

Hooper Bay's Wind Turbine Project



By Brent Petrie

Hooper Bay, Alaska, is Alaska Village Electric Cooperative's (AVEC's) largest community, with a population of 1,160 residents. The city is separated into two sections: a heavily built-up town site located on gently rolling hills and a newer section in the lowlands.

Until 2009 virtually all of the electric power generated in Hooper Bay has come from diesel generation. AVEC has progressively improved the system over the years to gain efficiency in the use of fuel. Even with such efforts, in 2008 after dealing with rising fuel costs retail rates were as high as 65.55 cents per kWh or over five times as high as some of the Alaskan and lower 48 urban areas.

Beginning around 2001, AVEC and the community of Hooper Bay started exploring options to reduce fuel costs. Meteorological and bird studies indicated good prospects for wind generation with minimal impacts and the City of Hooper Bay offered a retired tank farm site near its sewage lagoon as a prospective wind generation site.

Over the years AVEC applied for and received funding from the U.S. Department of Agriculture High Energy Cost Grant Program, administered by the Rural Utilities Service, and from the Denali Commission. These funds helped to purchase wind turbines; construct and install a power system control module to dispatch engines and integrate wind; and to provide access to the site in coordination with Hooper Bay's award-winning Subsistence ATV Trail Project Partnership, for which the community received a U.S. Department of the Interior Cooperative Conservation Award.

Project scope since 2004 included the planning, design, construction and commissioning of three new 100-kW capacity wind turbines at a site adjacent to the sewage lagoon, landfill, and previous bulk fuel storage site. The wind generators' output will augment the prime source generation by the diesel-powered generators. Expected generation is about 600,000 kWh per year which will displace about 44,500 gallons of diesel fuel used for power generation.

The towers supporting the wind turbine generators are 32 meters in height (105 feet), supported by steel beam foundations and driven steel piles. An insulated, silty, sand-fill pad was created at each turbine foundation. This system was designed to counteract the overturning moment forces from wind and vibration while considering the marginal permafrost soils. In order to preserve the integrity of the permafrost surrounding the foundations, thermosiphons were installed adjacent to all piles to help keep the ground frozen.

The wind turbines are connected to the new power plant via a new, three-phase primary distribution line. Installation of a fiber optic communication link providing communication and control of the wind turbines allows them to be either manually or automatically operated both at the power plant and from AVEC headquarters in Anchorage. This maximizes efficiency and allows remote troubleshooting in the event of alarms or warnings.

Under a separate project, electronic engine controls and fully automated switchgear are being installed in a new control module at the power plant. This control module is designed to provide a seamless integration of the turbines' output into the diesel power plant, leveraging the wind technology to the fullest extent possible.

Difficult soil conditions at the project location created substantial engineering challenges to develop a

foundation design that would work under these conditions. The end concept was to provide a steel foundation anchored to the permafrost for each tower.

As with other AVEC capital projects in rural Alaska, extremely challenging work conditions and remote locations with limited access add to project completion costs.

Towers and turbines were erected in 2008; operation could not begin until the ground around the foundation was acceptably frozen in 2009. A dump load heater remains to be installed and commissioned in 2009.

Full commissioning of the wind turbines will be completed when secondary loads are installed. The new control module at the power plant is connected and fully operational as of September 2009. Several outages were required but the crews worked really hard to complete the work before the school opened for fall, causing extra loads.



Power plant operator Larry Lake turning on the new control module. Larry is also a certified and talented wind turbine technician.



Larry Lake, getting ready to turn off the old control panel.



Some dignitaries visited Hooper Bay this summer, including George Canelos, Federal Co-Chair of the Denali Commission; Curt Parra with Kohler Power Systems; Jiri Purdic of AVEC; Jim Nordlund, Alaska State Director for Rural Development at the USDA; and Meera Kohler, AVEC's President and CEO.



Linemen hooked the wind turbines into a new distribution line.