Alaska Center for Energy & Power

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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
Alaska Energy 101

- High energy costs
- Fragmented electric grid
- Harsh & changing climate
- End of supply lines
- Stranded resources
- Dispersed population
- Limited road network
- Challenged economy

In rural Alaska:
- Electric power: 0.50-1.50 $/kWhr
- Heating fuel: 3.50-10.00 $/gallon
- Grid Size Range from <100 kW to MWs
Alaska’s Transmission Network
Alaska’s “Railbelt” Grid

of nested and interconnected microgrids
Alaska Microgrids Incorporating RE

Alaska has >250 remote microgrids and 70 incorporate grid scale REs

- 37 wind-powered systems
- 45 biomass projects
- 14 hydropower projects
- 5 hydrokinetic pilot projects
- Solar growing in importance
- 1 low temp geothermal
ACEP Utility Student Internship Program & Microgrid Boot Camp
Microgrid Boot Camp 2019
ACEP placed 10 interns with 9 utilities in 2019. All 10 were Alaska students.
Pan-arctic Circumpolar Off-grid Settlements

Off-grid Settlements
1,492 Settlements
Total Pop'n = 1,642,095
- 1 - 500
- 500 - 5,000
- > 5,000

- Regional Power Grid
- Continental Power Grid
- Arctic Boundary (ARPA 1984)

Map date: October 21, 2016
Map scale = 1:32,500,000

Kilometers
0 1,500

Miles
0 1,500
The Arctic region is a global leader in renewable energy development

- Finland (39%, biomass)
- Sweden (48%, hydropower, biomass)
- Norway (99%, hydropower)
- Iceland (100%, geothermal, hydropower)
- Greenland (70%, hydro)
ARENA: Arctic Remote Energy Network Academy (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 !!!
Alaska Regional Collaboration for Technology Innovation & Commercialization

Objective:
Facilitate and implement collaboration across Alaska, the Arctic, and greater Pacific to build local capacity and support a thriving economy through resiliency research, technology development / deployment, and education centered on expertise in energy and key interconnected areas (water, food, manufacturing, transportation).

Naval Impact / Value to Naval Warfighter:
- Improvements in reliable / resilient energy systems for Navy facility installations & Marine Corps expeditionary forces.
- Expanded and more resilient community capacity to support Navy operations in Alaska and the Arctic.

Approach:
- Education, Research, Knowledge Exchange
- Entrepreneurship, Incubation, Acceleration
- Public-Private Partnerships within Alaska, across the Arctic, and spanning the Pacific
- Students / Faculty / Professionals / Citizens
- Academia / Industry / Communities / Defense

The ARCTIC program is an Office of Naval Research (ONR) initiative. Member organizations: Renewable Energy Alaska Project (REAP), Launch Alaska, University of Alaska Anchorage Business Enterprise Institute (BEI), and the University of Alaska Fairbanks (UAF) Alaska Center for Energy and Power (ACEP) and UAF Center Innovation Commercialization and Entrepreneurship (Center ICE).
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

https://github.com/acep-uaf/MiGRIDS
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
Grid Bridging System Lab Testing and Qualification
Thank you

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