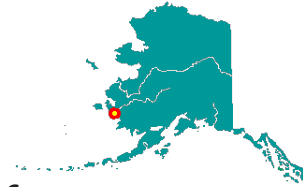


Kwigillingok Wind-Diesel Smart Grid



Kwigillingok, Alaska



Kwigillingok reduces energy costs by fifty percent.

Project Overview

In partnership with the Alaska Energy Authority (AEA), Kwigillingok Power Company (KPC) completed the construction of a wind to heat project in Kwigillingok, Alaska. Five WindMatic turbines were installed in addition to 27 Electric Thermal Storage (ETS) residential heating units, a load regulator, and a Smart Grid control system.

Objectives

The objectives of this project were to provide the community of Kwigillingok with a renewable, reliable, and cost effective energy source that would help displace and offset the expensive costs of heating fuel.

Economic Feasibility

The project became operational in February of 2012. Between February of 2012 and December of 2014, the turbines generated 293 megawatt-hours of electricity and 306 MMBtu of thermal energy. This allowed KPC to displace 24,000 gallons of diesel fuel, saving the community \$102,000 in reduced energy costs. The project was estimated to have a benefit/cost ratio greater than 1 but has not performed as designed.

Project Specifications

The Smart Grid control system is a unique aspect of this project. A network of advanced meters receives information about the availability of excess wind energy. If available, the system transfers excess energy from the turbines to Electric Thermal Stoves in peoples' homes at a reduced rate. The meters communicate wirelessly, provide a user interface for customers, and account for energy sold at different rates. The Smart Grid enables 27 ETS stoves to capture and store excess energy for heating village residences. For residents who have the ETS stoves in their homes, heating costs are reduced by 50 percent.

Quick Facts

Total Project Costs: \$3.2 million

Capital Costs

Design: \$208,204

Construction: \$2,991,796

Equipment Specifications

Make/Model: (5) Wind Matic 17-S

Rated Capacity: 95 kW

Net Capacity Factor: 24.5%

Rotor Diameter: 17 meters

Hub Height: 24.4 meters

Total Rated Capacity: 475 kW

Diesel Fuel Offset

Estimated Annual: 81,500 gallons

Actual Annual: 14,000 gallons

Feb. 2012-Dec. 2014: 24,000 gallons

Fuel Savings

Estimated Annual: \$350,000

Actual Annual: \$58,000

Feb. 2012-Dec. 2014: \$102,000

Benefit/Cost Ratio: 1.63

"Utility managers now have reliable access to real-time mechanical help from engineers and suppliers all over the world."

Wind Matic 17-S Turbines, photo courtesy of AEA.



Kwigillingok Wind-Diesel Smart Grid

Allocation of Funding

The Alaska Energy Authority's Renewable Energy Fund contributed \$1.6 million for design and construction of the project. The Department of Commerce, Community, and Economic Development (DCCED) also contributed \$1.6 million for the same project phases.

Learning Experiences/Challenges

One turbine experienced a drive train failure during operation. Because of this, there are four turbines currently operating. Although this was a setback, continued maintenance and developer involvement will aid these communities in preserving project longevity.

Community Benefits

With roughly 29 percent of village residents living below the poverty level and unemployment approaching 50 percent, Kwigillingok struggles under the burden of high energy costs. Before AEA's Power Cost Equalization program, electricity costs \$0.65/kWh (over four times the cost in urban Alaska) and heating oil has cost up to \$9/gallon in recent years. Harnessing the local wind resource has enabled those with ETS stoves to substantially reduce their heating costs.

As wind speed changes, Kwigillingok can control the power flows in its system by turning parts of the system on and off. They can also configure various components to minimize diesel generator use and optimize wind energy distribution.



Community member wind turbine training, photo courtesy of NREL.

This project also provides several part and full-time jobs through the Chaninik Wind Group (CWG). The CWG is a nonprofit corporation formed by the villages of Kwigillingok, Kongiganak, Tuntutuliak, and Kipnuk with a goal to reduce the consumption of fossil fuels by 40% and replace fossil fuel consumption with wind energy production. CWG community members in all four villages went through wind turbine training to construct and maintain their separate wind projects.

When residents pay their individual energy bills, more of their money now stays with KPC instead of going to outside fuel oil companies. This keeps money closer to home where it can help foster the local economy.

With the Smart Grid installation, utility managers have reliable access to real-time mechanical help from engineers and suppliers all over the world. Expensive support trips back and forth to villages have been practically eliminated.



WindMatic 17-S turbine, photo courtesy of AEA.

Project Contact Information

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