Canary User Conference

August 11- 14 State College, Pennsylvania

Delivering Low-Cost Power in Rural Alaska

Clay Koplin, PE

CORDOVA ELECTRIC COOPERATIVE INC.

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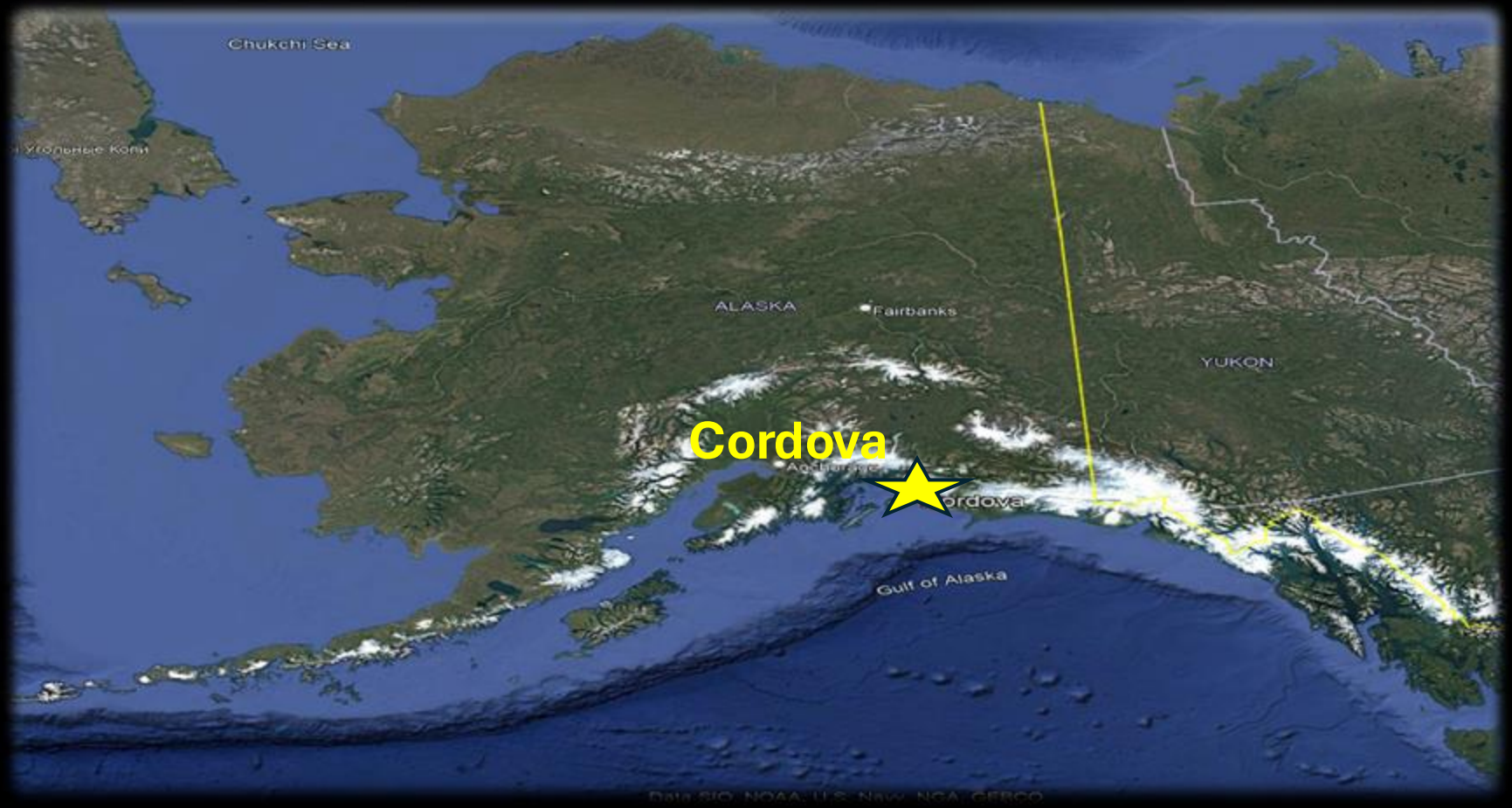
Cordova, Alaska – Remote Microgrid

Waterfront View, Orca Inlet off the Pacific Ocean foreground, Eyak Lake freshwater background
Location Map inset



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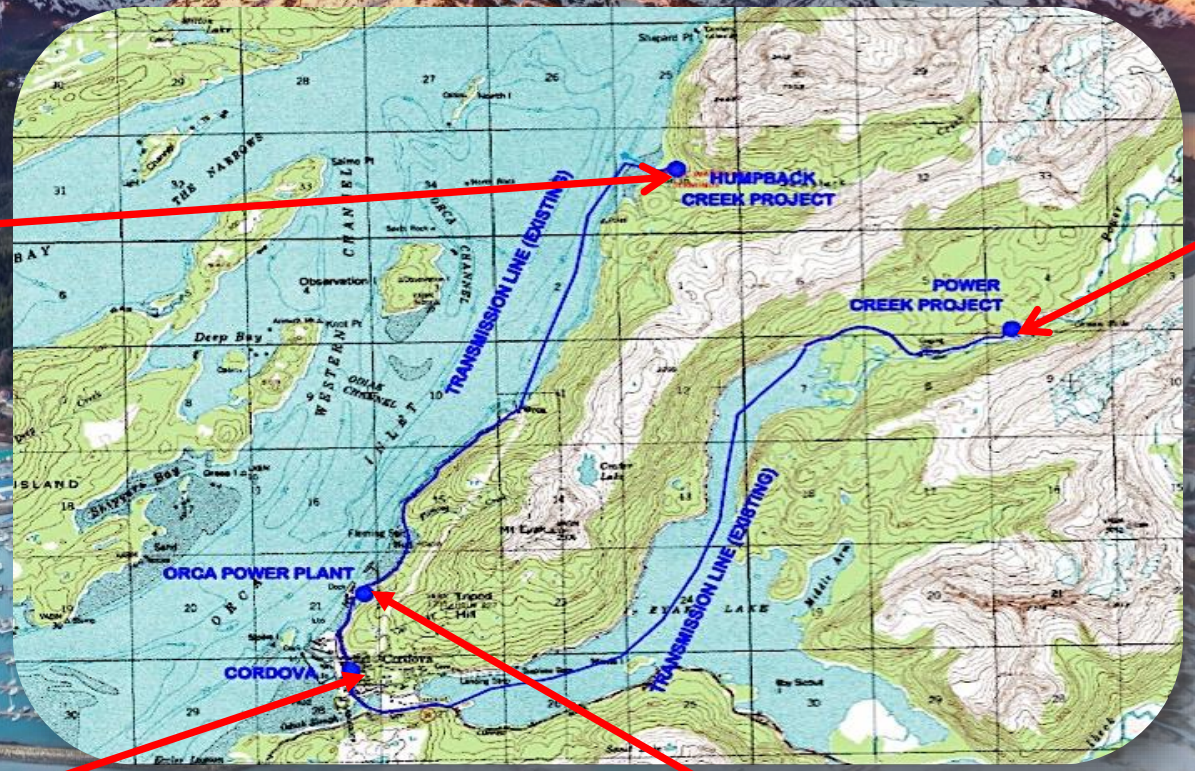
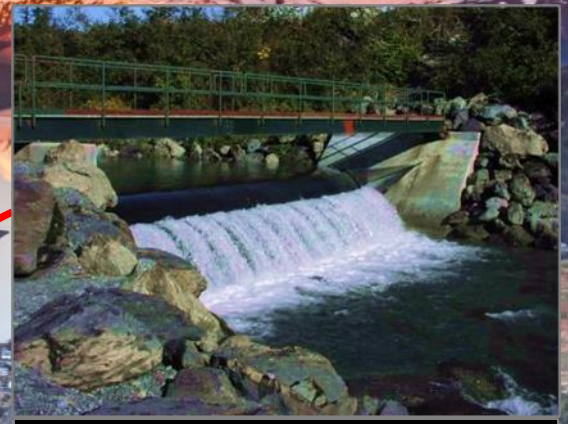
CEC Grid: Includes Diesel, Hydro, BESS & Data

City of Cordova servers 1,566 customers with 8MW of power through one Substation and 78mi UG distribution lines

Humpback Creek Hydro Plant
1250kW (2 x 500 kW + 1 x 250 kW)
17,000 foot UG and submarine transmission line





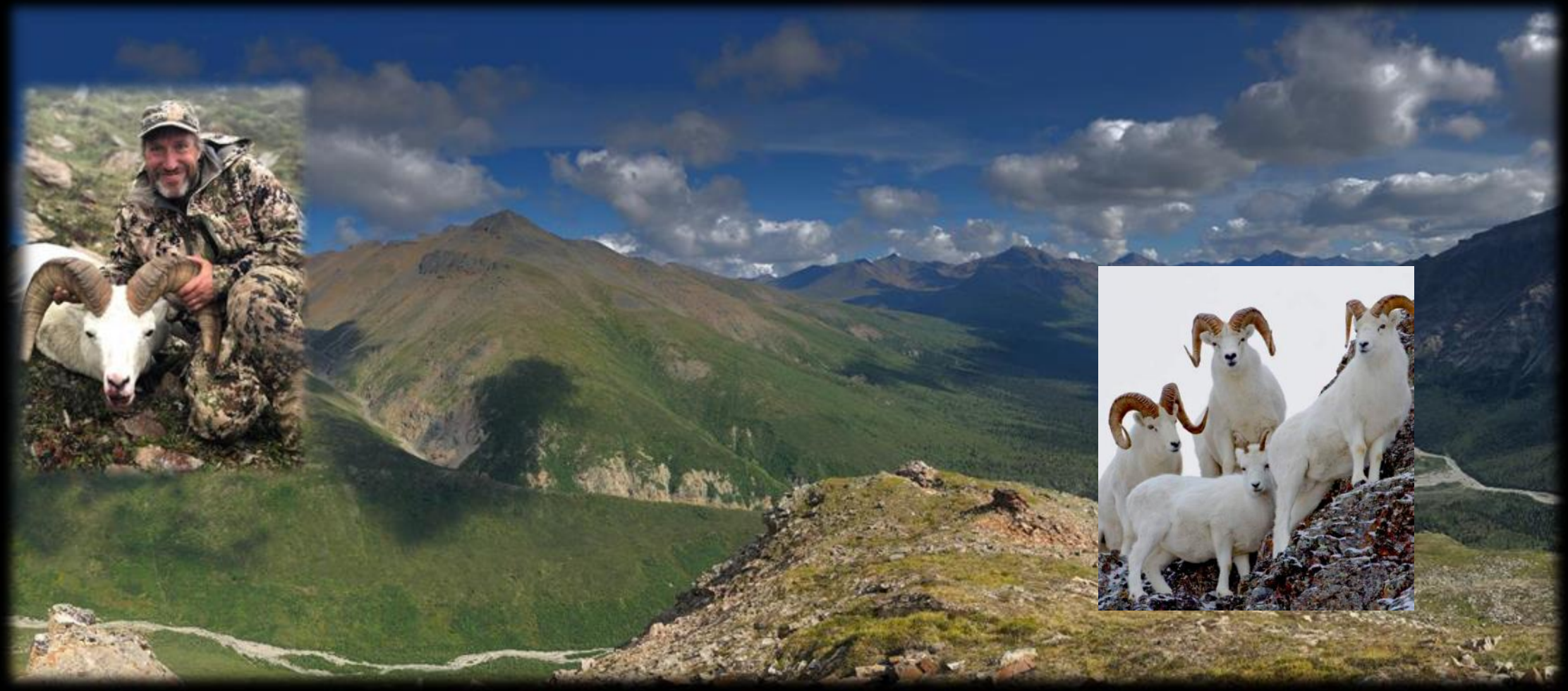
Power Creek Hydroelectric
6278kW (2 x 3124 kW)
25 kV transmission ties to Eyak Substation, Inflatable dam

Battery Energy Storage System
1 MW, 1MWh ABB/SAFT at Eyak Substation

Orca Power Plant
10.8 MW Diesel
Control Center, CEC

Data Resolution – An Alaskan Analogy

Managing different resolutions of data sets to “zoom out” to the forest view of operations, or “zooming in” to get forensic insights into short duration, transient events of millisecond time scales.



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CEC Canary History

We Initially purchased our Canary Historian in 2004 to collect and store SCADA Data and provide data trending with TrendLink. Our historian has grown over time as we continue to add assets and instrumentation.

- 2004 – Initial purchase
- We continue to add additional instrumentation to provide additional insight into asset health and performance.
- New assets are added to the Canary Historian as they are acquired to provide full life history.
- We routinely use Canary data to perform both short and long-term performance analysis to drive optimization and support overall performance improvements.
- Data sets are exported to perform deep grid analysis to identify opportunities for efficiency upgrades.
- We share data with partners at the national laboratories and various universities.

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Use Case #1 – Machine Learning with Canary Data

Large, historical data sets are used to tune machine learning algorithms to anticipate, alarm, and automatically or manually respond to periodic events. CEC does this automatically to flush gravel from dam intakes on a clog alarm basis but we chose not to automate for a once-in-decades event.

i.e. 2019 “Damalanche” - wet slush flow from mountains to ocean.

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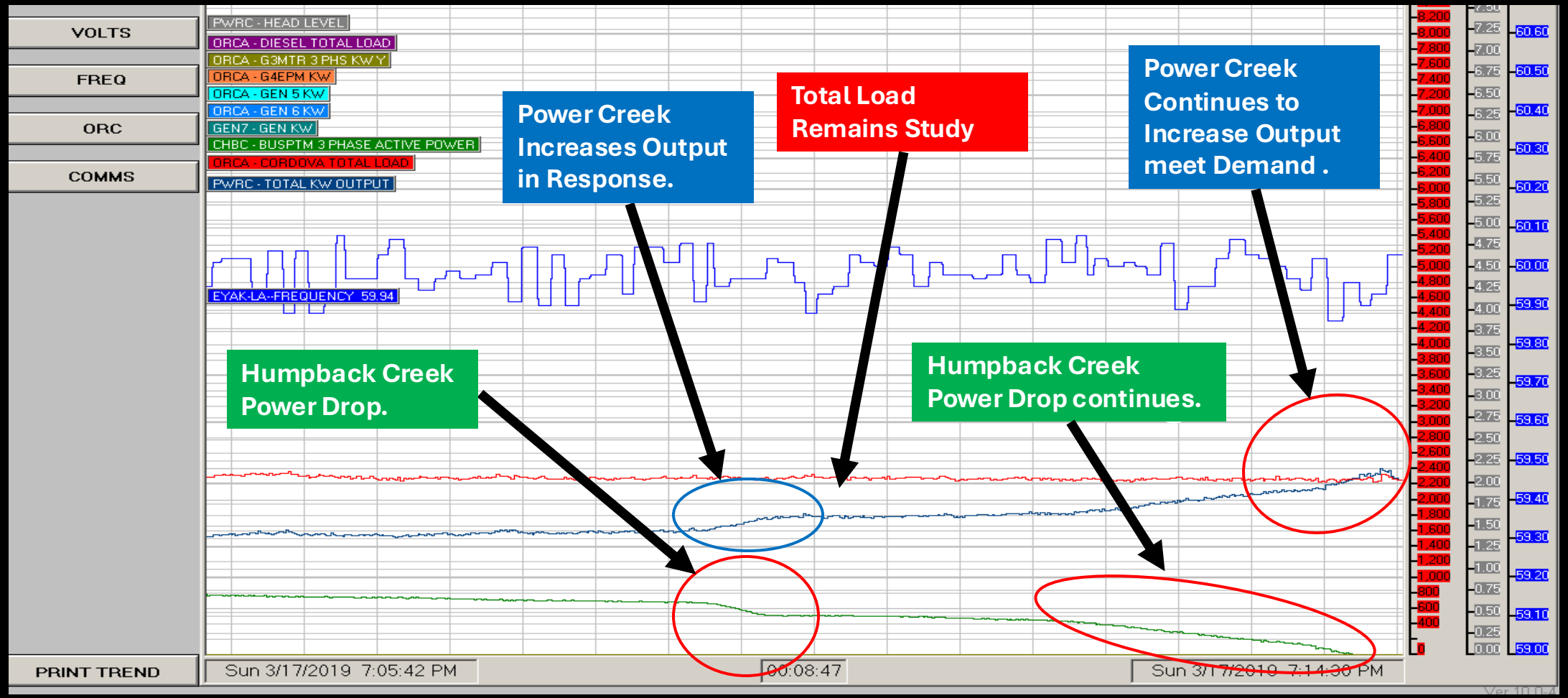
Humpback Creek Slush Flow - Issue

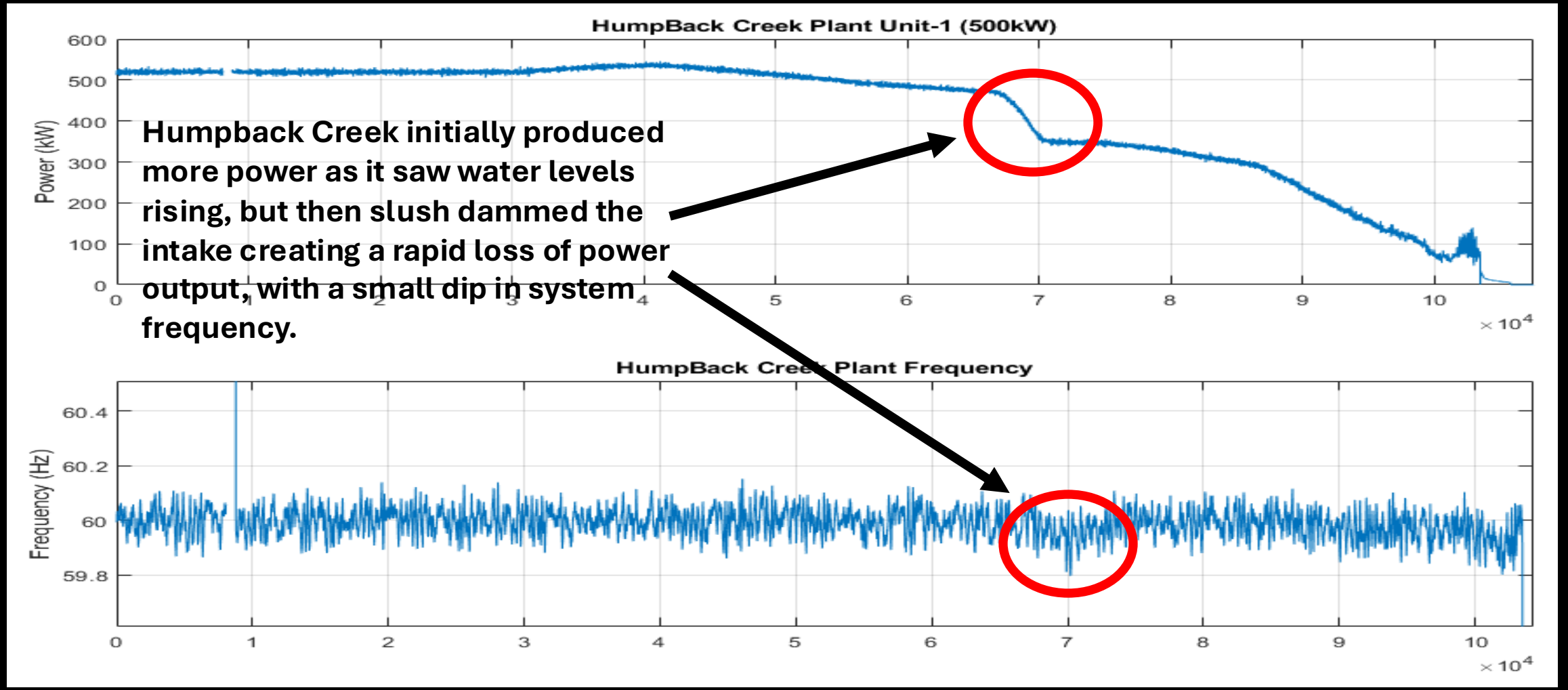
Slush flowed through the entire project creating life safety and operational hazards, the site was unmanned, and the CEC system narrowly avoided an outage.

Slush Flow - Trend Link Display

In less than 5 minutes Humpback Creek hydro output decreased but Power Creek was able to pick up the load quickly enough to avoid a power outage to the grid.



Slush Event – Power and Frequency Response



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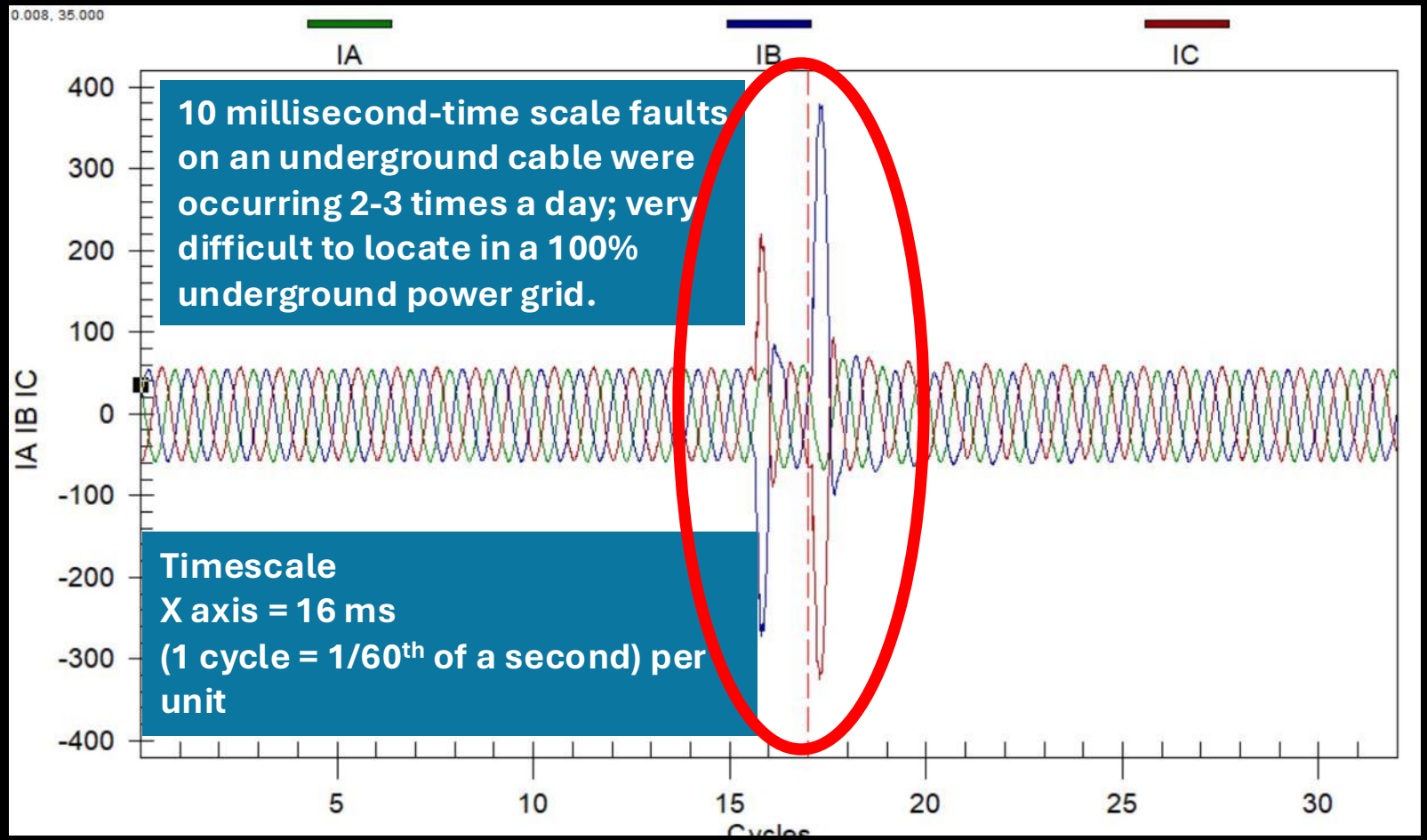
Use Example #2 - Faulted URD Cable

In October of 2022, CEC experienced an intermittent cable fault which was detected and corrected with electronic relays. Our Canary data was not collected at a high enough frequency to capture this issue.

Learning

- Sample frequency matters on very high frequency processes.
- Understand the limitations of your data.



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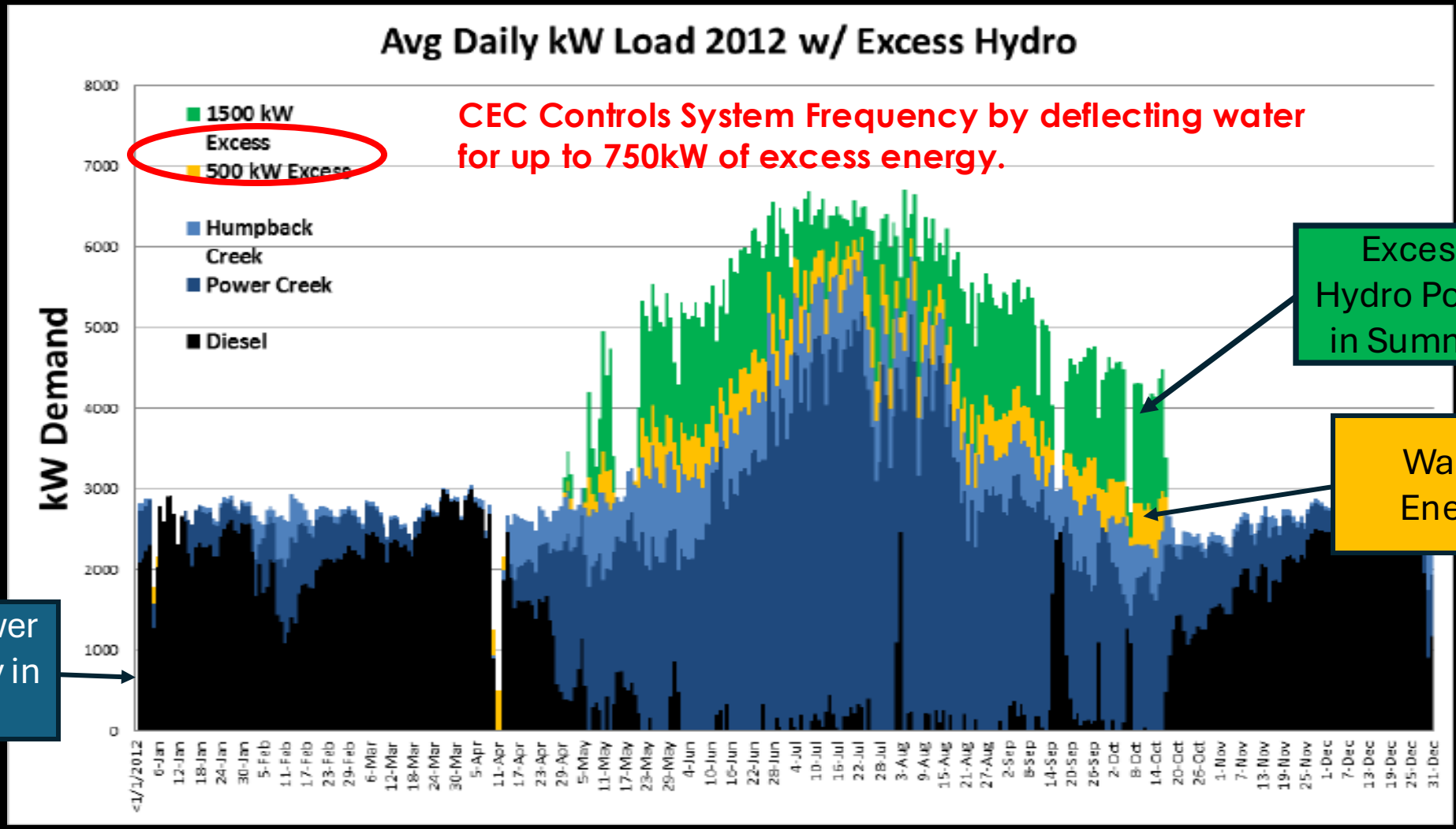
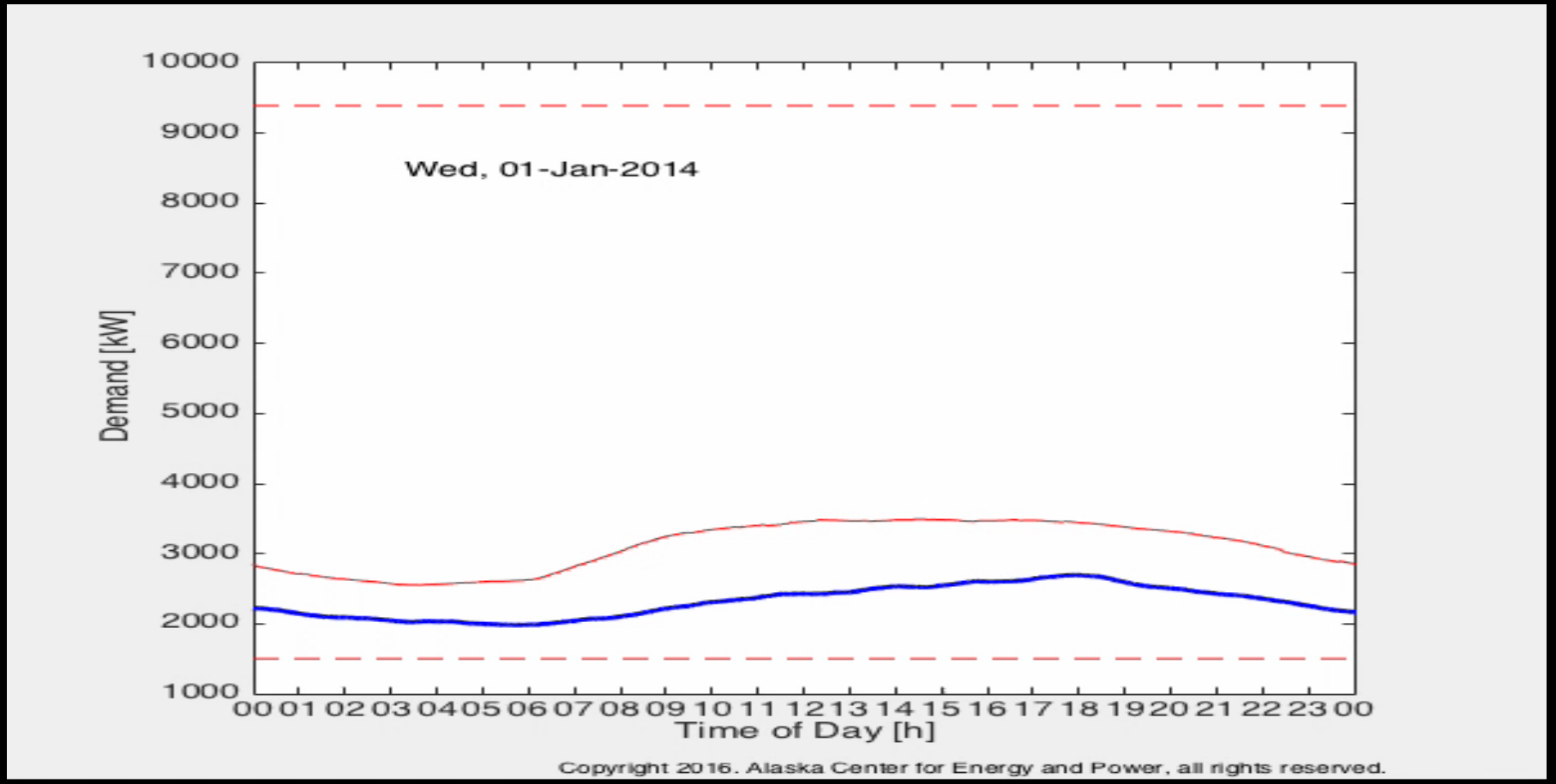
Use Example #3 – Battery Energy Storage System

Canary provided insights to help us identify the opportunity and size a BESS System 2014-2019.



BESS – Daily Grid Power Loading

Canary data was exported to Excel and animated to illustrate how dynamic the CEC grid is and emphasize the challenge of grid shaping/balancing and the role of the BESS System.



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Use Example #4 - Hydroelectric Inlet Valve Tuning

We recognized that the 6,000-kW plant was electrically capable of delivering 7,300 kW due to a high system power factor but had reached a hydraulic limit in the turbine water delivery pipeline that was capping output to 6,300 kW.

In 2023, Canary data was used to tune inlet water valve control after their replacement. Historical data was also used to calculate efficiency gain across their full range of operation.

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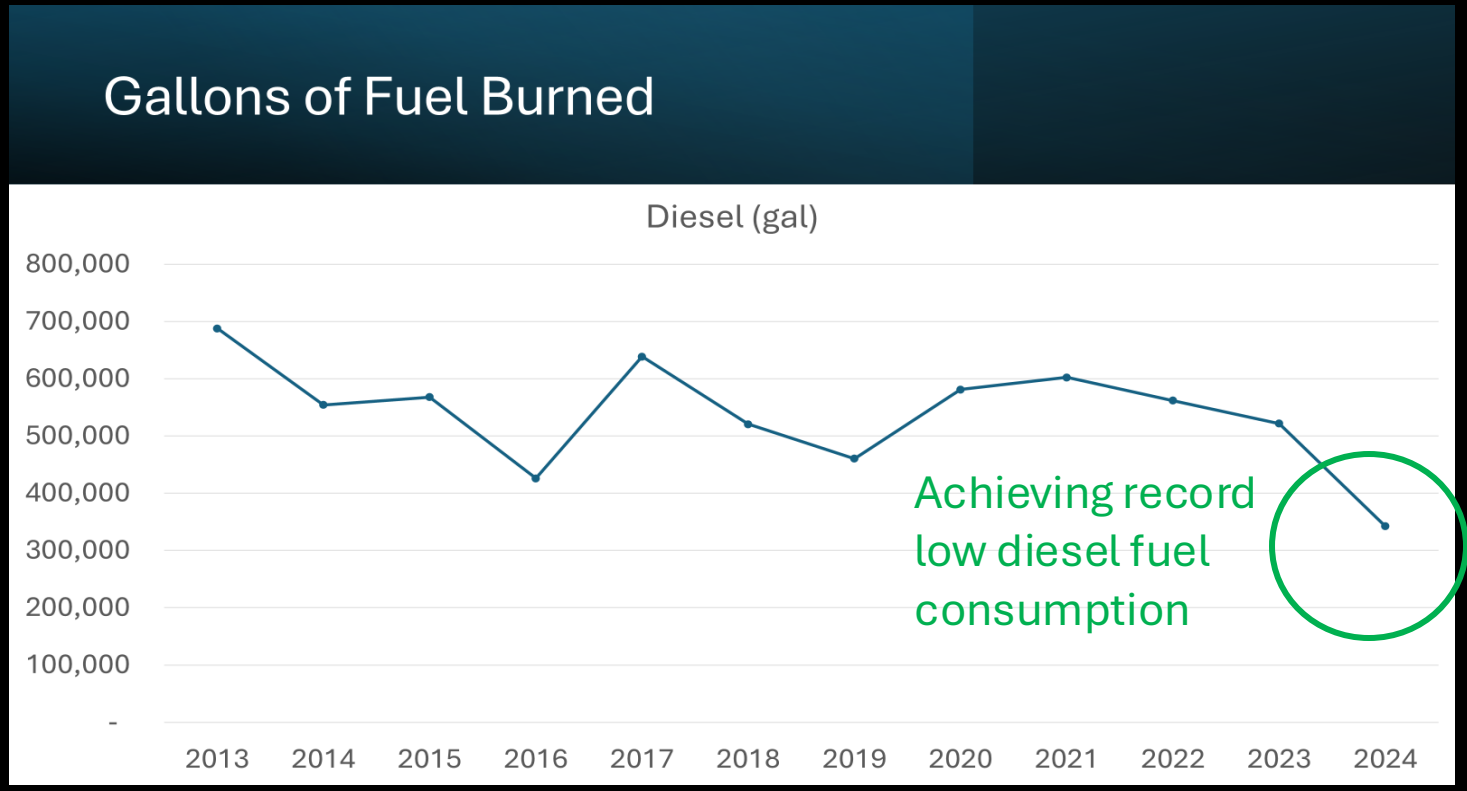
Communicate Successes to Stake Holders

Canary data is used to communicate operational successes like fuel use reduction to CEC customers at annual meetings, and for CEC Board and Staff to measure and manage CEC grid metrics.



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Planning The Future

CEC is now working with data industry to install small-scale cloud and AI servers in Cordova and are particularly interested in partnering with data industry to utilize our data set to model the integration of data servers onto a remote microgrid to grow sales of excess hydropower and economies of scale to reduce rate pressures.

Thankyou

Clay Koplin, PE

Questions ?

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