

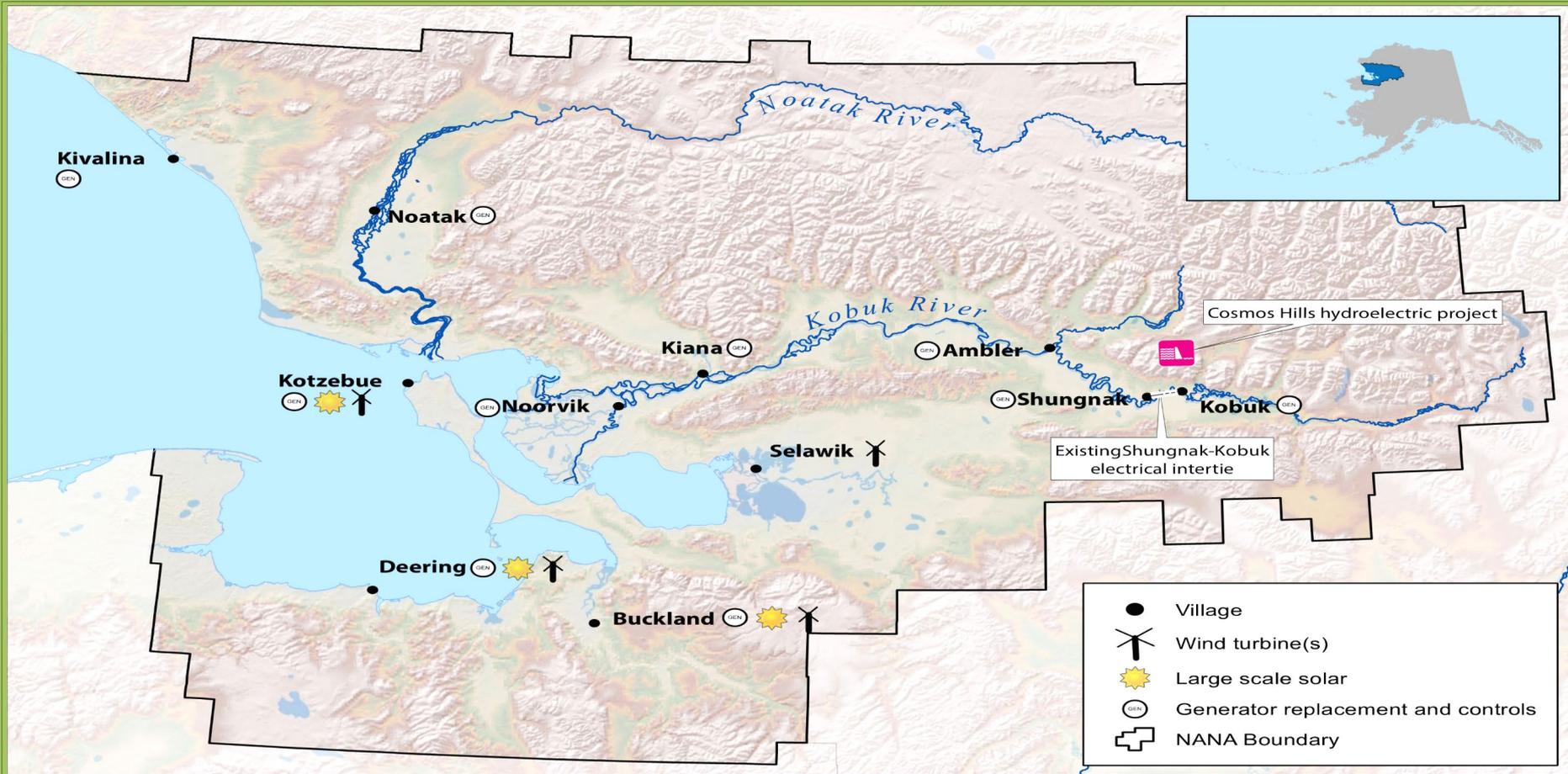


# DOE Program Review – Community Scale Solar

December 15, 2020 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

<b><u>WHY ARE WE DOING THIS???</u></b> <b>Mar 2020 ENERGY PRICES IN...</b>	<b>Gas/G</b>	<b>Stove Oil/G</b>	<b>Kwh (1-500) PCE</b>	<b>Kwh (&gt;501) NO PCE</b>
<b>Kotzebue</b>	<b>\$5.88</b>	<b>\$5.92</b>	<b>\$0.19</b>	<b>\$0.41</b>
<b>Ambler</b>	<b>\$10.30</b>	<b>\$10.30</b>	<b>\$0.23</b>	<b>\$0.64</b>
<b>Kobuk</b>	<b>\$9.27</b>	<b>\$9.27</b>	<b>\$0.23</b>	<b>\$0.70</b>
<b>Shungnak</b>	<b>\$8.50</b>	<b>\$8.50</b>	<b>\$0.23</b>	<b>\$0.70</b>
<b>Kiana</b>	<b>\$5.15</b>	<b>\$5.67</b>	<b>\$0.22</b>	<b>\$0.54</b>
<b>Noorvik</b>	<b>\$6.06</b>	<b>\$5.64</b>	<b>\$0.22</b>	<b>\$0.56</b>
<b>Selawik</b>	<b>\$5.30</b>	<b>\$6.36</b>	<b>\$0.22</b>	<b>\$0.54</b>
<b>Buckland</b>	<b>\$6.15</b>	<b>\$6.15</b>	<b>\$0.26</b>	<b>\$0.47</b>
<b>Deering</b>	<b>\$4.12</b>	<b>\$4.12</b>	<b>\$0.39</b>	<b>\$0.67</b>
<b>Kivalina</b>	<b>\$4.52</b>	<b>\$4.12</b>	<b>\$0.22</b>	<b>\$0.52</b>
<b>Noatak</b>	<b>\$9.26</b>	<b>\$9.26</b>	<b>\$0.24</b>	<b>\$0.91</b>

## Department of Energy Solar Grant

- Department of Energy has awarded NANA \$1M to install community solar arrays in Deering, Buckland, and Kotzebue; Requires \$1 M cost share (\$200K each Deering & Buckland, \$610K Kotzebue).
- Kotzebue Electric Association financed the \$610K cost share for the project (NWAB VIF) & additional internal funds.
- 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.
- Multi community collaboration



## Department of Energy Solar Grant

- Buckland Community Solar array is operational, but still needs performance monitoring & communication integration



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



## Department of Energy Solar Grant

- Deering Solar Array Installation complete
- Supersacks, gravel, & duckbill foundation/anchoring - reduced costs
- Single 50 kW inverter – reduced costs
- Maximum local hire via Ipnatchiaq Electric, Tribe, City
- Radio communication back to power plant for full system control, including curtailment



# Innovations & Lessons Learned

- Tilt Angle of 45 degrees = more output
- 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 – Each situation unique, requires analysis
- Integration with batteries, wind, grid-forming inverter, electric boilers in powerhouse and waterplant – LOTS of extra work
- Hosted Solar Energy International Training for region in June 2018 – created interest and competence
- Continue to replicate: Noatak, elsewhere



# Kotzebue Solar

- Alaska Native Renewable Industries selected as Kotzebue Electric Association Solar Contractor
- Replaced legacy wind turbines that are no longer operational, and used some existing infrastructure to reduce costs
- Largest solar array in rural Alaska (576 kW)
- Interconnected with existing wind, battery, electric boilers, and now electric vehicle charging above the Arctic Circle
- Drilled through permafrost for ground mounting – Improved over time, but could definitely be improved for future cost savings



# Replication in Process!

- Communities of Shungnak & Kobuk interconnected via 10-mile distribution line
- In process of receiving \$1.3 million from USDA High Energy Cost Grant for 150 kW solar and ~650 kWh battery for Shungnak & Kobuk
- Intend to create Independent Power Producer and sell power to AVEC
- Partnership between Tribes and Cities of Shungnak, Kobuk, NANA, Northwest Arctic Borough



## 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
- Necessary to make solar effective
- **ABB Control system and SAFT batteries operational in Buckland & Deering**
- Working 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



## 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



## Upcoming Energy Projects

- **USDA High Energy Cost Grant (HECG) – Install community solar array and energy storage batteries in Shungnak and solar in Kobuk**
- **BIA Tribal Energy Development Capacity – Continue formation of Joint Action Agency**
- **Intend to submit DOE grant application for solar and energy storage batteries for Noatak**
- **Support for all other villages in region**



A close-up photograph of several stalks of golden-brown grasses, likely a species of reed or tall grass, against a dark, blurred background. The grasses are illuminated by warm, golden light, highlighting their texture and the intricate details of their seed heads. The word "Taikuu" is overlaid in the upper right quadrant in a clean, white, sans-serif font.

Taikuu