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Sandia National Laboratories/Cordova Electric Cooperative Energy Storage Evaluation Overview

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SAND Document

Project Team

- **US Department of Energy – OE Stationary Energy Storage Program**
- **Sandia National Laboratories (Sandia)**
- **Clean Energy States Alliance (CESA)**
- **Cordova Electric Cooperative (CEC)**
- **Alaska Center for Energy and Power (ACEP)**

Funding and Important Dates

Estimated total project cost is $250,000.

Funding will come from DOE/SNL, ACEP, and CEC.

Phase 1: 02/01/2016 – 09/30/2016

Phase 2: 10/03/2016 – 03/31/2017

Problem

Run-of-the-river (no water storage) hydro-diesel islanded microgrid
Operated by CEC

- Periods of *low demand* and *high water availability:*
  - Spills significant amounts of water (non-realized power production)
- Periods of *high demand* and *low water availability:*
  - *Co-generate with diesel generators*

Approximate cost of generation:
$.0.9/kWh hydro
$0.40/kWh diesel

Community Overview

- City of Cordova and Native Village of Eyak
  - Combined population,[i] 2014: 2286
  - Accessible only by sea and air
  - Thriving fishing industry
    - Netting between $45 - $85 million annually

Figure 1: Cordova, AK (red dot). Source: Wikipedia.org.

[i] Alaska Energy Data Gateway, Census Data, retrieved January 2016: https://akenergygateway.alaska.edu/community-data-summary/1421215/

Background Information

- Bulk of generated electricity delivered to industrial fish processing plants and support industry.
  - Mostly during summer months.
- Loads peak at nearly 10MW during fishing season
  - In winter months peaks drop below 3MW

CORDOVA ELECTRIC GENERATING ASSESTS	
Power Creek Hydropower (6MW Total Capacity)	• 2x3MW Turgo Turbine
Humpback Creek Hydropower (1.25MW Total Capacity)	• 2x500kW Francis Turbine • 250kW Turgo Turbine
Orca Diesel Power Plant (11.15MW Total Capacity)	• 2.5MW EMD • 2.4MW Fairbanks-Morse • 2x1.125MW Caterpillar • 4MW EMD

Background Information

- 7.125MW hydropower generation capacity
  - CEC is able to meet demand with hydropower as much as 60% of the time.
- The figure below shoes a time-series for 2014 demand.

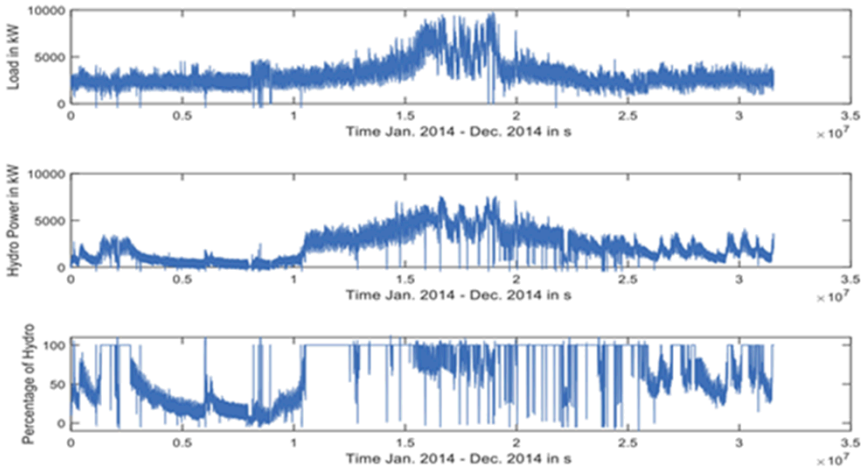

Figure 1: Demand and hydropower generation in Cordova, AK for 2014. Top panel: demand. Middle panel: hydropower output. Bottom panel: hydropower output as fraction of total generation. Intermittent drops to zero in hydropower generation are due to maintenance operations such as clearing debris from the intake structures.

- Opportunity for energy storage in Cordova.
- Significant amount of time when hydropower meets 100% of demand
  - Middle of the year
- Also times when diesel has to supplement to meet demand
  - Summer and occasionally in the winter

Work To Be Performed

- CEC, DOE/Sandia National Laboratories, and ACEP will team up to determine:
  - The availability of excess hydropower
  - Demand of supplemental generation to optimally sizing an energy storage system
  - Additional services that an ESS may be able to support
  - Identify potential sites for deployment of an ESS which provides best value based on dynamic modeling.

Risks

Risk	Mitigation
Energy Balance Model reveals no benefits for energy storage	Previous work performed by ACEP and Sandia has revealed that there are benefits for capturing spilled water from the hydropower and utilizing it for thermal loads. Therefore, this risk is low to non-existence.
No real estate in Cordova, AKfor installing an energy storage system	CEC owns quite a bit of land which the terrain is quite open. There is room at least in the Orca power plant therefore this risk is low or non existence.
Gathering electrical power data from CEC for modeling efforts does not happen at all or in a timely manner	CEC has already shared 10 years worth of data from their SCADA system at 1 second resolution with ACEP and Sandia. This risk is low to non-existence
Specifications for RFP that comes from the modeling do not match any technology that exists in the energy storage market	Energy storage technologies vary greatly in size for power and energy. If no one technology fits the specifications of the RFP, a combination of technologies will be looked at which meet certain specifications within the RFP. Due to the variety of technologies available today this risk is low to non-existence

Request for Proposal (RFP)

- Analysis that is performed will inform the technical sections of an RFP to be used by CEC
- RFP will be for procuring an energy storage system

Mention of our SNL Sponsor – DOE/OE - Grid Energy Storage Program, managed by Dr. Imre Gyuk

Thank You!

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Possible Extra Slides about the ES Program Below

Energy Storage Analytics

- Estimating the value of energy storage
  - Production cost modeling (vertically integrated utility)
  - LP Optimization (market area)
  - Stochastic unit commitment/planning studies (vertically integrated utility)
- Control strategies for energy storage
  - Wide area damping control, other grid functions
  - Maximizing revenue

- Public policy: identifying and mitigating barriers
- Standards development
- Project evaluation
  - Technical performance
  - Financial performance

- Model development (e.g. for dynamic simulation)