

Agency: Commerce, Community and Economic Development**Grant Recipient: Kodiak Electric Association, Inc.****Federal Tax ID: 920010172****Project Title:****Project Type: Remodel, Reconstruction and Upgrades**

AEA - Kodiak Electric Association Terror Lake Hydroelectric Facility Expansion

State Funding Requested: \$7,500,000
One-Time Need

House District: 36 / R**Brief Project Description:**

Expanding Terror Lake's capacity with a third turbine generator unit will significantly enhance the stability of Kodiak Electric Association's (KEA) electrical infrastructure, provide the foundation for integrating additional renewable energy sources onto the KEA grid, and reduce dependence on diesel fuel by supplying ample backup capacity for peak loads and outages of the existing hydro turbine-generator units.

Funding Plan:

Total Project Cost:	\$15,907,950
Funding Already Secured:	(\$248,160)
FY2012 State Funding Request:	<u>(\$7,500,000)</u>
Project Deficit:	\$8,159,790

Funding Details:

The total project cost is estimated at \$15.9 million. The grant request is for \$7.5 million. In an earlier round of the Renewable Energy Fund, the project was granted \$248,160. This grant request would put the project near a 50/50 match with KEA. The total project cost includes the engineering, purchase, and installation of the third hydroelectric turbine at Terror Lake.

Detailed Project Description and Justification:

The Terror Lake Hydroelectric Facility was constructed in 1984 with two turbine generator units and an empty bay for a future third unit. Expanding Terror Lake's capacity with a third turbine generator unit will significantly enhance the stability of Kodiak Electric Association's (KEA) electrical infrastructure, provide the foundation for integrating additional renewable energy sources onto the KEA grid, and reduce dependence on diesel fuel by supplying ample backup capacity for peak loads and outages of the existing hydro turbine-generator units. This is a one-time capital investment.

KEA provides electricity to approximately 5,800 meters on Kodiak Island in a service area that includes the region in and around the City of Kodiak, the U.S. Coast Guard Base, Bell's Flats, Chiniak, Pasagshak, and Port Lions. The Terror Lake Hydroelectric Facility is the primary source of KEA's energy supply, and is the cornerstone to KEA's renewable energy generation system.

The Terror Lake powerhouse was constructed in 1984 with two vertical axis impulse Pelton-type turbine generator units and an empty bay for a future third unit. A third turbine was not installed during the initial project construction because system loads at that time only warranted 20 megawatts (MW) of hydropower capacity. A study conducted for the Alaska Power Authority (now the Alaska Energy Authority) in June 1983 determined that the additional generation capacity of a third

turbine generator would not be needed until after 1995. Currently, there are significant periods when KEA's load surpasses the 20 MW capacity of Terror Lake's two turbines.

KEA is dedicated to providing the Kodiak community with cost-effective renewable power, and the community strongly supports the direction toward self-reliance obtained by reducing the use of fossil fuels. Terror Lake's hydropower provides the base load capacity needed to backup the other forms of renewable energy that are more variable in their energy output (i.e., wind, wave, tidal, river in-stream). Unfortunately, the current capacity at Terror Lake has been surpassed by the growing load demand. This lack of hydropower capacity, in effect, imposes a limit on the amount of renewable energy that can be stably integrated onto KEA's isolated grid system. A solution to this limit on renewable energy integration would be the expansion of Terror Lake's capacity with a 10 MW third turbine generator.

In addition to providing the necessary capacity for other forms of renewable energy on KEA's system, another benefit to expanding the capacity of Terror Lake by 10 MW with a third turbine generator is the ability to cover peak loads. Over the past decade, peak loads on the system have averaged 24 MW. Diesel-powered generation is currently required for these periods of high demand and the need for diesel-fueled supplemental capacity will continue to grow in the future as peak loads increase. Increasing Terror Lake's capacity to 30 MW with a third turbine generator will mitigate the use of diesel fuel by maximizing the use of wind power from the Pillar Mountain Wind Farm and covering the remaining peak loads with hydropower. The third turbine would also provide backup capacity to the two existing hydro generating units when offline for maintenance and repair, thereby eliminating the need to run diesel generators continuously to meet the system demand. The enhanced stability to KEA's grid resulting from this additional hydropower capacity also delays distribution infrastructure costs, and allows for additional renewable sources of energy (i.e., Phase II of Pillar Mountain Wind Project, potential tidal or wave projects) to be integrated onto the KEA system in the future.

The savings provided to the Kodiak community as a result of Terror Lake's capacity expansion are enormous. It is estimated that over the 50-year life of this project, the net present value (NPV) as compared to diesel power alone will be \$81,164,518 per the AEA Round IV Grant Fund Model.

KEA has begun the process to install a third turbine generator unit at Terror Lake to increase the facility's generating capacity to 30 MW. A regulatory review of KEA's Federal Energy Regulatory Commission (FERC) license assessed the feasibility of modifying the facility for additional capacity and found no major issues regarding the FERC amendment process or related permitting approvals associated with installation of the third unit. Fortunately, the engineers of Terror Lake had the foresight to design the facility for this future expansion; the powerhouse already contains an empty bay for the third turbine and the power tunnel, penstock, and tailrace are large enough to accommodate a flow corresponding to 30 MW of capacity without modification. An engineering review found no substantive reason that the Unit 3 addition would not be feasible with respect to electrical, protection, control, communications, and instrumentation.

The major economic benefit of this project is the savings from diesel fuel costs and emissions. As renewable solutions are developed and Terror Lake is expanded with a third unit to provide additional capacity and stability, more benefits will be realized by the Kodiak community.

Project Timeline:

The application process for the FERC license capacity amendment is currently under way, and is expected to be completed by spring 2012. Construction to install the third turbine could be completed by fall of 2013.

Entity Responsible for the Ongoing Operation and Maintenance of this Project:

Kodiak Electric Association, Inc.

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Has this project been through a public review process at the local level and is it a community priority? Yes No