

Systems Performance Analyses of Alaska Wind-Diesel Projects

Selawik, Alaska

Selawik, an Inupiat Eskimo community, is located at the mouth of the Selawik River about 70 miles southeast of Kotzebue, 670 miles northwest of Anchorage, and 3 miles north of the Arctic Circle. The current population is 841.

Thanks to funding assistance from the Denali Commission, Selawik has a state-of-the-art, automated power plant, elevated bulk fuel tank farm, and four 50-kW Entegreity Wind Systems EW50 wind turbines.

The power system, which is owned by Alaska Village Electric Cooperative, connects the four wind turbines to a 1,660-kW, three-engine diesel system. A 160-kW electric boiler, a secondary load, adds heat to the plant's heat recovery system, which in turn supplies heat to the village water plant. The wind turbine controller and secondary load controller were supplied by Sustainable Automation. Kotzebue Electric Association assisted with turbine erection.

The price for power in 2007 was \$0.51/kWh; assuming a \$110/barrel oil price, the system offers \$0.69/kWh.



Alaska Village Electric Cooperative Inc. installed four 50-kW turbines in Selawik, which is located 3 miles north of the Arctic Circle. Alaska Village Electric Cooperative/PIX13055.



Wind turbines at Selawik. Photo courtesy of the Federal Communications Commission Consumer & Governmental Affairs Bureau.



Aerial view of Selawik. Photo courtesy of the Federal Communications Commission Consumer & Governmental Affairs Bureau.



U.S. DEPARTMENT OF
ENERGY

Energy Efficiency &
Renewable Energy

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Turbines: Four 50-kW Entegri Wind Systems EW50

Capacity: 0.2 MW

Developer/owner: Alaska Village Electric Cooperative

Date online: Assumed to be 1/1/06

Rated power: 50 kW per turbine, plant rating 200 kW¹

Data collection dates: Through 4/07

Selawik systems analysis: 9/21/07

Energy Flow (Based on Monthly Summations)

Community load data	335 kW*
Wind turbine output	22.0 kW*
Diesel plant output	331 kW*
Thermal load data	0.05 kW*
Average wind speed	Not included in the data set; Alaska Energy Authority estimate 4.73 m/s @ 9 m

*1/06 – 4/07, difference between output and load represents system losses and plant uses.

Performance Characteristics Based on Energy Flow (Based on Monthly Summations)

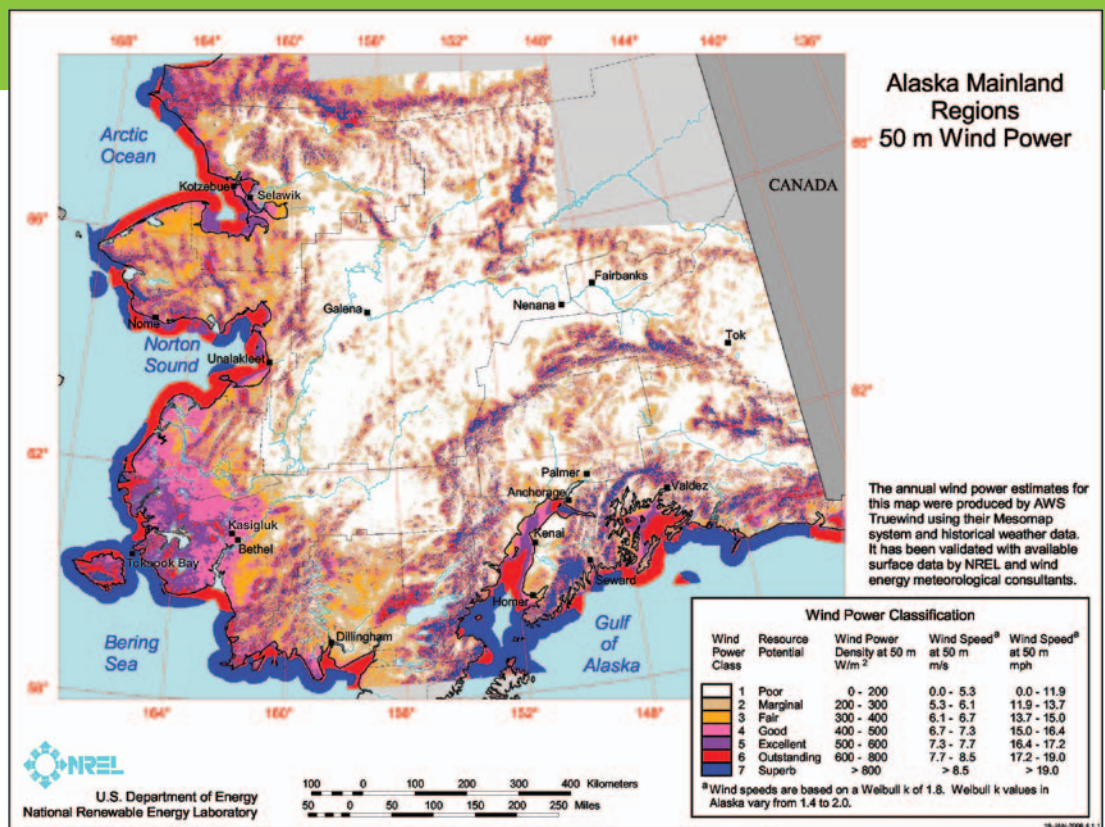
Average net capacity factor	11.6%*
Optimal net capacity factor based on Alaska Energy Authority wind data	HOMER: 15.89% Hybrid2: 19.15%
Average net wind penetration	6.4%*
Estimated fuel savings	18,608 gal*

*1/06 – 4/07 using FY06 Statistical Report of the Power Cost Equalization Program efficiency (available at www.akenergyauthority.org/PDF%20files/2007PCEStatisticsFY06.pdf)

Other Data

Diesel fuel price	\$2.41/gal*
Residential electrical rate	\$0.5237/kWh*
Diesel efficiency (kWh from diesel/gal)	13.46 kWh/gal*

* FY06 Statistical Report of the Power Cost Equalization Program (available at www.akenergyauthority.org/PDF%20files/2007PCEStatisticsFY06.pdf)



¹ Note: The Entegri EW50 is known to be underrated. Different organizations have assigned various ratings for this turbine. A rating of 66 kW, which was the value assigned by the NREL Turbine Verification Program for turbines operating in Kotzebue, was used in all performance calculations. This results in a plant-installed capacity of 256 kW.

In the previous tables, **average net wind penetration** refers to the product of total wind turbine energy output (kWh) divided by the total primary electrical load (kWh) over a given time period and provides an idea of the amount of system energy produced by wind. **Capacity factor** is the ratio of actual average power produced to the rated power of the wind plant over a defined time period and provides an indication of the wind resource and system efficiencies (capacity factors above 15% for distributed wind systems would be considered good, although the acceptable capacity factor for a specific community will depend on project and alternative fuel costs).

For more information on Alaska wind-diesel projects, please contact:

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