

BESS Application in a Microgrid - Cordova Electric Cooperative



Energy Storage Peer Review
Albuquerque, New Mexico
September 24, 2019

Cordova, AK (aerial view)

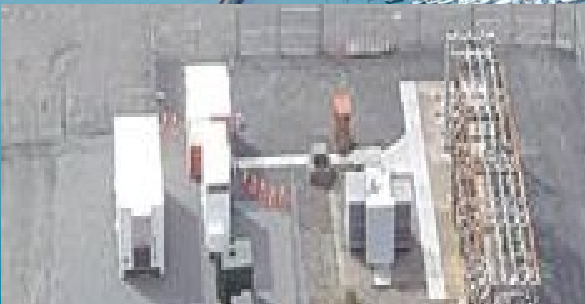
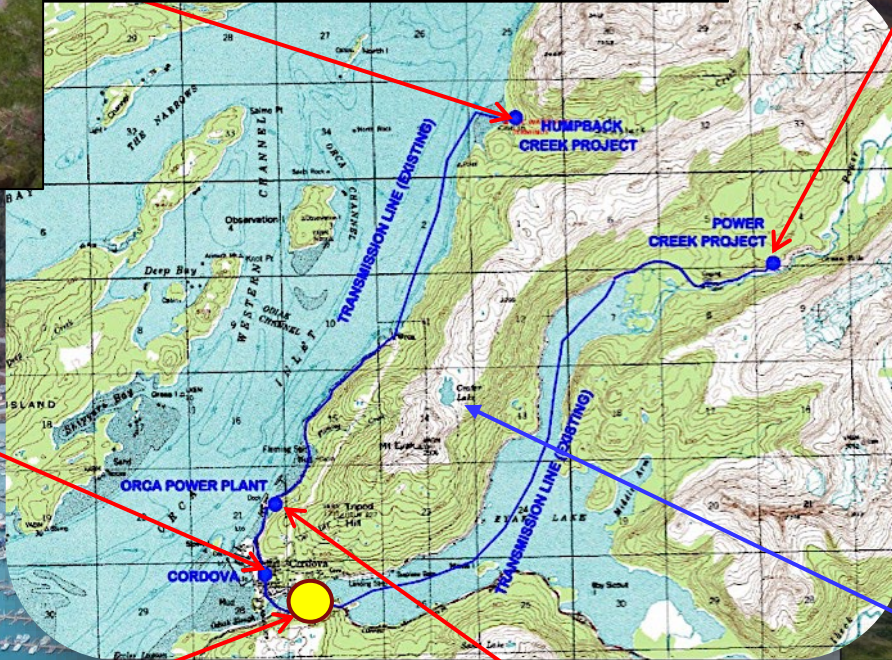


**Humpback Creek
Hydroelectric Plant**
1250kW (2 x 500 kW + 1 x 250 kW)
17,000 foot UG and submarine
transmission line



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

City of Cordova
1,566 customers,
18MW
One Substation
78mi UG distribution
lines



CEC BESS
1 MW, 1 MWh
Eyak Substation

**Orca Power
Plant**
10.8 MW Diesel
Control Center,
CEC



Crater Lake Dam Storage
may offset 25% remaining
diesel consumption

A US Department of Energy Sponsored Microgrid Battery Energy Storage Application

(Dr. Imre Gyuk, Director of Energy Storage Research, Office of Electricity)

**PARTNERS: US DEPT OF ENERGY-SANDIA-NRECA-ACEP-CEC;
SAFT/ABB PACKAGE**



Office of
ELECTRICITY

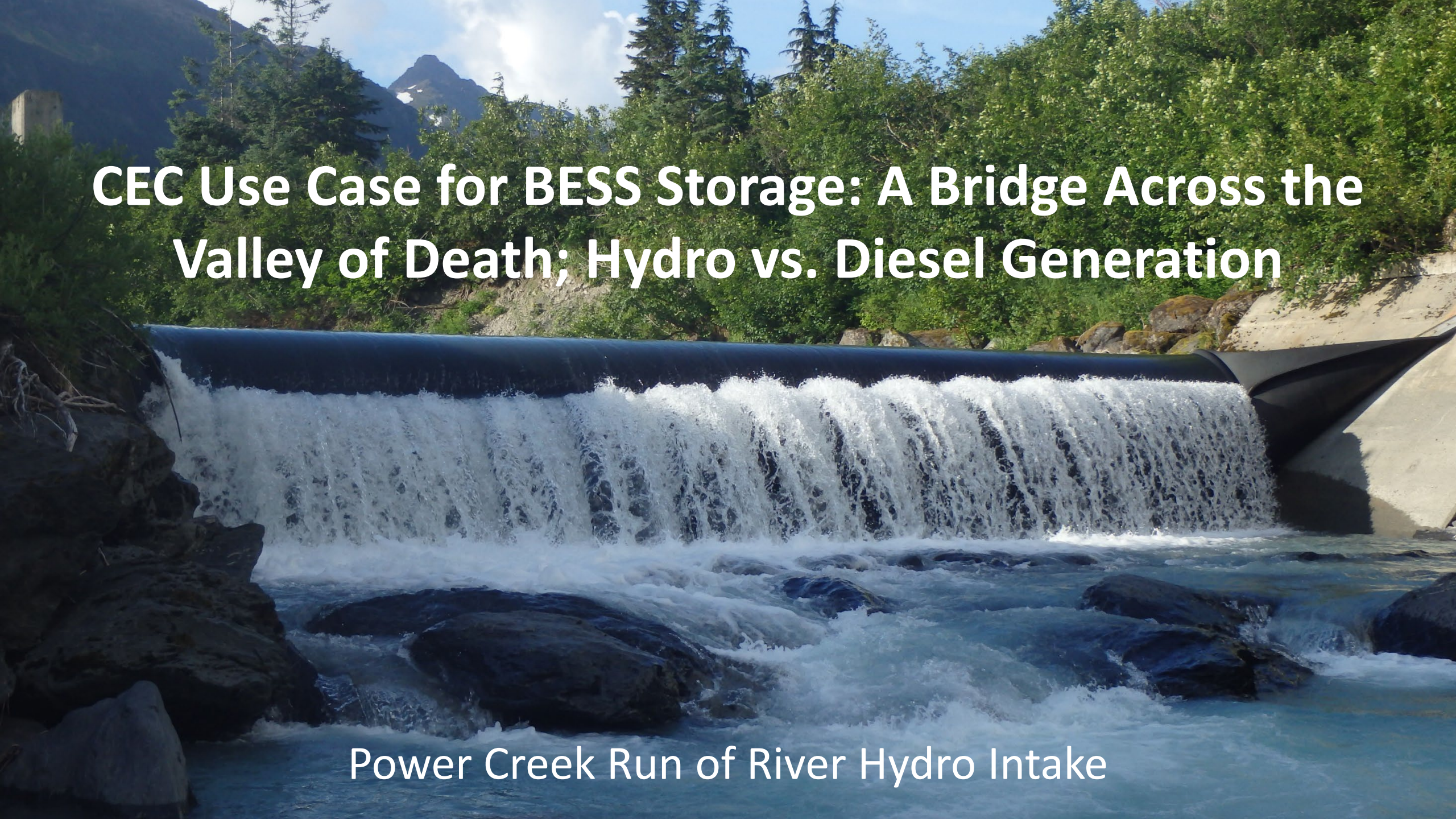


Sandia
National
Laboratories



ACEP
Alaska Center for Energy and Power



The image shows a wide river flowing through a lush green valley. A large concrete dam is visible on the right side of the river, with water cascading over it in a series of small waterfalls. The river is surrounded by dense evergreen forests, and in the background, snow-capped mountains rise against a blue sky with scattered clouds. The overall scene is a natural, scenic view of a river in a mountainous region.

CEC Use Case for BESS Storage: A Bridge Across the Valley of Death; Hydro vs. Diesel Generation

Power Creek Run of River Hydro Intake

CEC BESS Cost & Benefit

▶ SAFT-ABB Package 1MW, 919	\$1,400,000
▶ EPS Design & Integration	\$ 200,000
▶ CEC Force Labor/Staff Deliverables	\$ 150,000
▶ Additional Equipment & Site Develop	\$ 100,000
▶ Annual Operating Cost (finance/O&M)	\$ 171,644*

▶ Fuel & Lube Oil Savings	\$ 106,626
▶ Rebuild & Capacity Savings	\$ 16,590
▶ Defer Diesel Maintenance and Replace	\$ 30,000
▶ Annual Operating Savings	\$ 153,216



Site Work – May/June 2019

INSTALLATION / COMMISSIONING June 2019

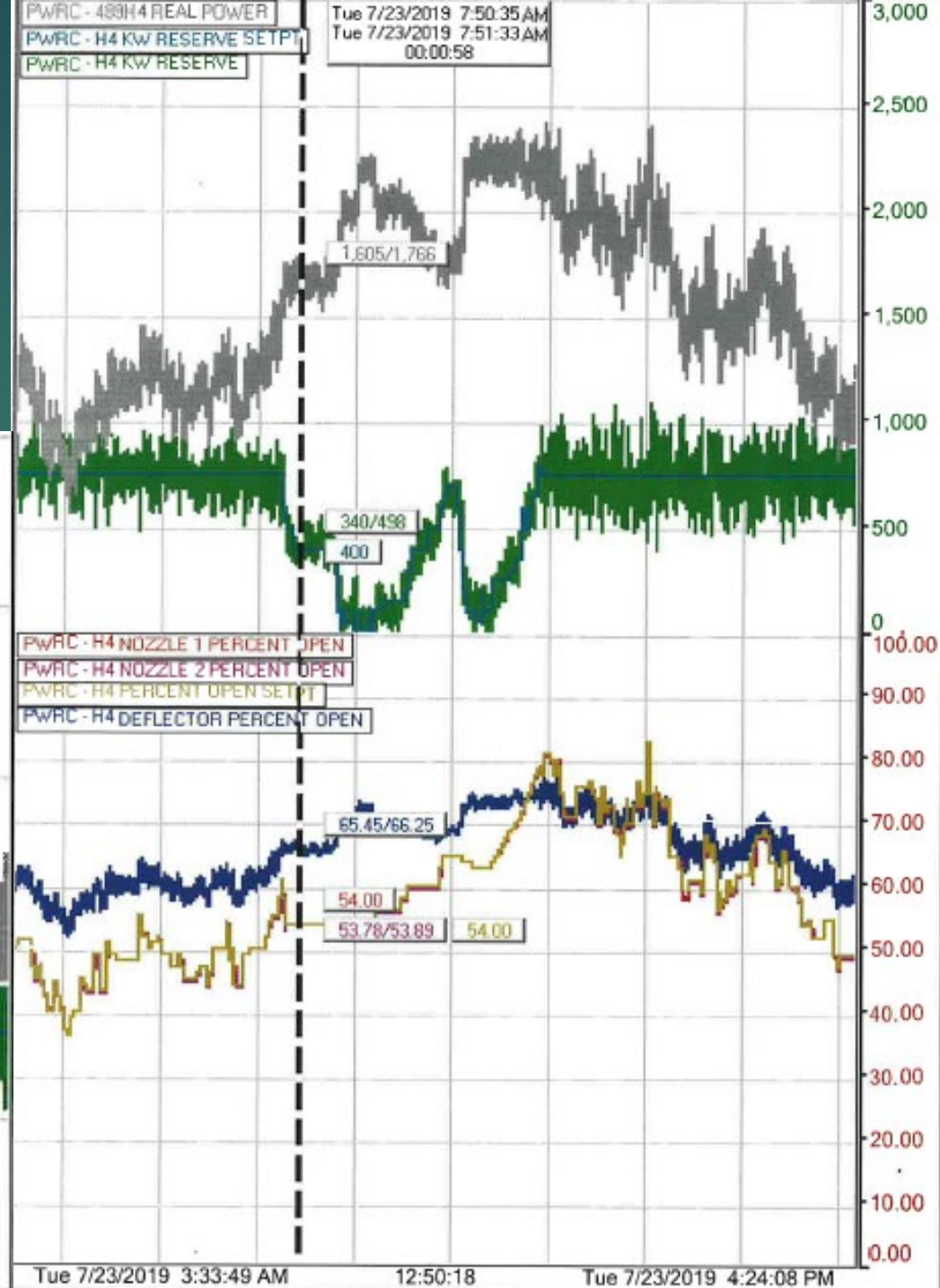
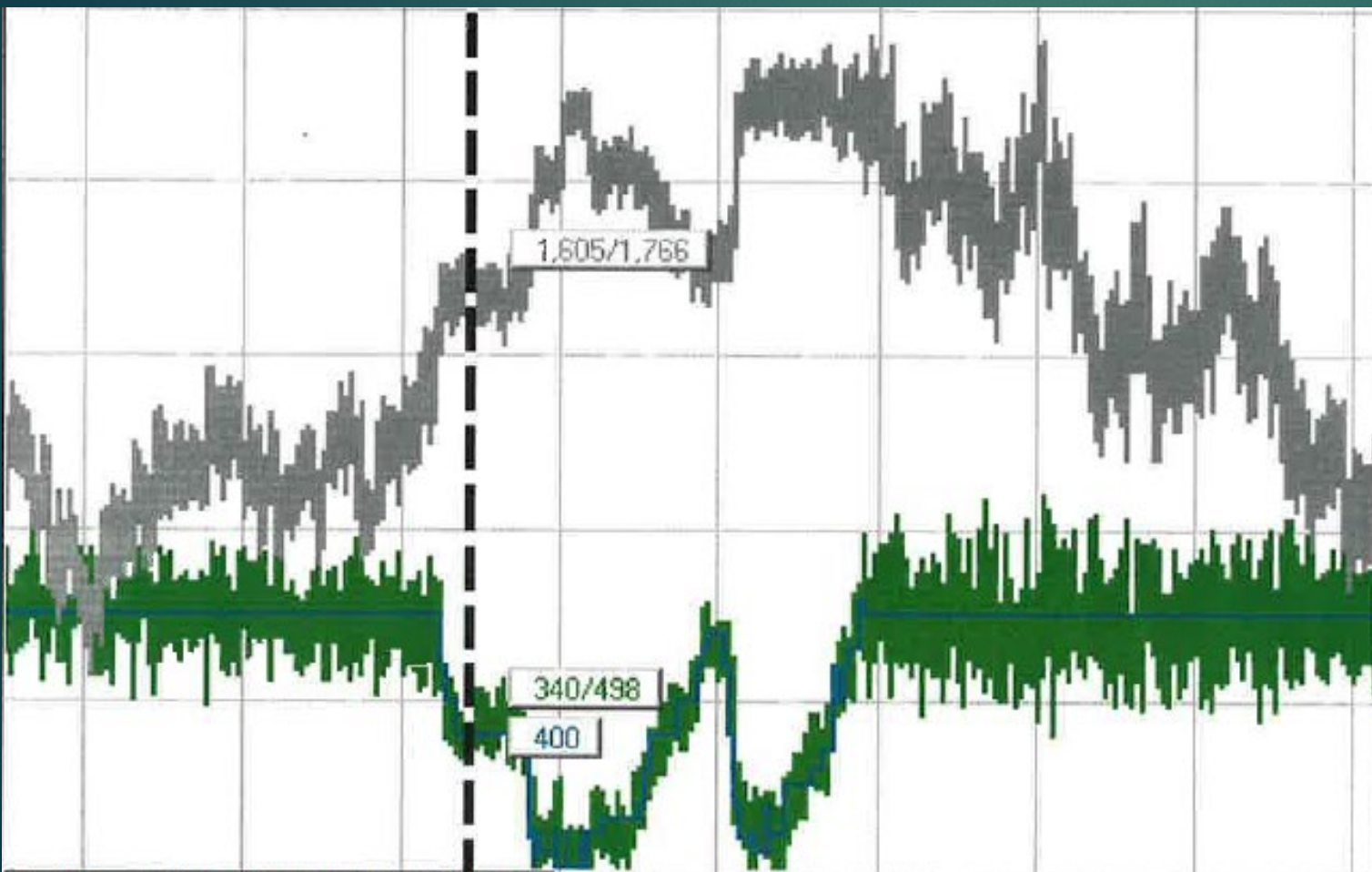


RIBBON CUTTING

June 2019



Grid Forming Operation (Isochronous Mode) Diurnal Diesel-Off July 2019



Here is What We Learned About BESS...

- Calendar aging capacity loss of 1.5% per year, our chemistry is estimated at 0.5%
- Capacity loss is kWh; kW remains near constant, round trip DC efficiency drops slightly
- Deep cycling causes rapid loss of life, shallow cycling extends life and total kWh throughput
- Frequency controls (small charges/discharges) can occur while bulk charging/discharging
- Removal, recycling, replacing a full battery set can cost 60% of initial package cost.
- Delivery times are fairly short, < 12 mo. From award to receipt
- Factory warranties and required annual maintenance are expensive
- Control algorithms are complex
- Integration into a microgrid is costly and complex
- Significant improvements can be expected through careful monitoring and iterative optimizations

Questions?

