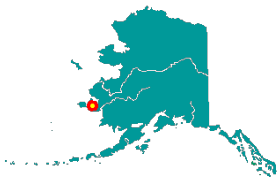
Toksook Bay Wind Farm

Toksook Bay, Alaska



Outstanding wind class topples rural energy prices

Project Overview

In partnership with the Alaska Energy Authority (AEA), the Alaska Village Electric Cooperative (AVEC) completed the design and construction of a 400 kW wind farm with the addition of a fourth turbine. The fourth Northern Power 100 kW turbine was part of a larger power system upgrade project that continues to serve the community of Toksook Bay.

Objectives

The objectives of this project were to displace diesel fuel and provide the community of Toksook Bay with a renewable, reliable, and cost effective energy source. An additional objective was to supplement the neighboring communities of Tununak and Nightmute with wind-generated electricity.

Economic Feasibility

The expanded project became operational in August of 2009. Through December of 2014, the turbines generated 991 megawatt-hours of electricity and displaced 69,000 gallons of diesel fuel. This displacement saved the communities of Toksook Bay, Tununak, and Nightmute a total of $258,000 in avoided fuel costs. Over its 20-year projected lifespan, the project has a calculated benefit/cost ratio of 1.

Project Specifications

Toksook Bay is one of three villages located on Nelson Island off the southwest coast of Alaska and has an outstanding wind class of 6 out of 7. The original 2006 wind project consisted of 3 turbines and was funded by sources outside the Alaska Energy Authority. In October of 2010, the Renewable Energy Fund (REF) grant financed the installation of the fourth turbine to increase total capacity to 400 kW. To maximize benefits in the region, an intertie was constructed from Toksook Bay to Tununak and Nightmute-the other

Quick Facts

Total Project Costs: $1,191,687

Funding: REF, State, & Local Funds

Capital Costs
- Design: $43,993
- Construction: $1,147,694

Equipment Specifications
- Make/Model: Northern Power 100A
- Rated Capacity: 100 kW
- Net Capacity Factor: 25%
- Rotor Diameter: 19 meters
- Hub Height: 30 meters
- Total Rated Capacity: 400 kW

Diesel Fuel Offset
- Estimated Annual: 17,520 gallons
- Actual Annual: 9,000 gallons
- Aug. 2009-Dec. 2014: 69,000

Fuel Savings
- Estimated Annual: $66,187
- Actual Annual: $34,000
- Aug. 2009-Dec. 2014: $258,000

Benefit/Cost Ratio: 1

Northern Power turbines, photo courtesy of AEA.

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two communities on Nelson Island. This tieline allows all three villages to reap the benefit of reduced diesel fuel costs on their electric bills. The diesel power plants in those communities were placed in standby and only operate with diesel during line outages.

Allocation of Funding

The Alaska Energy Authority's Renewable Energy Fund contributed $1,037.750 for the construction and installation of the fourth turbine. Funding provided by the Denali Commission, Rural Utility Service, Coastal Village Regional Fund, and AVEC financed the older project that replaced the power plant, upgraded the distribution system, installed a new community bulk tank farm, and the first three turbines.

Learning Experiences/Challenges

Except for some initial issues, including a blade failure during a software upgrade, the power system operated normally for several years.

A cracked rotor hub was discovered on one of the turbines in 2011. This led to a retrofit on all A-model turbines in Alaska as a precautionary measure. This learning experience illustrates how this wind project and others like it allow information, experience, and assistance to be shared between communities who are using similar technology and experiencing the same issues. Developing this support system is crucial, especially in rural Alaska where support from vendors and contractors can easily be inhibited by weather conditions and distance.

Northern Power 100A, photo courtesy of Nrel.gov.

Community Benefits

The 2014 reported cost of wind-diesel generated electricity in Toksook Bay was $0.54/kWh. The expected diesel-generated electric rate would be closer to $0.77/kWh based on an average fuel cost of $3.85/gallon. An AEA program called Power Cost Equalization (PCE) has further reduced residential electric rates to $0.34/kWh. This helps diminish the financial burden on rural residents who continue to face high costs of living.

Thanks to this project and similar ones, local wind technicians are being trained in AVEC villages across Alaska. This training supports local economies, generates increased local income, and garners even more support for renewable energy throughout the state.

Power plant, tank farm, and wind turbine, photo courtesy of AVEC.

Project Contact Information

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