

Shaktoolik Wind Construction



Shaktoolik, Alaska



Wind turbines reduce residential electric bills by more than 50 percent

Project Overview

In partnership with the Alaska Energy Authority (AEA), the Alaska Village Electric Cooperative (AVEC) completed the construction of a 200 kW wind farm. The project installed two 100 kW Northern Power turbines, secondary heat loads, load controllers, and new switchgear for the power house.

Objectives

The objectives of this project were to displace diesel fuel and provide the community of Shaktoolik with a renewable, reliable, and cost-effective energy source.

Economic Feasibility

The project became operational in April of 2012. Between April of 2012 and December of 2014, the turbines generated 651 megawatt-hours of electricity and displaced 50,000 gallons of diesel fuel. This displacement saved the community \$200,000 in reduced fuel costs. In its projected 20-year lifespan, the project has a calculated benefit/cost ratio of 1.51.

Project Specifications

The two Northern Power turbines are located on the community's abandoned air strip. This location was chosen largely because it contained structurally sound and well compacted fill material to support the tower's foundation loading requirements. All wind-generated electricity is managed through secondary load controlling equipment at the powerhouse. Heat generated from excess energy was used primarily at the community powerhouse, but AVEC and the Alaska Native Tribal Health Consortium (ANTHC) have determined uses for the thermal energy elsewhere in the community. The power system is managed by a computerized supervisory controller which monitors all system parameters and makes decisions to regulate each component of the wind-diesel system. The

Quick Facts

Total Project Costs: \$2,839,977

Funding: Renewable Energy Fund & Local Funds

Capital Costs

Design: \$230,972

Construction: \$2,609,005

Equipment Specifications

Make/Model: (2) Northern Power 100B

Rated Capacity: 100 kW

Net Capacity Factor: 23.5%

Rotor Diameter: 21 meters

Hub Height: 37 meters

Total Rated Capacity: 200 kW

Diesel Fuel Offset

Estimated Annual: 33,000 gallons

Actual Annual: 24,000 gallons

April 2012-Dec. 2014: 50,000 gallons

Fuel Savings

Estimated Annual: \$133,375

Actual Annual: \$97,000

April 2012-Dec. 2014: \$200,000

Benefit/Cost Ratio: 1.51



Aerial view of Shaktoolik and turbines, photo courtesy of AEA.

Shaktoolik Wind Construction

"With their reduced operation/maintenance costs, AVEC is able to reduce residential electricity rates by more than 50 percent."

controller tracks the wind and diesel output along with load demand and automatically carries out instructions to safely and efficiently operate the turbines. When the wind power is insufficient, the supervisory controller selects and starts the most efficient diesel engine or combinations of engines.

Allocation of Funding

The Alaska Energy Authority's Renewable Energy Fund grant contributed \$2,465,633 toward the design and construction of the project. Local funds contributed \$374,344 for the same project phases.

Learning Experiences/Challenges

One of the turbines suffered a problem with the microprocessor and needed to be repaired. This, however, was a small setback in the scheme of the project as a whole and did not require a lot of down time.

After applying in 2011, AVEC and ANTHC received an additional REF grant in 2012 that funded the design and construction of a secondary load system. The system is designed to capture excess wind energy and use it to provide heat for the water treatment plant and drinking water storage tank. A challenge with this kind of system is that it is necessary to have sizeable secondary loads in order to handle the excess wind power.



Northern Power 100B turbines, photo courtesy of AEA.

Community Benefits

Electrical consumption and generation has increased by 35 percent in Shaktoolik since 1991. It is expected that the load in Shaktoolik will continue to grow throughout the duration of the project's lifespan. This project has allowed AVEC to continue providing for the demand growth at a reduced generation cost.

With the turbines operating, AVEC's utility bills have been cut by more than 50 percent, which allows them to free up hundreds of dollars per month to help them keep up with maintenance, facility operations, and customer service. As a result of AVEC's operation/maintenance costs, residential rates have also decreased from \$0.54/kWh with diesel-generated electricity to \$0.20 with diesel-wind generated electricity.



Northern Power 100B turbines, photo courtesy of Solsticeak.com

Project Contact Information

Parties Involved:

Kirstin Enanoria, AVEC

Email: kenanoria@avec.org

Case Study Author:

Zoe Tressel, AEA

Website: Akenergyauthority.org

Phone: 907-771-3000

Published August, 2015