

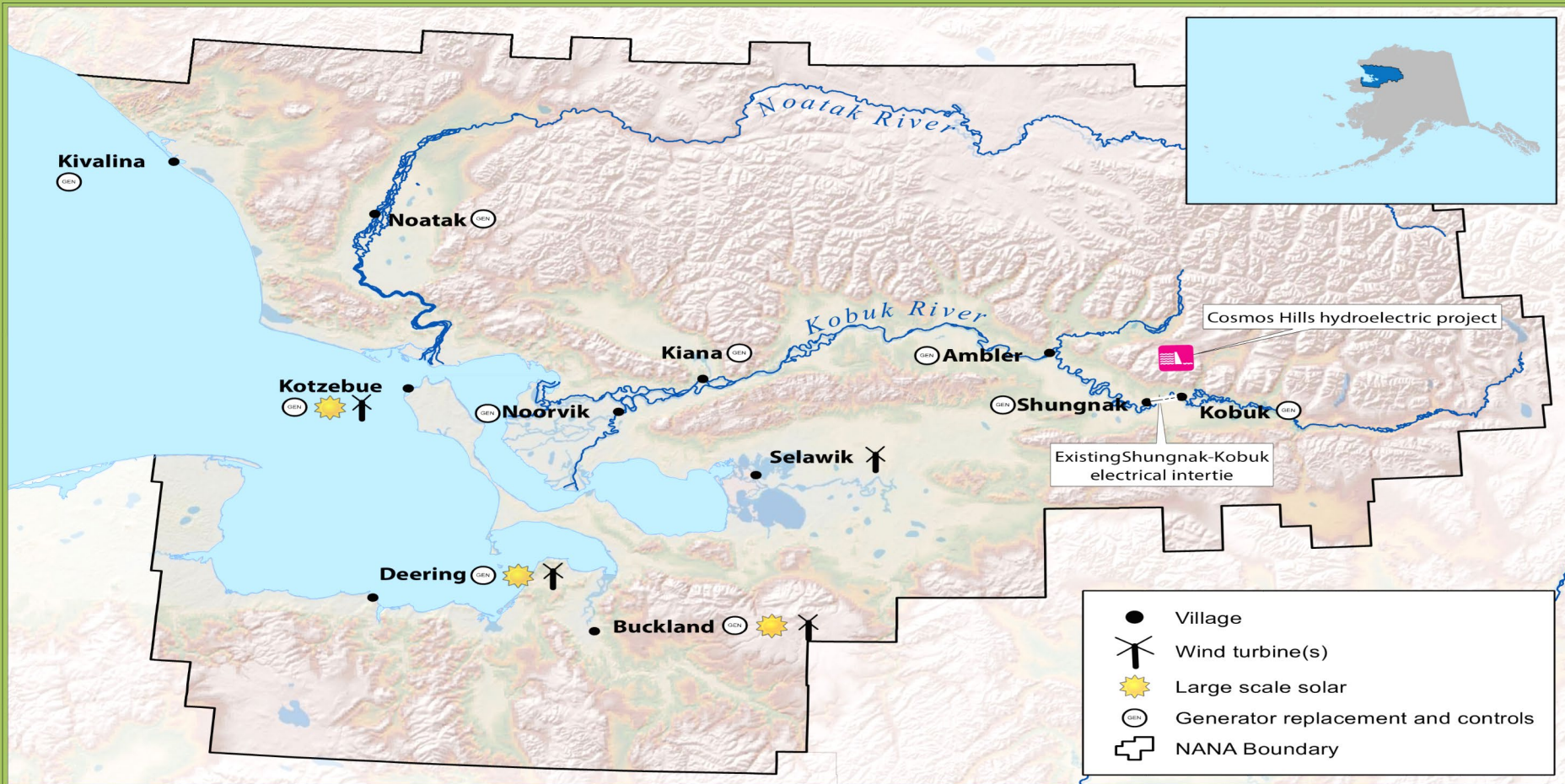


DOE Intertribal Peer Review

November 15, 2021 Virtual Presentation



NANA REGION Introduction



Energy Projects in the NANA Region

NOT FOR NAVIGATION Date: 7/6/2016

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NANA's Energy Vision

- **The energy vision for the NANA Region is to be 50 percent reliant on alternative energy sources, both renewable and non-renewable.**
- 10 percent decrease of imported diesel fuels by 2020
 - ✓ **We are on-track to meet this goal, in part thanks to DOE and significant community effort**
- 25 percent decrease of imported diesel fuels by 2030
- 50 percent decrease of imported diesel fuels by 2050

APPLIED ARCTIC TECHNOLOGY

Alaska Mini-Split Heat Pump Calculator

Thank you to our sponsors:





**NORTHWEST
ARCTIC
BOROUGH**

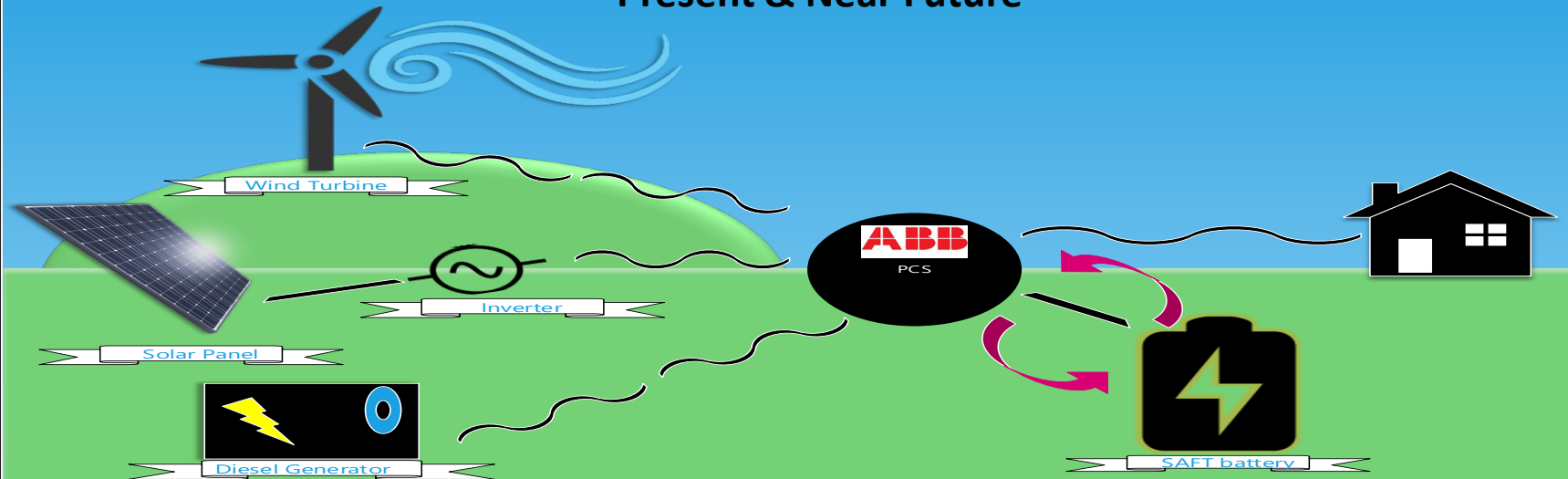
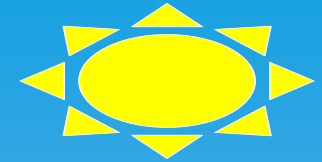


Homer Electric
Association, Inc.
A Touchstone Energy® Cooperative



 = Alternating Current
 = Direct Current

BASIC MICRO-GRID – Present & Near Future



Department of Energy Solar Grant

- Department of Energy awarded NANA \$1M to install community solar arrays in Deering, Buckland, and Kotzebue; Required \$1 M cost share (\$200K Deering & Buckland, \$610K Kotzebue)
- Kotzebue Electric Association financed the \$610K cost share for the project (NWAB VIF)
- NANA & KEA formed Joint Venture to share ownership of solar equipment during grant period, JV agreement signed.
- Both Deering & Buckland using Village Economic Development Committee (VEDC) \$ for their cost share
- Many Tribes struggle to find these cost share resources.



Buckland, AK – First of Three Installations

- Buckland Community Solar array is fully operational (inverter integrated with system controls)
- Integrated with wind & batteries for first multi-renewable hybrid diesel-off system in rural AK



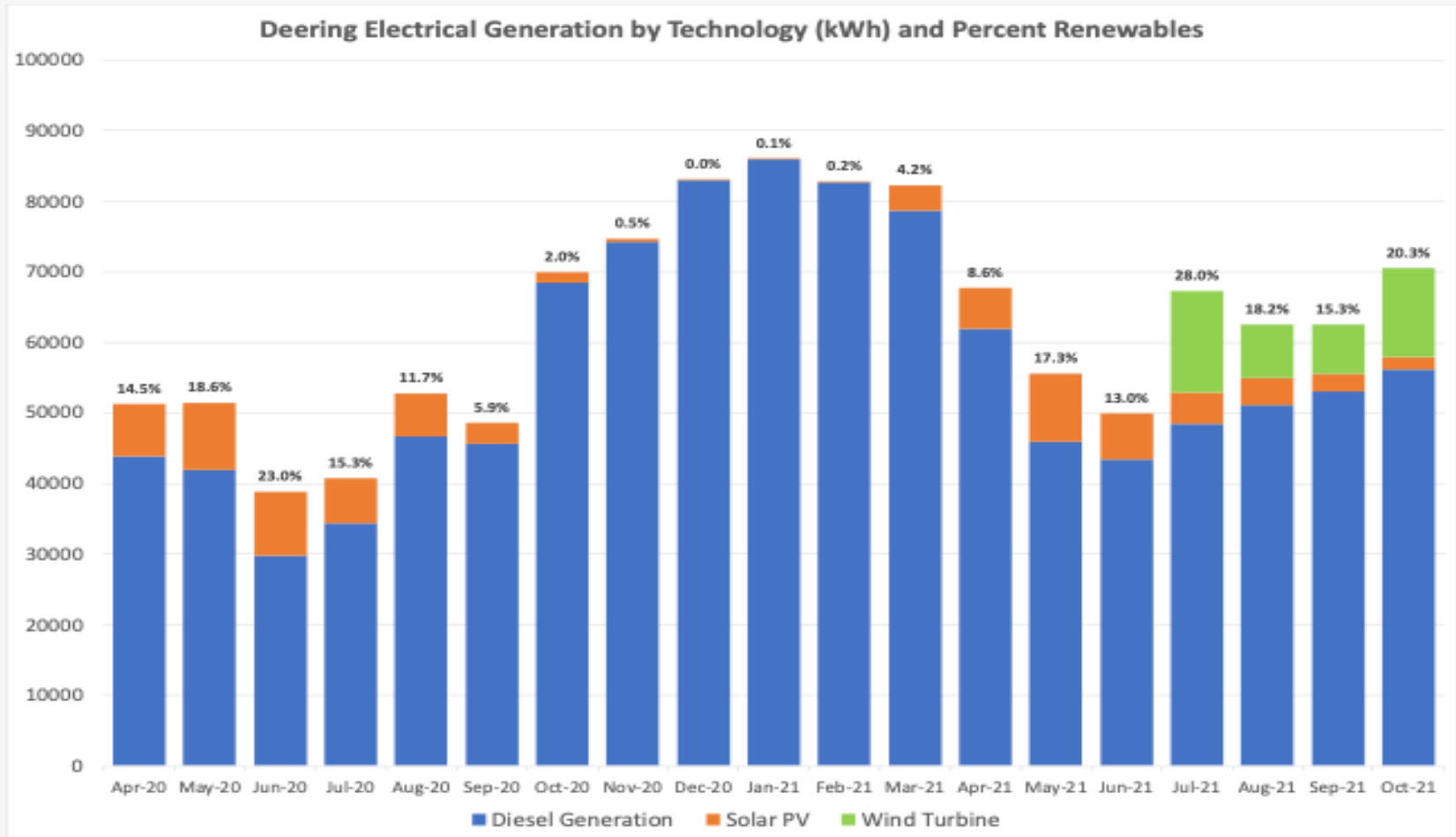
- Completed in Dec 2019
- First BoxPower installations in Alaska
- Modified foundation & racking based on site-specific needs
- Community training and major in-kind contributions

Deering, AK – 2nd of 3 solar PV Installations

- Deering Solar Array Installation complete
- Required additional Power pole, transformer, 250-ft conductor, comm equipment
- Supersacks, gravel, & duckbill foundation/ anchoring
- Single 50 kW inverter
- Maximum local hire via Ipnatchiaq Electric, Tribe, City
- Significant on-site modifications, but cost savings from Buckland project (applied lessons learned)



Deering Renewable Production



Year to date - 2021	kWH	Gallons Displaced	Savings		Prior 12 months	kWH	Gallons	Savings
Solar Production	38,393	3,071	\$ 8,433		Solar Production	38,804	3,104	\$ 8,523
Wind Production	41,399	3,312	\$ 9,093		Wind Production	41,399	3,312	\$ 9,093
Diesel Production	607,723				Diesel Production	765,123		
Total Production	687,515				Total Production	845,326		

Innovations & Lessons Learned

- Tilt Angle of 45 degrees = more output & Snow shedding
- Each box > 15 kW, but could be 20 kW
- Low wind locations = less costly
- Local Crew Works!
- Trade-off between size of array and construction requirements – optimize performance based on site specific criteria and community needs
- Integrated with batteries, wind, grid-forming inverter, electric boilers in powerhouse and waterplant – requires sophisticated controls
- Replicating in Kotzebue, Shungnak, Kobuk, Noatak
- Continuing to drive down costs – battery building, inverter consolidation, engineering, logistics



Kotzebue KEA Solar array



Courtesy KEA

Kotzebue Solar Array

- Kotzebue Solar Array Installation complete
- Largest solar array in Rural Alaska
- 576 kW
- Bi-facial solar panels
- Maximum local hire via Alaska Native Renewable Industries
- Integrates with wind & batteries



Shungnak Solar Array

- Shungnak Solar Array Installation complete
- Solar Array serves Kobuk via transmission line
- 223 kW Solar, 384 kWh battery
- Maximum local hire via Alaska Native Renewable Industries
- IPP/PPA in progress w/AVEC
- Funded by USDA, but informed by previous NANA/DOE projects



USDA High Energy Cost Grant

- NANA selected for High Energy Cost Grant – \$1.6M to install energy storage batteries and controls in Deering and Buckland
- USDA completed environmental review
- **ABB Control system and SAFT batteries operational in Buckland & Deering**
- Worked with IES, ABB, Saft, KEA, DeerStone, NWAB for system integration
- Allows for high penetration renewables (wind & solar) to turn diesels off when enough renewable energy available
- Also controls electric boiler for additional diesel displacement
- Project complete



USDA High Energy Cost Grant – Breaking Trail

- First (**and second!**) utility scale wind-solar-battery-diesel hybrid system in rural AK
- Diesels-off in Buckland on July 24, 2019 & in Deering on October 11, 2019
- Expect Significant Fuel Savings
- Developing Institutional and Financial Structures to Monetize Fuel Savings
- Still Need to Address heating diesel engines and powerhouse under long-duration diesels-off (good problem to have!)
- Enables high penetration & high quality renewable generation, like wind and solar energy, without destabilizing the system



What challenges have you had to overcome to develop capacity?

- Logistics
- Overlaying new technology on legacy systems
- Component compatibility from different manufacturers
- Telecomm
- Local turnover
- Costs/Funding



A close-up photograph of several stalks of golden-brown grasses, likely a type of wild rice or similar grain, set against a dark, blurred background. The grasses are illuminated by warm, golden light, highlighting their texture and color. The word "Taikuu" is overlaid in white, sans-serif font in the upper right quadrant of the image.

Taikuu