DOE Program Review – Community Scale Solar

November 21, 2019  Denver, Colorado
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
**WHY ARE WE DOING THIS???
2019 ENERGY PRICES IN...**

<table>
<thead>
<tr>
<th>Location</th>
<th>Gas/G</th>
<th>Stove Oil/G</th>
<th>Kwh (1-500) PCE</th>
<th>Kwh (&gt;501) NO PCE</th>
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<td>Kotzebue</td>
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<td>$0.45</td>
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<td>Ambler</td>
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<td>Kobuk</td>
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<td>Kivalina</td>
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<td>$0.21</td>
<td>$0.75</td>
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</table>
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 Deering & Buckland, $610K Kotzebue)
- Kotzebue Electric Association to finance the $610K cost share for the project (NWAB VIF)
- NANA & KEA to form Joint Venture to show ownership of solar equipment during grant period, JV agreement signed.
- Both Deering & Buckland using Village Economic Development Committee (VEDC) $ for their cost share
Department of Energy Solar Grant

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

• Expected Completion Date of 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
- Single 50 kW inverter
- Maximum local hire via Ipnotchiahq Electric, Tribe, City
- Radio communication back to power plant for full system control
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
- Will be integrated with batteries, wind, grid-forming inverter, electric boilers in powerhouse and waterplant
- Hosted Solar Energy International Training for region in June 2018 – created interest and competence
- Aim to replicate: Kotzebue, Shungnak, Kobuk, Noatak, ??
Kotzebue Solar

• Contractor selected
• System design in process
• Will replace legacy wind turbines that are no longer operational, but will use some existing infrastructure to reduce costs
• Will be largest solar array in rural Alaska
• Will interconnect with existing wind, battery, electric boilers, and now electric vehicle charging above the Arctic Circle
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
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