

## GCI's TERRA Network Powers "Smart Energy" for Southwest Alaska

For thousands of years the Yup'ik people of Southwest Alaska have used their wits to survive in their harsh northern environment. Now their smarts are going high-tech with sophisticated energy systems enabled by high-speed computer networks. They're called "smart grids," and in several communities they have already enabled a significant reduction in home heating costs.

Temperatures in Southwest Alaska hover around zero for up to eight months of the year. Many villages in the region are not connected to electric transmission lines or accessible by road. For most of the year they can only be reached by small plane or snow machine. Any food and other supplies that can't be harvested from the land have to come in by barge during the few summer months when the rivers are free of ice. That makes diesel fuel, used to power electric generators and heat homes, very expensive. Many households spend as much as 50 percent of their annual incomes on heating and electricity.



*Wind turbines in Kwigillingok, Alaska.*

For several villages along the Kuskokwim River, the solution has turned out to be energy from the strong, steady winds that blow in from the Bering Sea. In 2005, local leaders formed the Chaninik Wind Group (CWG) and began building a series of smart grids designed to integrate cheaper wind power into their energy systems. Initially the grids relied on satellite Internet service for remote communications and data transmission, but for a number of reasons it wasn't up to the task. Weather, long lag times, and satellite dishes that needed frequent adjusting all hampered the CWG's effort to use as much wind energy as possible.

Then in 2012, the TERRA network arrived in Southwest Alaska. A hybrid fiber-optic and microwave system built by GCI, Alaska's largest telecommunications company, TERRA brought terrestrial broadband to the region for the first time. Prior to TERRA, broadband speeds were delivered via cable modem and DSL. "TERRA made it all possible," says Dennis Meiners of Intelligent Energy Systems, the Anchorage company that helped the CWG design and build its grids. "Whether it's a wind turbine, a diesel generator, a protective relay, or a meter, the smart grids are a collection of controllers that need to work together. The Internet allows us to capture, share and understand the data that keeps those systems operating efficiently and reliably. Things happen on both micro-second basis, so a fast Internet connection like TERRA makes all the difference."

The Chaninik Wind Group currently has two wind-heat systems up and running in the villages of Tuntutuliak and Kongiganak. Each village operates five 95kW wind turbines on 80-foot towers out on the tundra. The turbines, the diesel generators that produce electricity, and the meters in local homes and offices are all interconnected by a local area network (LAN). That allows local utility managers to monitor all operations with “supervisory control and data acquisition” (SCADA) systems and automated electrical metering. TERRA brings it all together, also enabling a variety of remote management, monitoring and diagnostic services.



*Chaninik village residents Kenny Nicolai, Ben Daniel, Sam Atti, Burt Paul, Joey Kiunya, Wassillie Lupie, and James Paul review wind tower diagrams with trainer Norman Ingram (second from left).*

The main pay-off from all that technology is that each village can control the power flows in its system as wind speed changes, turning parts of the system on and off and configuring various components to minimize diesel generator use and optimize wind energy distribution--the more the wind blows, the more wind energy displaces the fuel used to power diesel generators. When the wind blows long and hard enough to meet all regular electricity needs, surplus wind energy kicks over to power “thermal storage devices,” a

new type of ceramic heater now installed in many homes. The surplus energy costs about half as much as diesel fuel, so many families are seeing their total household expenses reduced by as much as half. At the same time, when they pay their energy bills, their money goes to their local utility instead of to outside fuel oil companies, keeping it closer to home where it can help nurture other community development projects.

Meiners points out that with TERRA, besides being able to measure and control energy production and consumption more accurately, local utility managers now have reliable access to real-time technical help from engineers and suppliers all over the world. More importantly, they can take advantage of advanced metering and reporting systems supported by Web-based applications. “The villages use the smart grid system every day,” says Meiners, “and its value only increases when it is paired with reliable cell phone service via TERRA.”

“Every day, there are texts and pictures between local power plant operators, and engineers, and technicians. Issues are addressed and problems are diagnosed and solved right away. Utility managers have tools that didn’t exist before and expensive technical support trips back and forth to villages have pretty much been eliminated. TERRA has improved communications across the spectrum of operations, and that results in bringing improvements that were simply too difficult and too expensive to implement without it. As time goes by, and we learn how to improve the productivity and economics of village energy systems, TERRA will probably be taken for granted, but it is already a key asset in lowering power costs for many Alaskans.”

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