Alaska Energy Authority
Emerging Energy Technology Grant Fund Application
March 9, 2012

Project Title:	**Enhanced Smart Grid Services for the Chaninik Wind Group**
Applicant:	**Intelligent Energy Systems, LLC**
Contact Information:	**Intelligent Energy Systems, LLC** **Dennis Meiners** **Tel: 1-907-770-6367** **dennis@iesconnect.net**
Partners:	**SAIC Energy, Environment & Infrastructure, LLC** **Chaninik Wind Group**
Total Project Cost:	**$655,000.00** **Grant Funds Requested: $630,000.00** **Match Committed: $25,000.00**
Previous Grants:	**Kwigillingok Wind Farm Construction – REF #2195410** **Tuntutuliak Wind Farm Construction – REF #2195457** **Kongiganak Wind Farm Construction – REF #2195411**
Previous Abstracts:	**Shared Service Multi-Village WiFi SmartGrid – AEA EETF** **SmartGrid Control System for Tuntutuliak – Denali Commission EETG**

Abstract

1. Project Summary

a. **Project Description**

1. **Background:** High energy costs are devastating village economies, which are completely dependent on fossil fuels. Difficult weather, remoteness, and complicate logistics, and make the ability to understand, manage and control energy consumption across the spectrum of consumers very important. Customers and managers must have the tools to understand how to control costs. The solution lies in the deployment of Smart Grid technologies that will optimize the management of the entire power system.

   In 2011, the Chaninik Wind Group built wind diesel heat smart grids. The initial phase of project included establishing a shared services Smart Grid infrastructure that included installation of distributed load control and installation of smart electric meters in each of the four member villages of Kwigillingok, Kipnuk, Kongiganak and Tuntutuliak. The initial phase of Smart Grid infrastructure provides automatic on-demand meter reading, remote connects/disconnects, outage alerts, and the power system SCADA provides distributed load control. This phase has laid the foundation for an enhanced smart grid, which integrates management of fuel, water resources, energy consumption and power generation, along with distribution system management, village energy system planning and utility financial management. Once this integrated Smart Grid infrastructure is established, it can be shared with other communities in Alaska as well as provide a complete picture of community energy usage.

2. **Description:** The Enhanced Smart Grid funding requested will build upon the foundational infrastructure and will make significant progress toward the long-term smart grid strategy to curb future demand, improve operational efficiency, and ultimately reduce overall energy costs. Through increased analytics, supplementary information, and near real-time monitoring the project will curtail the current double digit power loss to the acceptable industry standard of 4-6 percent loss. Moving from monthly to hourly measurement and comparing this information to power production statistics will give the village utilities more information to control to synchronize power generation. Additionally, the data collection elements of this grant request will help the utilities and the AEA to make objective informed decisions for future energy projects. The proposed Smart Grid enhancements include the following proposed components:

   a) Integration of consumer portal – Empowers residential utility customers to better manage their electricity use consistent with the stated goals of the U.S. Department of Energy.
   b) Automation of billing process & account management – Automates the generation of the customer billing cycle to increase their accuracy and standardization.
   c) Automation of monthly reporting to state – Automates the generation of mandatory regulatory reports to increase the timeliness and accuracy of the submissions.
   d) Outage Restoration Management – Automates the process of bringing the utility customers back online after a power failure allowing for a more controlled restoration process and reducing the utilities power surge requirements.
   e) Augmentation of the Security Framework – Provides an enhanced hardware/software solution at the utility office and utility manager's residence (for after hour access) to create an industry standard IP/SEC secure connection to the power generation monitoring & control tools and the utility customer account data.

f) Sub-metering Diesel and Wind Power Generation – Expands the collection of electrical metering to power generation, both at the power houses and wind turbines, in order to get a more complete representation of all power generated and consumed within a village.

g) Sub-metering Pilot – (Planned for Kipnuk only initially) Expands the collection of statistical data beyond the electrical intervals into other key areas of interest to include the possible metering of heating oil, water storage, diesel fuel, etc.

h) Village Infrastructure Data Warehousing – Provides for a robust collection, warehousing, and reporting of key planning data elements within a village and the aggregation of this information across villagers into a common addressable database. Key elements would include items such as the GIS location and other relevant planning information related to home insulation, electric transformers, fuel tanks, water tanks, etc.

b. **Project Eligibility**

1. This project meets the requirements of AS 42.45.375(c), which includes demonstration projects of technologies that have a reasonable expectation to be commercially viable within five years. All the individual component technologies identified in the previous section are in service today throughout the world. What makes this unique is the prospect of integrating these individual components into a single energy management solution that will enable the village utilities to more aggressively manage and optimize their fuel and energy consumption. When proven successful in this pilot program, this same infrastructure can be replicated across a large number of villages throughout Alaska and other remote locations with similar energy control challenges.

2. The project also meets the definition of energy technology under AS 42.45.375(j) (2), which states that an "energy technology" means technology that increases energy efficiency. Approval of this request will enable the village utilities to identify, package, and demonstrate an integrated platform of expanded Smart Grid functionality that together will provide a repeatable, low risk, cost-effective approach to scaling back Alaska's dependency on diesel fuel based power generation at remote locations.

c. **Project Innovation**

1. **Cost Savings:** The overarching objective of this program is to enhance the efficient use of energy in order to save money and preserve our limited natural resources. The tools to accomplish this objective lies in the areas of data collection, data analysis, operational efficiency, security, and in giving residential customers the tools to manage their own energy use and participate actively in the conservation of electricity. The project will clearly demonstrate improved electricity distribution system performance, reliability, and security of electricity delivery through the integration of distributed resources and advanced technologies.

2. **Technical Synopsis:** This project enhances the Smart Grid infrastructure put in place at the target villages in 2011. The advances proposed in this application include improved functionality of the Smart Grid system (i.e., consumer portal, billing, customer account management, automated reporting, and basic outage management), as well as, expansion of the meters install base (i.e., sub-metering of the power production plant totalizer and station service, wind turbines, and select collection points). Included in the final product will be the collection and data warehousing of many key data elements for future use by the state for planning purposes, such as, % of home properly insulated, location and size of transformers, and lat/longs for items of interest (i.e., fuel tanks, water storage, etc.). Encompassing this entire system will be a robust secure communications network that conforms to industry IP/SEC standards.

d. **Priority**

This application meets all four of the stated priority considerations outlined in AS 42.45.375(d) and the Alaska Energy Authority's Request For Applications (RFA sec. 4.3):

1. **Alaska residents, associations, organizations, or institutions** – This project will serve the more than 2,000 people in the native villages of Kwigillingok, Kipnuk, Kongiganak and Tuntutuliak. The project will engage the electric utilities in each of the villages and their utility customers, and will provide a platform from which other communities can benefit.
2. **Projects that demonstrate partnership with the University of Alaska or another Alaska postsecondary institution** – The Institute of Social and Economic Research of the UAA is participant, to collect and analyze energy system performance data to improve village power system performance and provide guidance to state and federal energy programs.
3. **Projects supported by matching funds or in-kind partnerships** – IES commits to support this project with $25,000.00 in in-kind services during the operational support phase of this project.
4. **Projects with potential for widespread deployment in the state** – The successful implementation of the enhanced smart grid platform establishes a web based smart grid service platform that may be made available to all other communities.

2. Technology Validation and Research Methodology

a. **Objectives**: The primary objective of this project is to provide the framework, automation, and tools necessary in four native villages to meet Alaska's and the nation's objective of lower energy consumption and the preservation of natural resources. To meet this objective, our goals are:

1) To accurately and objectively measure the reliability and quality of power generation
2) To provide an village wide energy management, which is accessible to all community members.
3) To lower demands for fossil fuel
4) To increase the quality and reliability of power production
5) To protect village power system revenues
6) To increase the security of sensitive data related to utility customers and power consumption
7) To create a aggregated repository of pertinent planning information for the state and AEA
8) To empower utility customers to aggressively manage their energy use and costs

b. **Methodology**: The enhanced smart grid will be implemented in the villages of Kwigillingok, Kipnuk, Kongiganak and Tuntutuliak. Project performance will be measured by the ability to successfully provide timely energy usage data, lower energy demand, and reduce overall energy costs. This project will use web based reporting, customer portals and custom reports, which can be made available to the Alaska Energy Authority (AAE) to demonstrate the project effectiveness. As well as monthly progress report against our goals and objectives—both technical and financial.

3. Summary of Project Schedule and Summary of Project Budget

a. **Project Schedule:** The schedule below assumes a grant award by June 2012. Planning and coordination would begin July 2012 with a program completion date of July 2013. Equipment installation and integration would begin in September 2012. Data collection and analysis would begin no later than November and run through the end of the program.

Step 1 Site Surveys, Coordination, and Planning (July/August 2012)

1) Data collection, including at full asset condition, location and documentation of all village energy infrastructure
2) Determine planned infrastructure upgrades at each location (schools, power plants, etc.) to ensure appropriate coordination
3) Establish baseline for energy consumption and costs for comparison of progress

Step 2 Equipment Installation and Software Integration (Begins in September 2012)

1) Installation of enhanced security nodes
2) Installation and integration of sub-metering devices, water, heating, fuel
3) Implementation of advanced smart grid service functionality (financial and regulatory reporting, controlled restoration of power, web reporting and visualization etc.)

4) Determine data model and coordinate with stakeholders for the prioritization of data elements

Step 3 Data Collection and Analysis (Begins NLT November 2012)

1) Begin collection of key planning information across the four villages
2) Aggregate data and develop ad hoc and static reporting and querying methodology

Step 4 Develop Strategies for Expansion Beyond the Pilot Locations (when/if substantiated)

1) Gather appropriate performance information and report on success factors
2) Develop with ISER and AEA, financial and technical strategies around the expansion

b. **Project Budget:** The projected budget allocated by expenditure type is listed below:

Smart Grid Enhancements – Hardware/Equipment/Software	$175,000
Installation and integration	$250,000
Operational support	$230,000
Total Project Cost	$655,000

4. Project Team Qualifications

a. **Chaninik Wind Group**: William Igkurak is the President of Chaninik Wind Group. The Group is an association of the four utilities serving the native villages of Kwigillingok, Kipnuk, Kongiganak and Tuntutuliak. Mr. Igkurak is also the General Manager of Kwig Power Company. Mr. Igkurak will serves as the interface between the contractors (IES and SAIC) and the four village utilities.

b. **Intelligent Energy Systems:** Dennis Meiners, CEO of the Anchorage-based Intelligent Energy Systems will be the Project Manager. Intelligent Energy Systems, LLC was founded in 2007 and specializes in the development of renewable energy systems and information solutions for off-grid communities. Intelligent Energy Systems was project manager for the wind farm construction projects at Kwigillingok, Kipnuk, Kongiganak and Tuntutuliak.

c. **SAIC Energy, Environment & Infrastructure (SAIC):** SAIC will provide the subject matter expertise required for this project. SAIC is uniquely positioned to provide a complete, standards-based open-architecture commercial off-the-shelf solution that will satisfy the unique needs of the village utilities and provide a solid platform that will grow with its future needs. The personnel of the SAIC team have the requisite operational and utility experience necessary to understand the special challenges faced by the village utilities and the technical experience to develop innovative solutions based on emerging technologies. SAIC currently provides the 'Smart Grid as a Service' functionality to the utilities in Kwigillingok, Kipnuk, Kongiganak, and Tuntutuliak.

d. **ISER/UAA:** Ginny Faye, Assistant Professor of Energy Economics has 30 years of research experience as a resource economist and biologist in Alaska. Current research projects include wind-diesel hybrid energy systems, renewable energy project economic analyses.

5. Discussion of Commercialization of Funded Technology

a. **Potential Market:** The immediate potential market is the 190 utilities participating in the Power Cost Equalization Program. The expanded market for the enhanced Smart Grid package is all other remotely located Alaskan utilities with energy cost challenges.

b. **Potential Public Benefit:** The potential public benefit is to lower the operating costs of diesel generation throughout Alaska and increase the efficiency of energy use. Additionally the public is served by the objective and accurate measurements of energy consumption.

6. Signed Applicant Certification: By signature on this application, I certify that we are complying and will comply with the amount of matching funds being offered.

_____Dennis Meiners, Intelligent Energy Systems, LLC

Proof of Eligibility: Intelligent Energy Systems, LLC meets the eligibility requirement as a business holding an Alaska business license. Please see Attachments (Alaska Business License – Intelligent Energy Systems, LLC).