Average 2005	2.26	+.28
• Average 2006	2.26	
• Average 2007	2.93	+.67
• Average 2008	4.55	+1.62
Increase since 2002	\$3.26	+353%

AVEC Board's 2008 Goals

- Reduce diesel fuel use by 25% in 10 Years
 - 1,250,000 gallons
 - 77% of our fuel is used in Wind Class 4+ villages
- Reduce number of power plants by 50% in 10 Years
 - Interconnect another 24 villages
- Reduce non-fuel costs by 10%
 - Plant costs, depreciation, interest...

Our Wind Potential

- 39 of AVEC's 53 villages are in 4+ wind regimes
- A high-efficiency generator yields 14 kWh/gallon
- A 100-kW turbine could displace 15,700 gallons
- Three units = 47,000 gallons

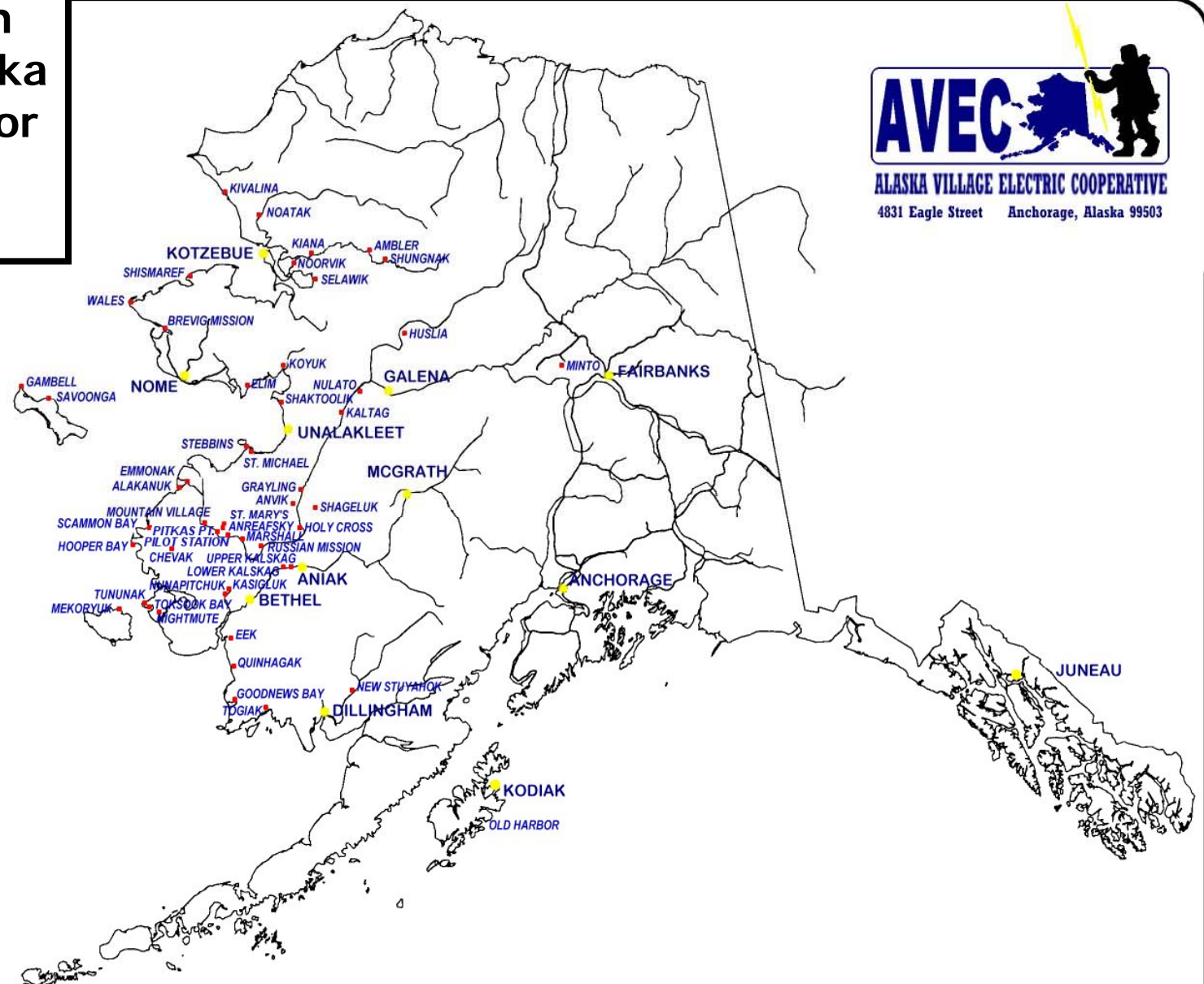
At 2008 fuel prices, wind has lowered the fuel cost by almost 1/3 in villages served by the Kasigluk and Toksook Bay projects

Many of AVEC's villages are in Western Alaska have Class 4 or better wind regimes.



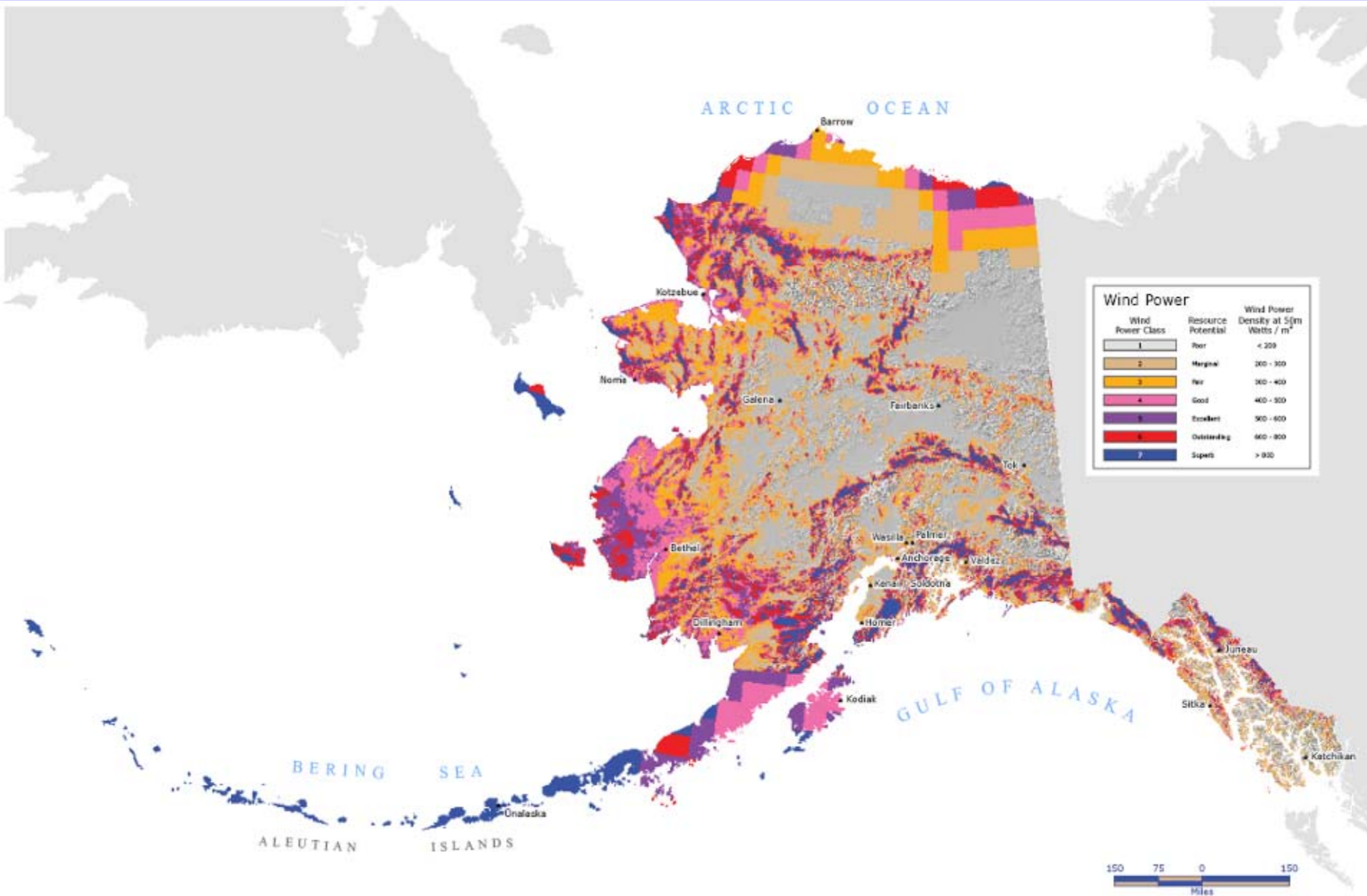
ALASKA VILLAGE ELECTRIC COOPERATIVE

4831 Eagle Street Anchorage, Alaska 99503



MAP OF ALASKA VILLAGE ELECTRIC COOPERATIVE VILLAGES

Alaska Wind Map



Challenges to Wind Development

- Remote locations
- Complex logistics
- Difficult environmental conditions
- Small loads
- Poor soils
- Complex foundations
- Turbulence
- Low temperatures
- Icing
- Few options for remote village systems (100-500 kW)

AVEC's work truck got stuck and needed help!



Wind Diesel Efficiency: Penetration Levels

- **Low**
 - Max 30% Wind
 - Grid Connected
- **Medium**
 - Max 80% Wind
 - Secondary Load Control
- **High**
 - 100% Wind
 - Diesel Off
 - Load Control
 - Short Term Storage

Typical AVEC Systems

Wind Generation Advantages

- A hedge against rising fuel costs
- Lower carbon footprint
- Reduced exposure to oil spills
- Reduced oil storage needs



Value of 2007 Wind Production

		2007 \$	2008 \$
Selawik	129,780 kwh	\$27,472	\$45,294
Kasigluk	442,760 kwh	\$71,753	\$156,428
Toksook	562,693 kwh	\$90,308	\$199,720
Total	1,135,233 kwh	\$189,533	\$401,442

Savoonga

AVEC Consolidated Power Plant and Tank Farm at Toksook Bay
Serves Tununak and Nightmute via 23 miles of intertie
Eliminated two power plants and their associated tank farms
Load consolidation made wind power at Toksook Bay more feasible



AVEC Wind Projects

2003 – Selawik

2006 – Kasigluk

- Tieline to Nunapitchuk

2006 – Toksook Bay

- Tieline to Tununak
- Tieline to Nightmute

2008 – Hooper Bay

2008 – Savoonga

2009 – Gambell

2009 – Chevak

USDA has funded 1/3 of all costs!



Kasigluk

Interconnecting Villages

Reduce the number of power plants

Larger loads make renewables like wind feasible

Existing Interties

- Kasigluk-Nunapitchuk
- St. Mary's-Andreafsky
- Upper Kalskag-Lower Kalskag
- Mt. Village-Pitka's Point
- Shungnak-Kobuk
- Toksook Bay-Tununak
- Toksook Bay-Nightmute

Possible Future Interties

- Brevig Mission-Teller
- St. Mary's-Mt. Village
- St. Mary's-Pilot Station
- St. Michael's-Stebbins
- Emmonak-Alakanuk
- New Stuyahok-**Ekwok**
- Togiak-**Twin Hills**
- Noorvik – Kiana – Selawik (NKS)
- Ambler – Shungnak – **Kobuk** (ASK)
- **Upper Kobuk – Lower Kobuk** (ASK – NKS)

A key issue is the availability of heavy construction equipment

- Dovetailing wind projects with other local projects reduces construction costs



Selawik

Wind Assessment is critical

- Determine estimated output of a project
- Avoid misplacement of a project
- Identify potential problems...



Problems Such as...

- Land ownership and land use in the area
- Geotechnical issues for foundations
- Historical and cultural resource impacts

Other challenges

- Bird issues
- Equipment accessibility
- Proximity to power lines




Foundations in permafrost are a major hurdle

Warming trends are affecting the expanse and depth of permafrost



Geotechnical Conditions





Poor roads, water and sewer lines,
boardwalks and existing overhead power
and phone lines present hurdles





Transportation Issues





*Hauling equipment
upriver between villages*





*Hauling equipment
upriver between
villages – towing a
power pole*

*Hauling power poles
by specialized sled*





Kasigluk – 1970s

*Hauling equipment
and distribution
line by specialized
sled – back in the
“good old days”*



*Hauling equipment by sled –
“modern day” transportation*



AVEC villages - 2008



You know you're having a bad day when your heavy crane gets stuck



Summer Tundra/ Permafrost



Difficult Environmental Conditions





***Frozen,
snow- and
ice-covered
equipment
and
employees***





Building Human Capacity

- AVEC and its contractors 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

**Charles Green Sr. of Toksook Bay - left
Elias Friday of Chevak - middle
Lawrence Lake of Hooper Bay - right**
**3 of 8 Native Alaskans who received Wind Technician certificates
at the Northern Power manufacturing facility in Barre, Vermont
A total of 14 village residents have received this training**



Wind Technicians Lawrence Lake and Julius Bell standing by a nacelle in Hooper Bay



**Wind Technician
Julius Bell
adjusting the rotor
assembly during
the installation of
the NW100 wind
turbines in Hooper
Bay, Alaska**



Questions?

Toksook Bay, Alaska



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