

Alaska Energy Storage Projects and Opportunities

DOE Peer Review and EESAT2015

At the invitation of DOE Energy Storage Program – Dr. Gyuk (via Sandia NL)

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U.S. DEPARTMENT OF
ENERGY



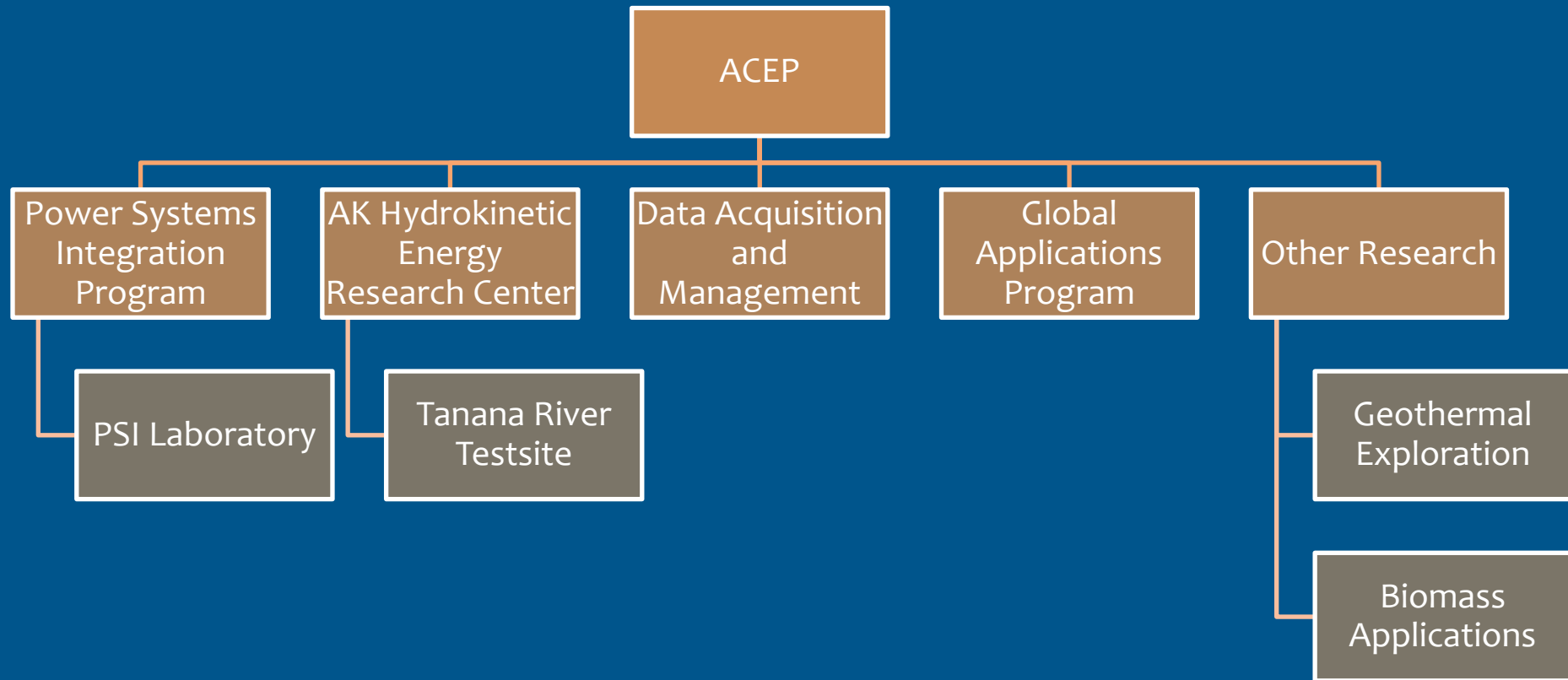
UNIVERSITY OF
ALASKA
FAIRBANKS



ACEP
Alaska Center for Energy and Power

Alaska Center for Energy and Power

Mission: Develop practical and cost effective energy solutions for Alaska and beyond.

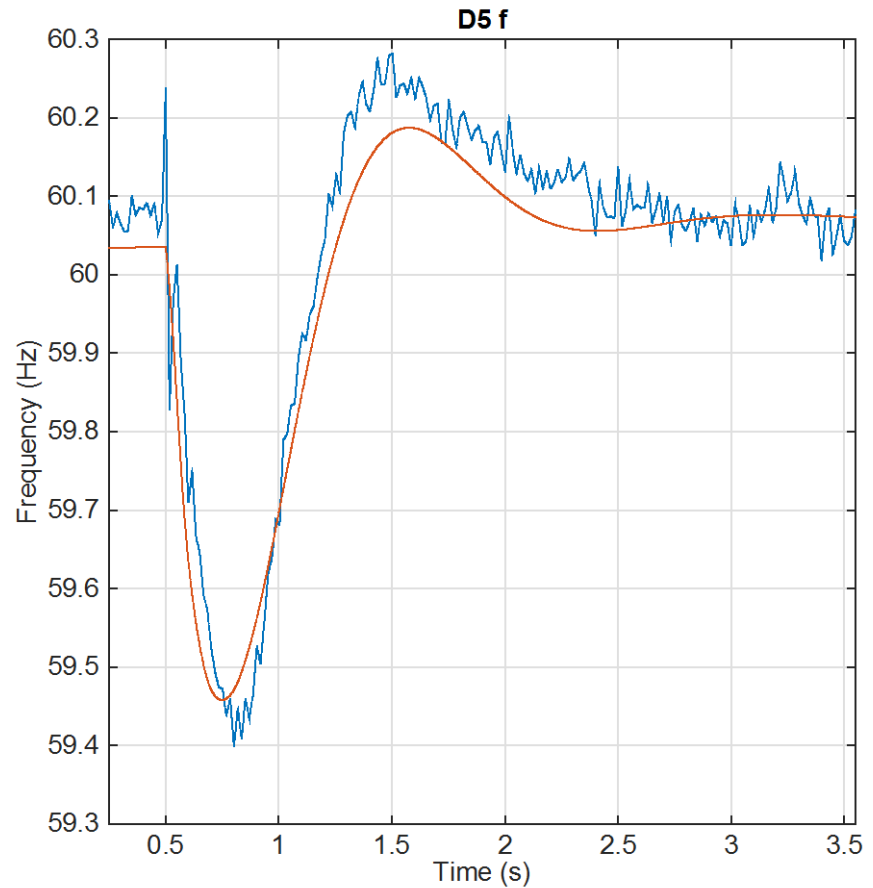
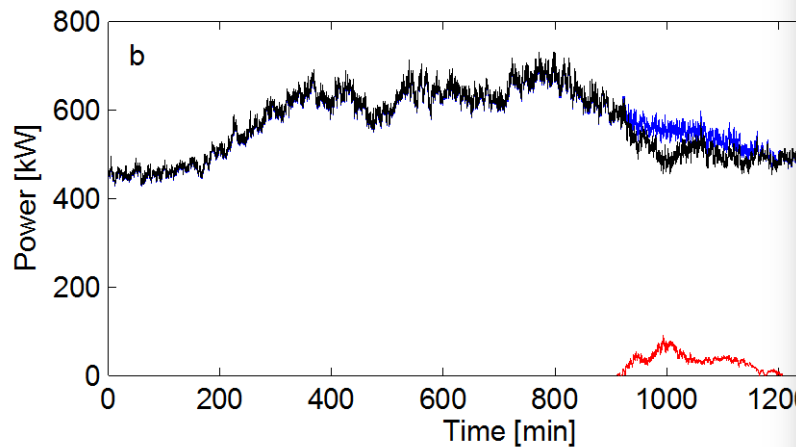
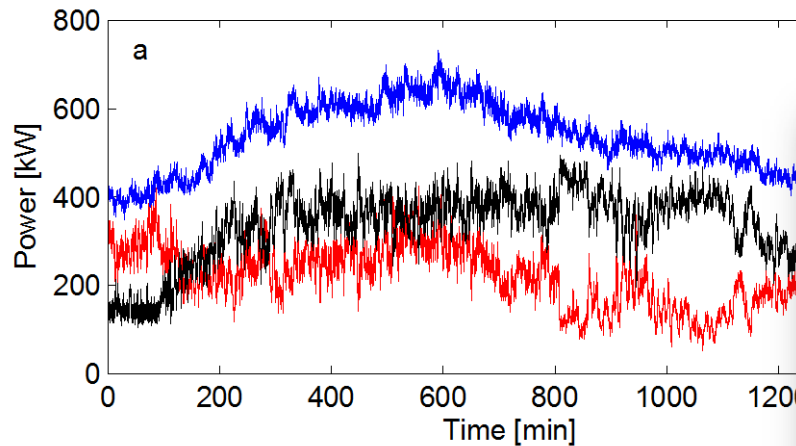


Why care about Alaska?

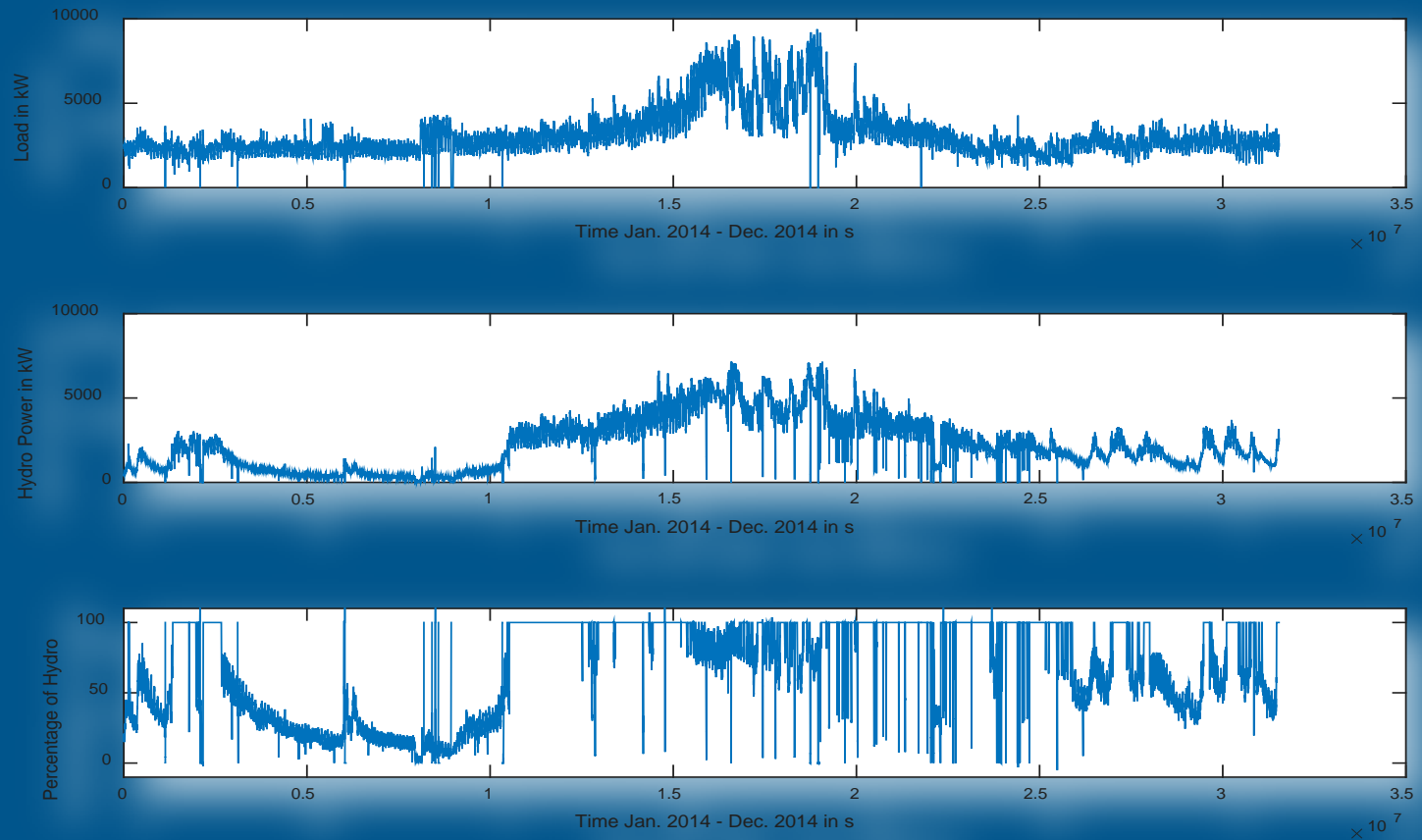
- Remote islanded microgrids in AK:
 - May exhibit renewable **power** penetration in excess of 300%
 - Have achieved >98% renewable **energy** penetration
 - Permanently islanded = millions of hours of 'lower-48 emergency' operation
 - Function in challenging:
 - Technical conditions
 - Logistic conditions
 - Economic conditions
 - Human capacity conditions
- If it is '**Alaska tough**', it might just work for you.
- Global remote microgrid market is large.



Power-class storage needs



Energy-class storage needs



Cordova Electric Coop

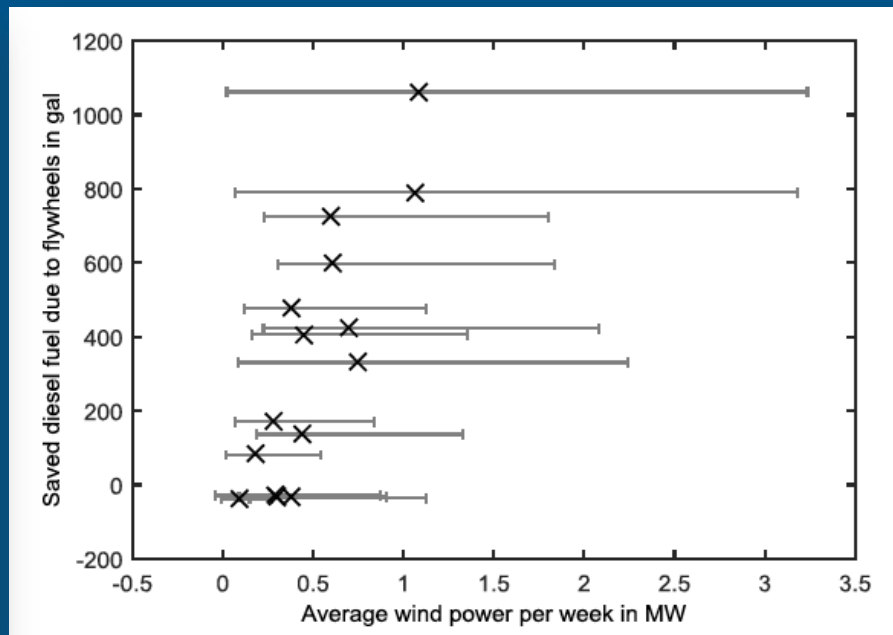
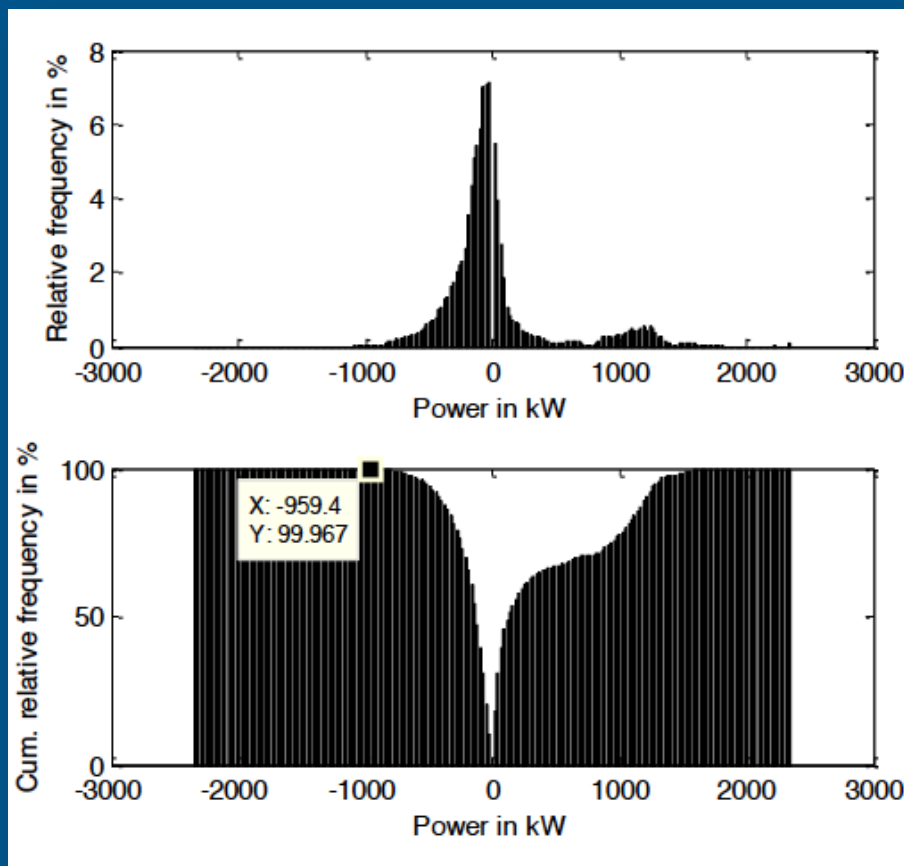
Partners: Sandia NL (DOE Energy Storage/OIE), ACEP (DOE EPSCoR, State of AK, DAAD)

- Hydro-Diesel System (hydro \$0.09/kWh, diesel \$0.45/kWh)
 - Run-of-river hydro, no water storage
 - Peak loads supplemented by diesel
 - Excess hydro lost (> 1 MW much of the time)
- Storage and Demand Managed Loads
 - Storage: frequency regulation
 - Storage: spinning reserve
 - Demand management: increase hydropower utilization (electro-thermal storage)
- To-do:
 - Storage specification, optimal sizing and dispatch
 - Demand management: optimal sizing, distribution and control



Nome, AK: Wind-Diesel System

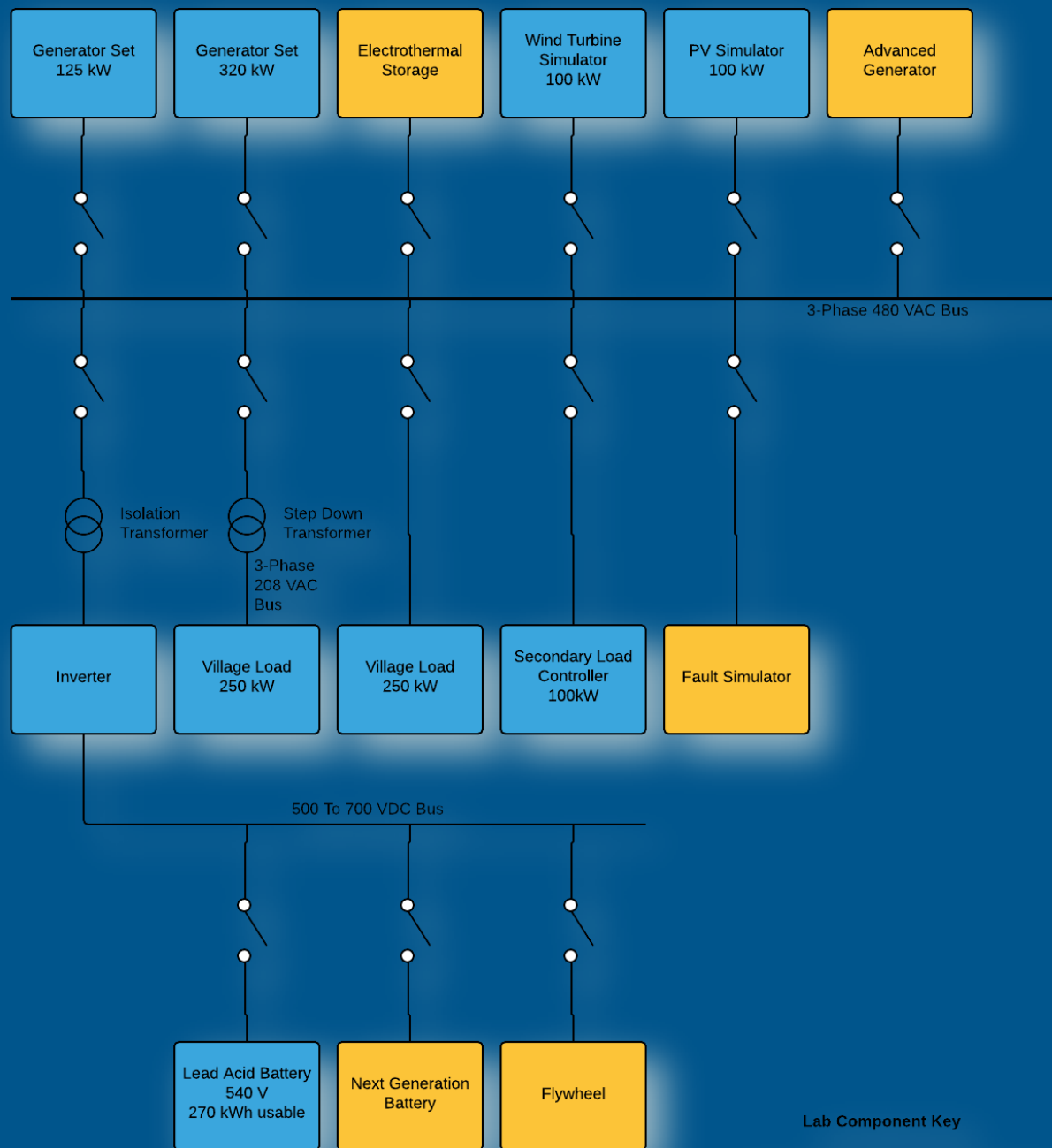
Partners: ACEP (DOE EPSCoR, State of AK), TU Darmstadt, Germany



Specification, Design and Assessment (SDA):
Reduce diesel use, by delaying diesel starts
Power-class energy storage, e.g., flywheel,
reduces fuel use by up to 1000 gal during
windy weeks.



Power Systems Integration Lab



Lab Component Key

Permanent

Optional



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Flywheel-Inverter-Controls Integration

Partners: Hatch Engineering, Williams Hybrid Power/KTSi, ABB, ACEP

- Integration of:
 - 200 kW Flywheel
 - ABB PCS100
 - Hatch Control System
- R&D and testing of:
 - Power quality mitigation strategies
 - Power smoothing
 - Controls for dispatch and SOC management



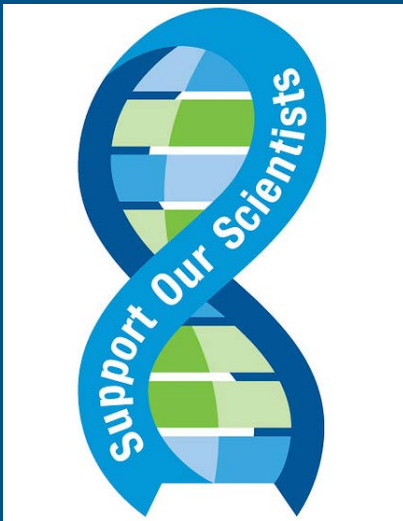
Other ESS in AK

- GVEA BESS: 27 MW NiCd (frmly. worlds largest battery)
- Kodiak: 3 MW Xtreme Power, 2 MW ABB Power Store
- Kwillingog: Li-battery, PCS100 inverter, diesel-off
- St. Paul Island: Beacon Power Flywheel
- Chaninik wind group: electro-thermal storage
- Kotzebue: 1 MW Saft Li battery



Thank you!

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Partners:

US Department of Energy
US Department of the Interior
US Denali Commission
US Economic Development Administration
State of Alaska
Alaska Energy Authority
Alaska Power and Telephone
Cordova Electric Cooperative
City of Cordova
Nome Joint Utility Systems
Kokhanok Village Council
City of Galena
Power and Water Corporation, Darwin, Australia
Pohnpei Utilities Corporation, Micronesia
National Renewable Energy Laboratory
Sandia National Laboratory
Lawrence Berkley National Laboratory
Oak Ridge National Laboratory
Colorado State University
Technical University Darmstadt, Germany
ABB
Shell
Huntley and Associates
Hatch Associates Consultants
Oceana Energy LLC
Marsh Creek LLC

