

Alaska Center for Energy and Power

OVERVIEW

Gwen Holdmann,

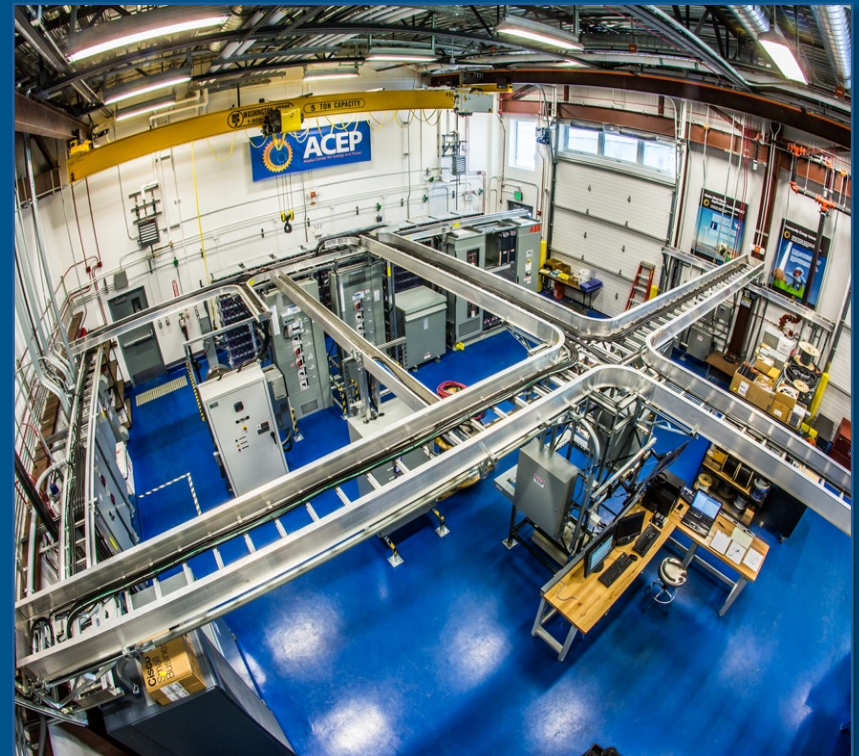
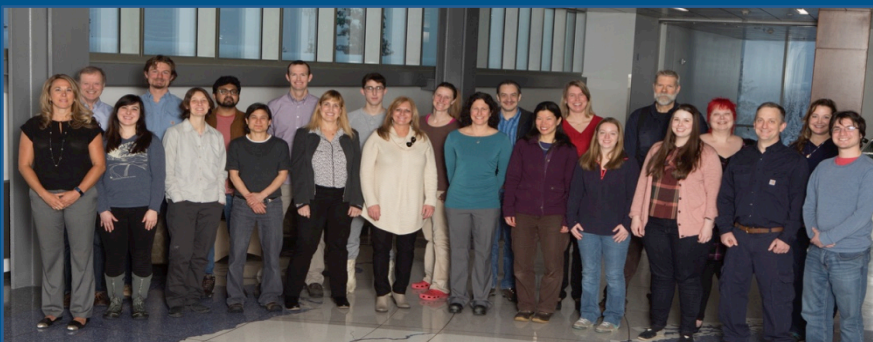
Alaska Center for Energy and Power, University of Alaska Fairbanks



Alaska Center for Energy & Power

Mission: Fostering development of practical, innovative and cost effective energy solutions for Alaska and beyond

- ❖ Applied energy research program
- ❖ Technology testing & optimization
- ❖ Energy systems modeling & analysis
- ❖ Knowledge network creation
- ❖ Commercializing energy innovation

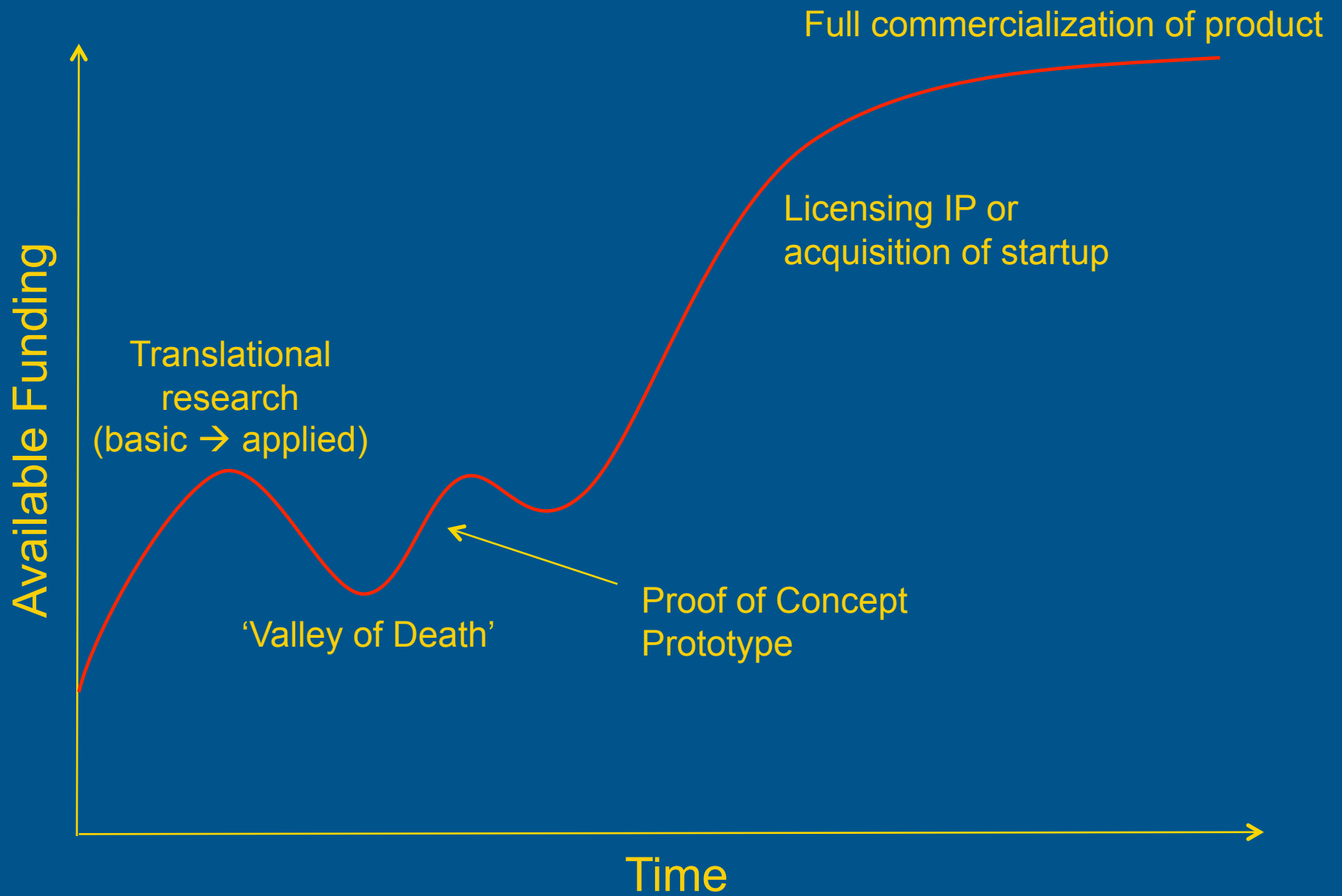


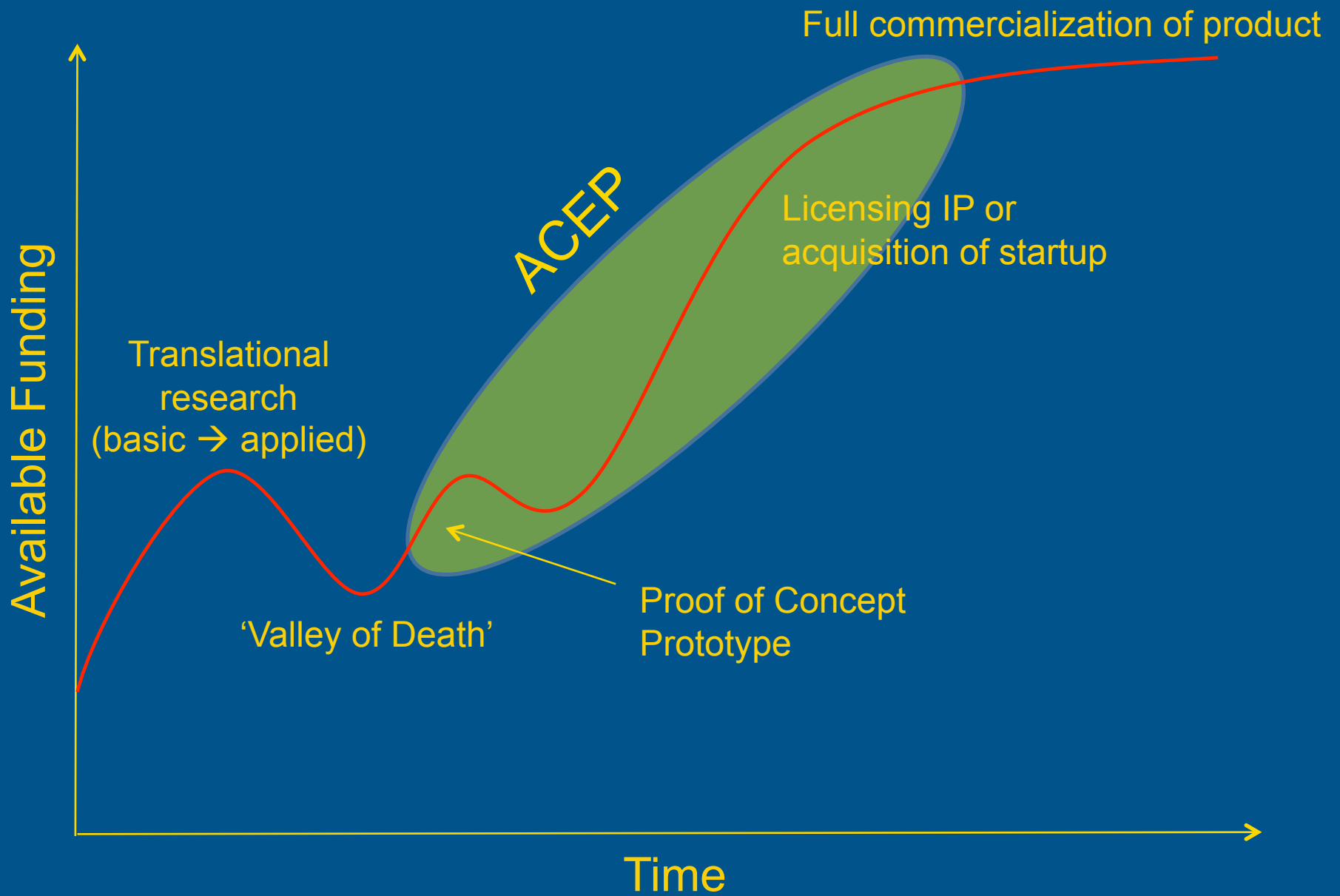
ACEP
Alaska Center for Energy and Power

Our Philosophy

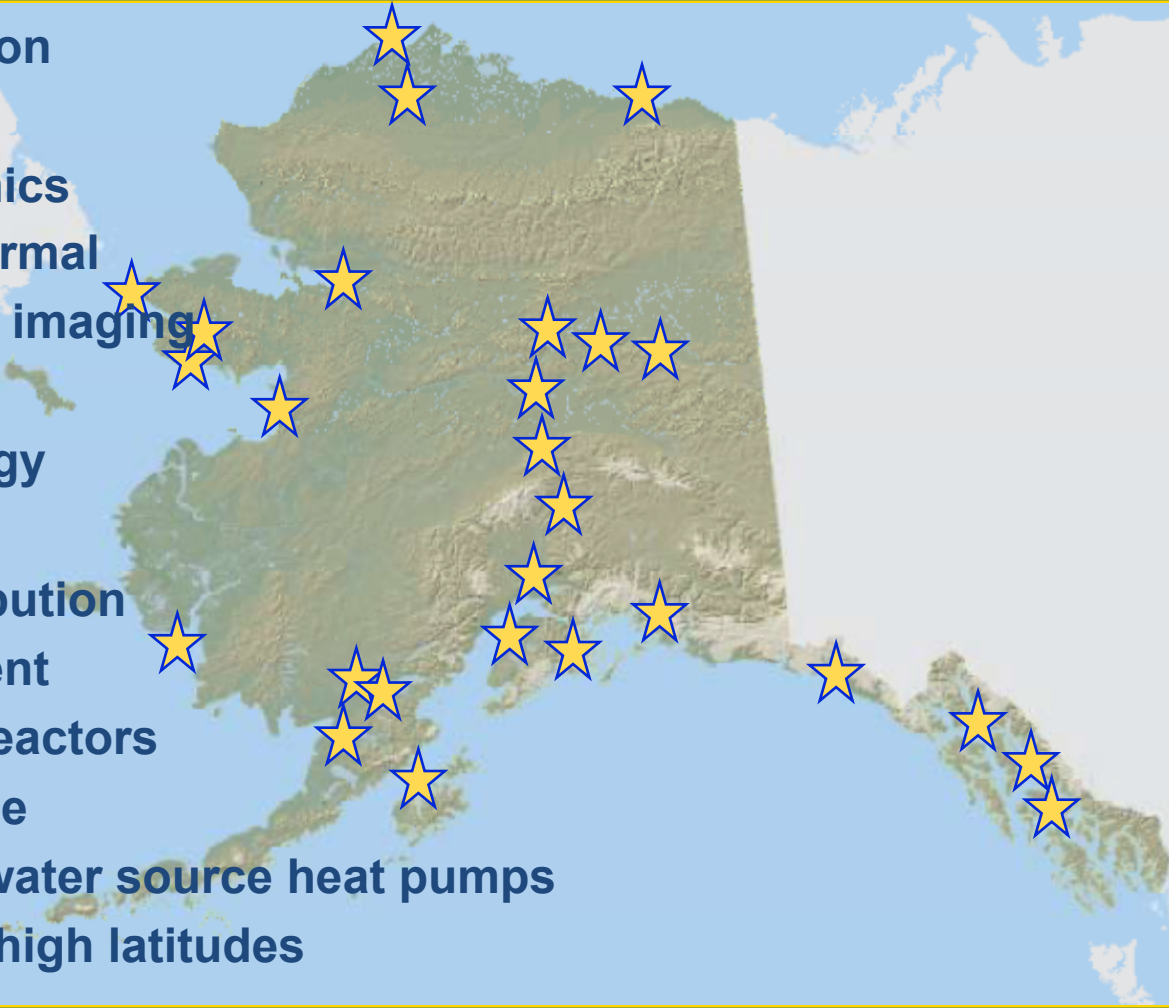
*Emphasis is on the research question,
not interests of individual researcher*







Current and recent research in Alaska

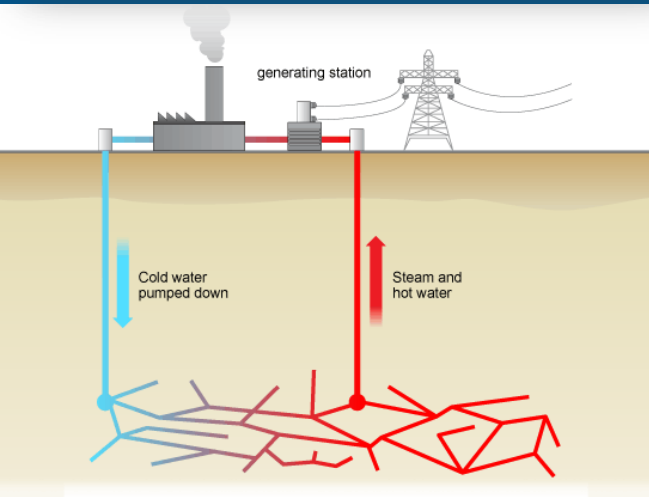
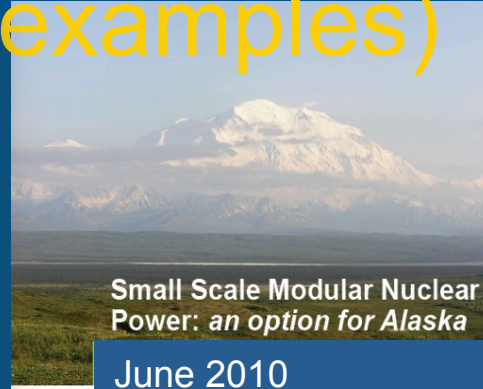


Power systems integration
River hydrokinetics
Energy analysis/economics
Low temperature geothermal
Remote sensing/thermal imaging
Waste heat utilization
Coal-to-liquids technology
Biomass energy
Transmission and distribution
Fuel additives assessment
Small modular nuclear reactors
Advanced energy storage
Ground source and seawater source heat pumps
Solar energy efficacy at high latitudes



ACEP: Future Generation Sources

(examples)



Clockwise from upper left: Wind, micronuclear reactors, biomass gasification, waste to energy enhanced/ engineered geothermal systems



ACEP
Alaska Center for Energy and Power

Alaska Hydrokinetic Energy Research Center



- Strategic plan developed with industry and agencies
- Working closely with OSU, UW
- Development of Tanana River Test to test technologies

Eagle 25 kW New Energy turbine (top), and Oceana turbine at Tanana River Test Site (right)



ACEP: Next Generation Energy



Clockwise from upper left (Williams Flywheel testing, Ambri battery, Cordova Li-ion battery, integration testing (Raglan Mine, Quebec))

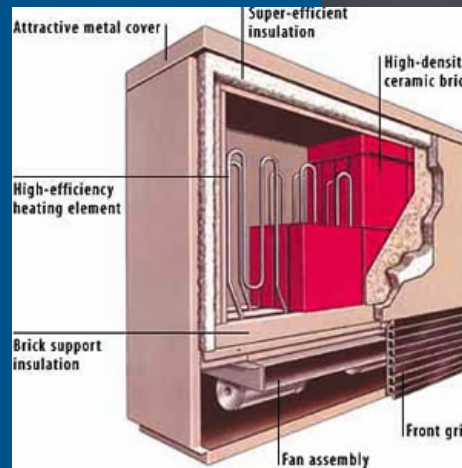


ACEP: End-User Technologies

(examples)
Electric
vehicles



Air source heat pumps



Thermal electric heater



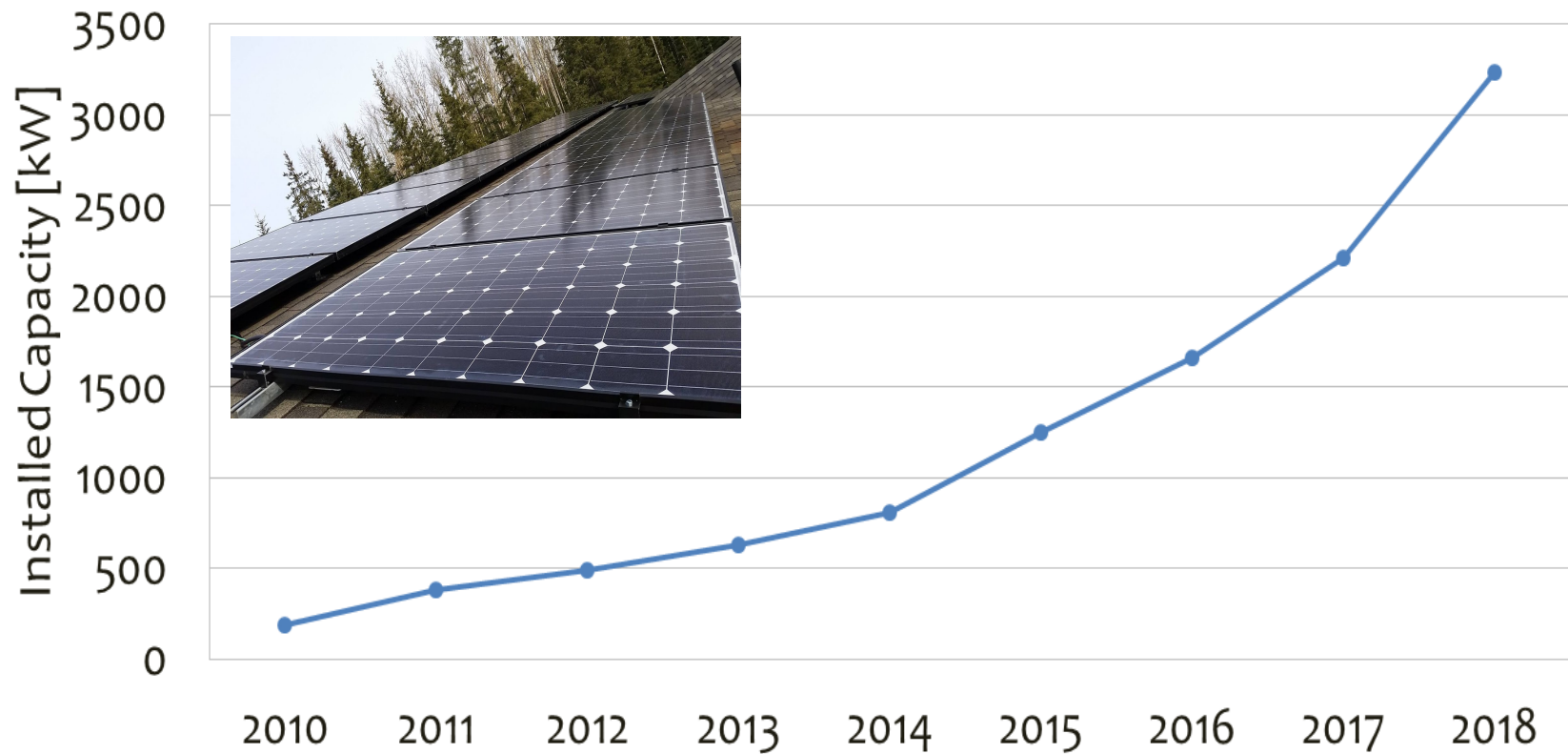
Solar PV

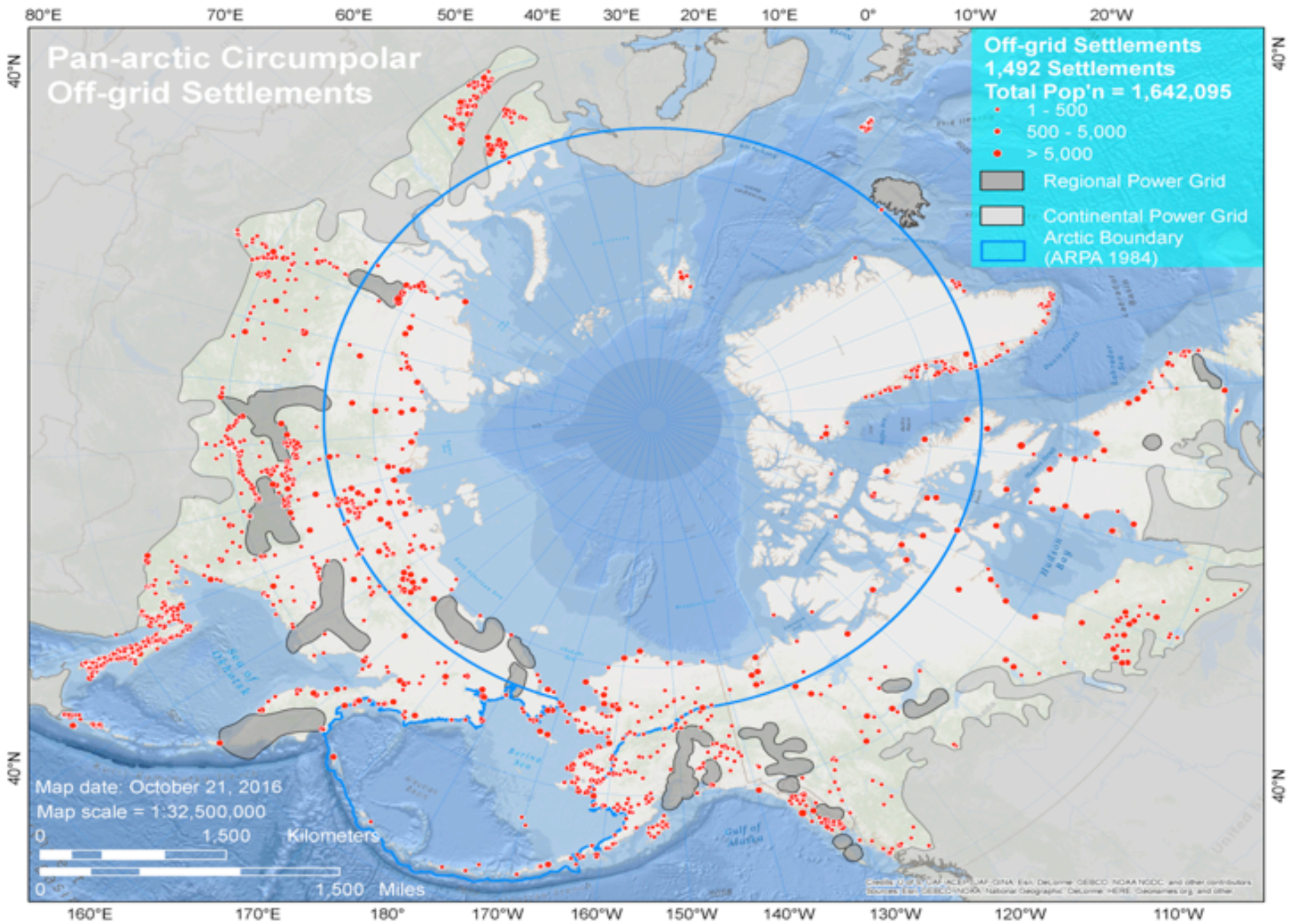


ACEP fuel meter for vented oil heaters



Total Installed Net Metering Capacity on the Railbelt





Alaska is a global leader in microgrid development



“Alaska has the world’s greatest concentration of experience and expertise for integrating renewable and conventional power in hybrid systems.”

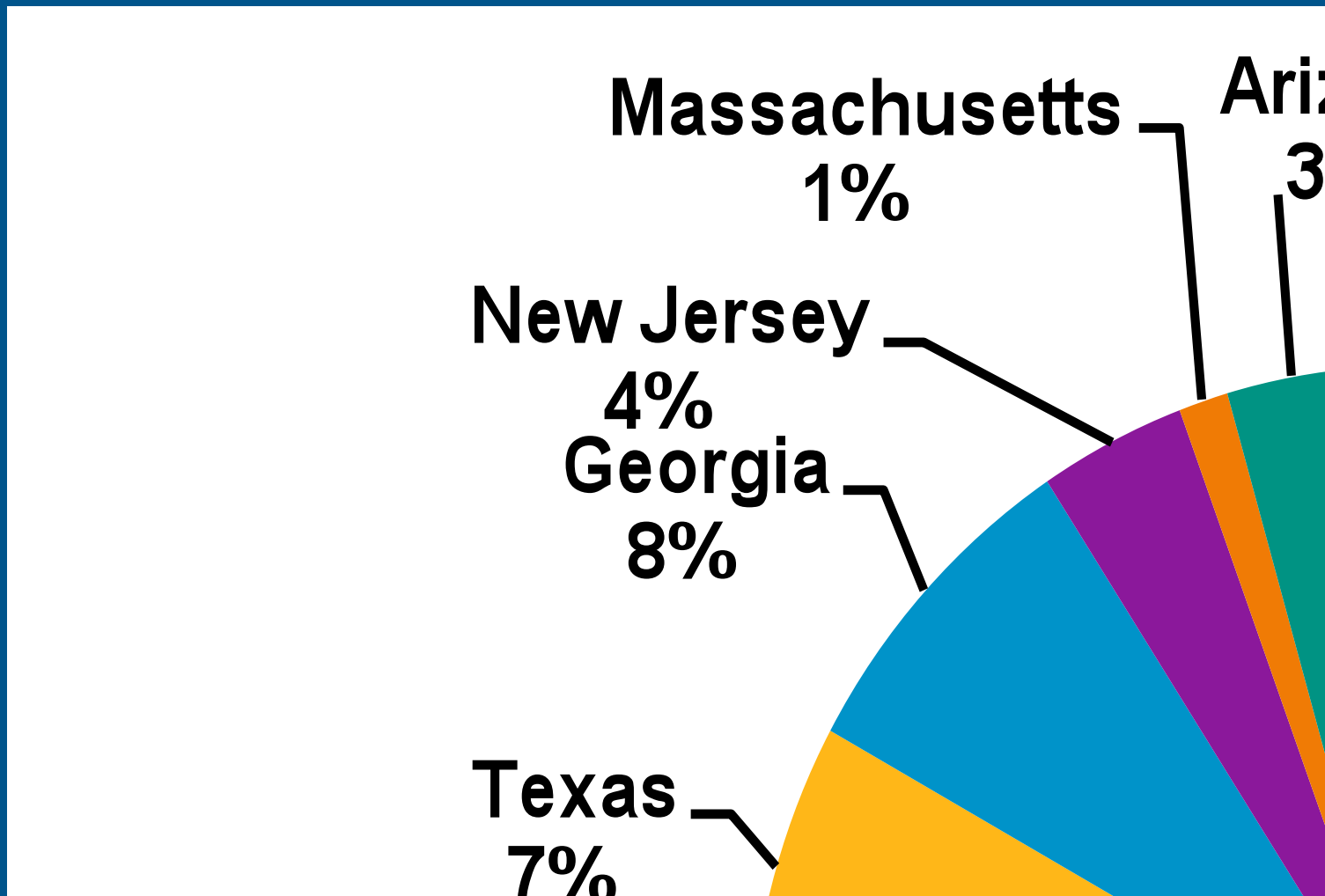
—Peter Lilienthal, CEO HOMER Energy

HOMER Energy is the world’s leading microgrid modeling software company, with over 100,000 users in 193 countries.



ACEP
Alaska Center for Energy and Power

Top 10 States for Microgrid Capacity



ACEP Power System Integration Program



Lab recreates a remote microgrid at full power levels (500kW)

Example: Flywheel/controls integration

Customer:

- ▶ Hatch Engineering
(Canadian Company)

Testing of:

- ▶ Williams/Ktsi Flywheel
(Power quality mitigation strategies and power smoothing)



Example: Flywheel/controls integration



System has now been installed at the Raglan Mine in Northern Quebec (Canada)



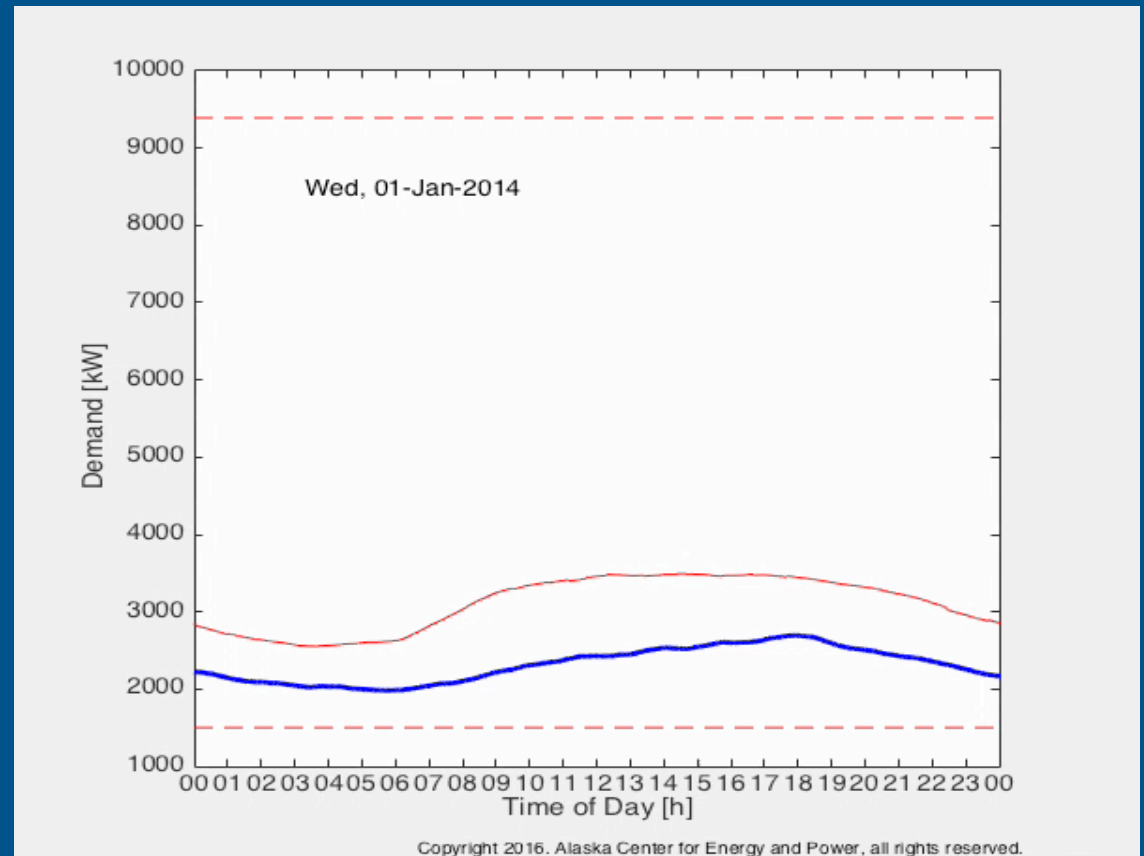
Cordova Energy Storage Project

Partners: Cordova Electric Cooperative, ACEP, SNL, CESA – funded through DOE OE



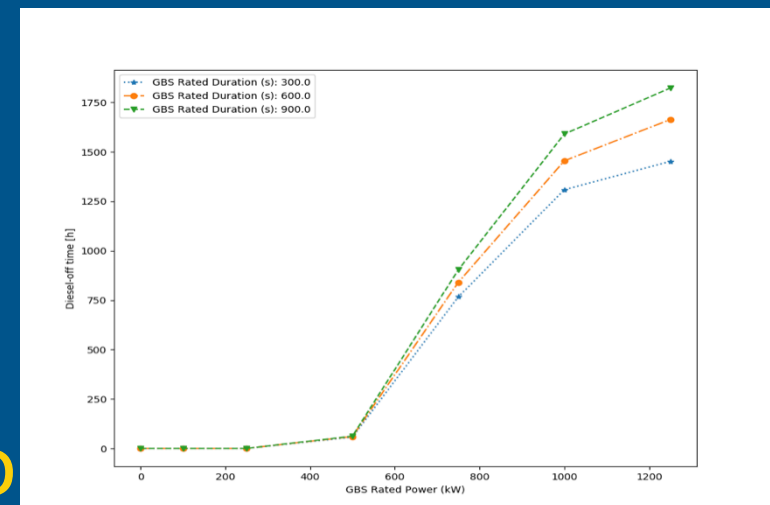
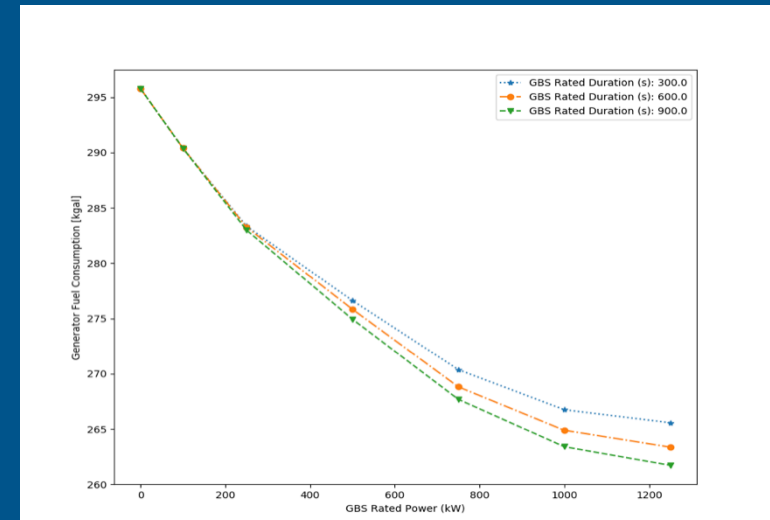
Cordova Battery System –
1MW, 1MWh Saft Battery +
ABB PCS100 Inverter.

Greatest economic value in
replacing spinning reserve



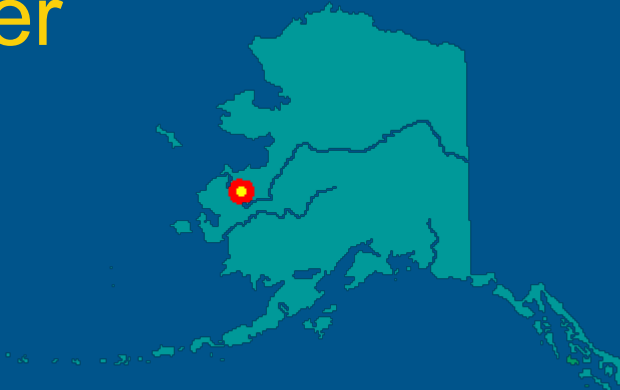
MiGRIDS <https://github.com/acep-uaf/MiGRIDS>

- **Micro Grid Renewable Integration Dispatch and Sizing**
- Open source
- Years of development + industry expertise
- Energy balance simulations
 - short time steps
 - high level dispatch control



St. Mary's and Mt. Village

- Yukon River
- 566 and 811 people
- Plane or boat access
- \$6.26/gallon diesel
- 20 mile intertie this winter

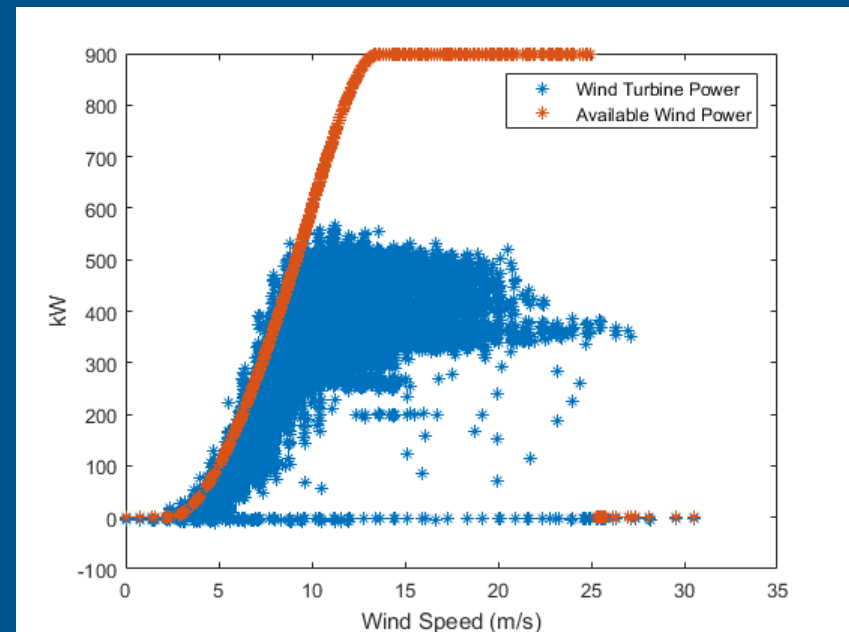


Aerial view of Mountain Village



Current wind operation

- 900 kW EWT wind turbine installed
- Transmission line near completion
- Heavily curtailed wind
- EWT holds power set-point very well



Grid Bridging System

- LTO (Lithium titanate) batteries
 - Ultra-cap and hybrid options were considered
 - Ultra-caps are technically appealing, but LTO more economic
- 1 MW recommended size (based on MiGRIDs)
 - Allows ~~maximum~~ most economic utilization of wind power
- Containerized
 - Plug and play
 - Easy shipping



ACEP Lab Testing and Qualification



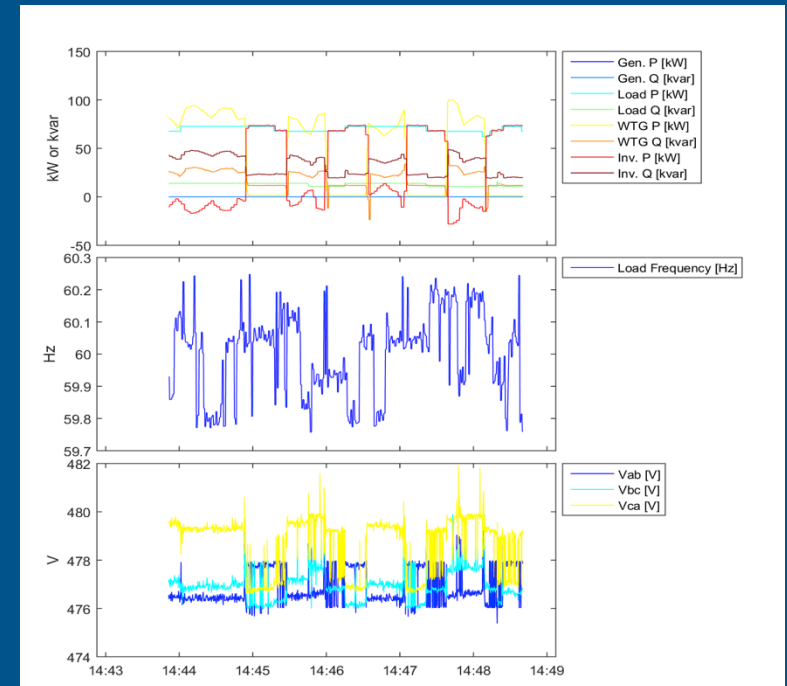
ACEP Lab Testing and Qualification

Operate as:

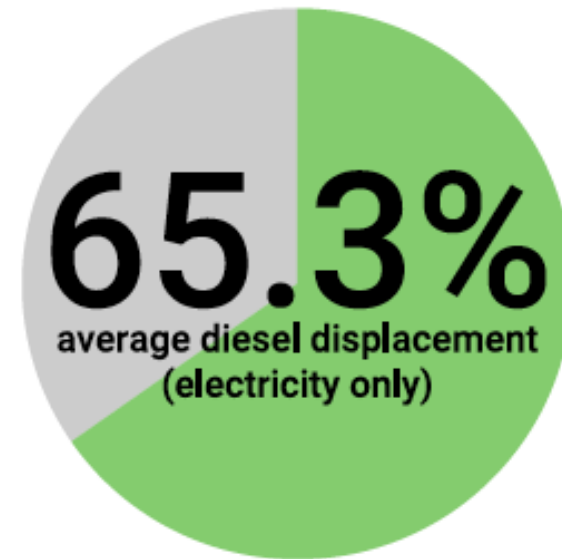
- grid forming
- frequency and voltage support
- power set-point

Under conditions:

- normal operation
- jump/drop in wind or load
- loss of generator
- phase imbalance
- faults



Example: Kongiganak (population 439)



In January 2019, Kongiganak displaced over 65% of diesel for electric power generation with wind, including 168 consecutive hours of zero diesel operation (IES/Chaninik Wind Group Project)



ARENA: Arctic Remote Energy Network Academy (*visit* *ARENA.alaska.edu*)

Putting the right information in the
hands of the right people at the right
stage of project development to
accelerate viable local energy solutions



Seeking participants
for ARENA 2020 !!!



Thank you

Gwen Holdmann
Alaska Center for Energy and
Power
University of Alaska Fairbanks
Gwen.Holdmann@alaska.edu



ACEP
Alaska Center for Energy and Power