

Kotzebue Electric Association
Flow Battery Storage Systems
Quarterly Report

9/25/2011

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Funding

Denali Commission	\$425,000
AEA	\$300,000
CREBS Loan	<u>\$575,000</u>
Total	\$1,300,000



Premium Power Transflow 2000

Project Summary:

The goal of this project is to test an advanced battery system and its' application to Alaskan energy needs. Kotzebue Electric Association's (KEA's) interest is to evaluate a large flow battery in conjunction with wind power in order to improve overall system efficiency and reduce the amount diesel fuel used for electrical generation by time shifting energy from both the wind and diesel systems. Additionally, KEA is interested in the ability of advanced battery systems to provide frequency regulation, provide a substitute spinning reserve, and provide black start and emergency power capability. There are currently a number of batteries in the >1 megawatt capacity being developed by several suppliers. If these batteries become commercially available at the price points suggested by manufacturers their deployment could result in significant diesel fuel savings in similar communities with wind or other renewable energy sources.

Background:

In August, 2009, the Alaska Center for Energy and Power (ACEP), which is part of the University of Alaska and Kotzebue Electric Association (KEA) applied separately for funding to test advanced battery systems through the Denali Commission Emerging Technologies Grant Fund. These projects were organized differently based on the different project management needs, two classes of batteries, and the level of technology readiness. The larger Premium Power battery is most appropriate for Kotzebue, given KEA's excellent track record of integrating new wind turbines with their existing diesel system, with some support from ACEP on data collection and analysis. The smaller batteries were proposed as laboratory tests at ACEP, which proved to be of considerable value during previous testing of the VRB battery, as clean performance data could be collected to assess the validity of the claims made by the supplier. During the second round the Denali Commission requested that the two proposals be combined for a total of \$855,000. This was partially awarded. Since October of 2009 KEA has worked with ACEP to re-scope the work plan to address the reduced funding level of \$500,000, while meeting the original objectives of the project- to demonstrate viable storage options to augment wind-diesel systems in rural Alaska. The re-scoping was further complicated by the existence of another proposal by KEA (see below), which affected the prioritization of effort on this project.

KEA has applied for funding for the Premium Power zinc-bromide battery through the Cooperative Research Network (CRN) to the Department of Energy. This proposal was not funded. Therefore, the re-scope of the joint ACEP/KEA funding through the Denali Commission will focus the majority of funds to KEA's demonstration project. However, this amount is insufficient to outright purchase the Premium Power battery, as it would amount to one-third of the commercial installation price.

Project Work Plan:

A. Purchase and Delivery of Premium Power Flow Battery

Updated: March 2011- September 2011

In the spring of 2010 KEA received production status reports from Premium power estimating a unit completion date at the end of May 2010, with testing beginning in June 2010. This would have put KEA on track for the summer construction and barge deadlines. KEA estimated receiving the unit in Kotzebue in August or September 2010 on the last barge of the season. However, initial testing of the battery by Premium Power indicated the need for fluid upgrade in the unit. This delay caused the battery to miss the 2010 summer barge season. KEA explored other shipping options, such as utilizing the transportation barge of other private late-season construction projects in the region. However, the fluid upgrade launched a new series

of tests on all four quadrants of the battery unit. Premium Power began Factory Acceptance Testing anew on the unit in July of 2011 with expected arrival at the port in Seattle in time to make the last barge of the shipping season.

KEA received the unit in Kotzebue in September of 2011.

B. Installation

Update: Sept 2011

KEA will install the TransFlow 2000 at their substation in Kotzebue and will ensure that the site is prepared for installation upon delivery of the battery. The following is a bullet list of the site preparation done by KEA during the summer of 2011 in anticipation of the delivery of the battery:

1. EPS engineer, wiremen and a programming engineer have been on site to complete the installation of the wiring and programming to the Battery switchgear.
2. EPS has programmed the switchgear relaying and metering and has been working on the SCADA switchgear reporting.
3. KEA personnel have completed the primary wiring installation from the battery switchgear to the Battery Transformer and the secondary run to 5 fused disconnects.
4. The Battery switchgear has been energized both via SCADA in remote mode and via local mode and the relaying and controls have been tested and proven functional. The Battery transformer was tested and is operation at the correct voltage. Phase rotation was tested on the battery and at each fused disconnect and was correct and uniform.
5. The communication conduit between the substation SCADA controller and the battery has been installed and the communication wiring will be installed after the battery is placed in the substation.
6. The flow battery arrived in Kotzebue on Sunday September 25 and will be moved into place Monday September 26, 2011.

The secondary connections between the five fused disconnects and the Battery will be installed after the battery has been inspected by Premium Power and the liquid has been installed into the Battery Tanks.

Specific TransFlow installation requirements will be coordinated with the manufacturer who will have a representative on site and will address the need for electrolyte containment and mechanical systems to provide temperatures that will maximize operational efficiency. KEA and Premium Power technicians will commission and test the battery to ensure proper operation.

Project Status:

KEA will install the battery in September and October of 2011 which is on schedule to provide one full year of operational experience and data collection as per this award.

To date the project is on budget as set out in the original grant agreement. The total amount of funding provided by the Commission to KEA is insufficient to purchase the battery outright. KEA has moved forward with the purchase of the Premium Power battery by utilizing several funding sources including state and federal grants and a low interest CREBS loan.

Currently KEA has no expected problems with this project. KEA is looking forward to the opportunity to install, commission, test, and gain valuable operational knowledge of integrating this technology with a wind-diesel power plant.



Premium Power TransFlow 2000 arrives in Kotzebue.



Off-loading the TransFlow 2000.



Finalizing Fuse Disconnects at KEA substation.



Battery Controls and SCADA interface in the KEA power plant.