

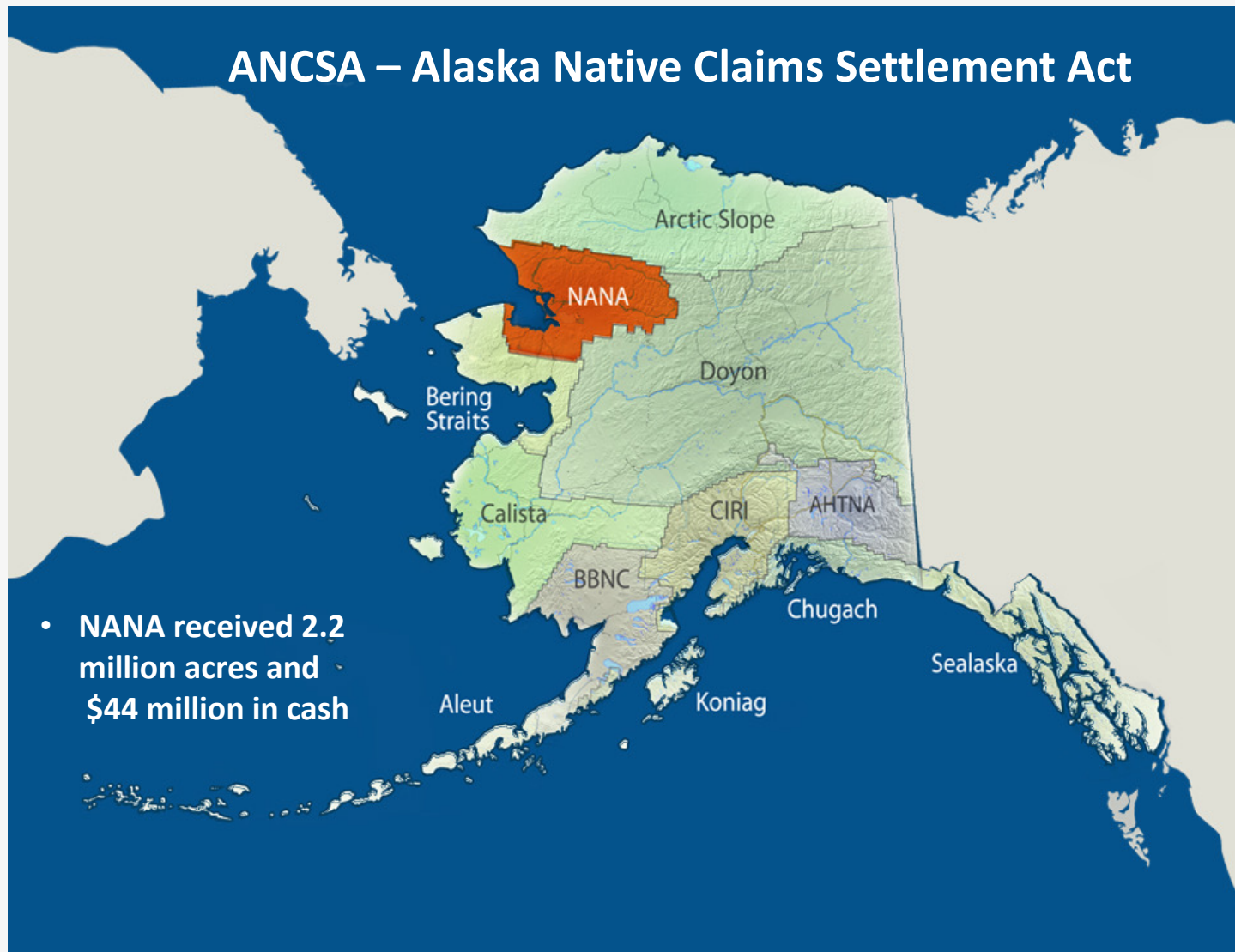


Arctic Sustainable Energy Research Conference – Alaska Energy and Climate Equity – Regional Needs Informing Energy Policy

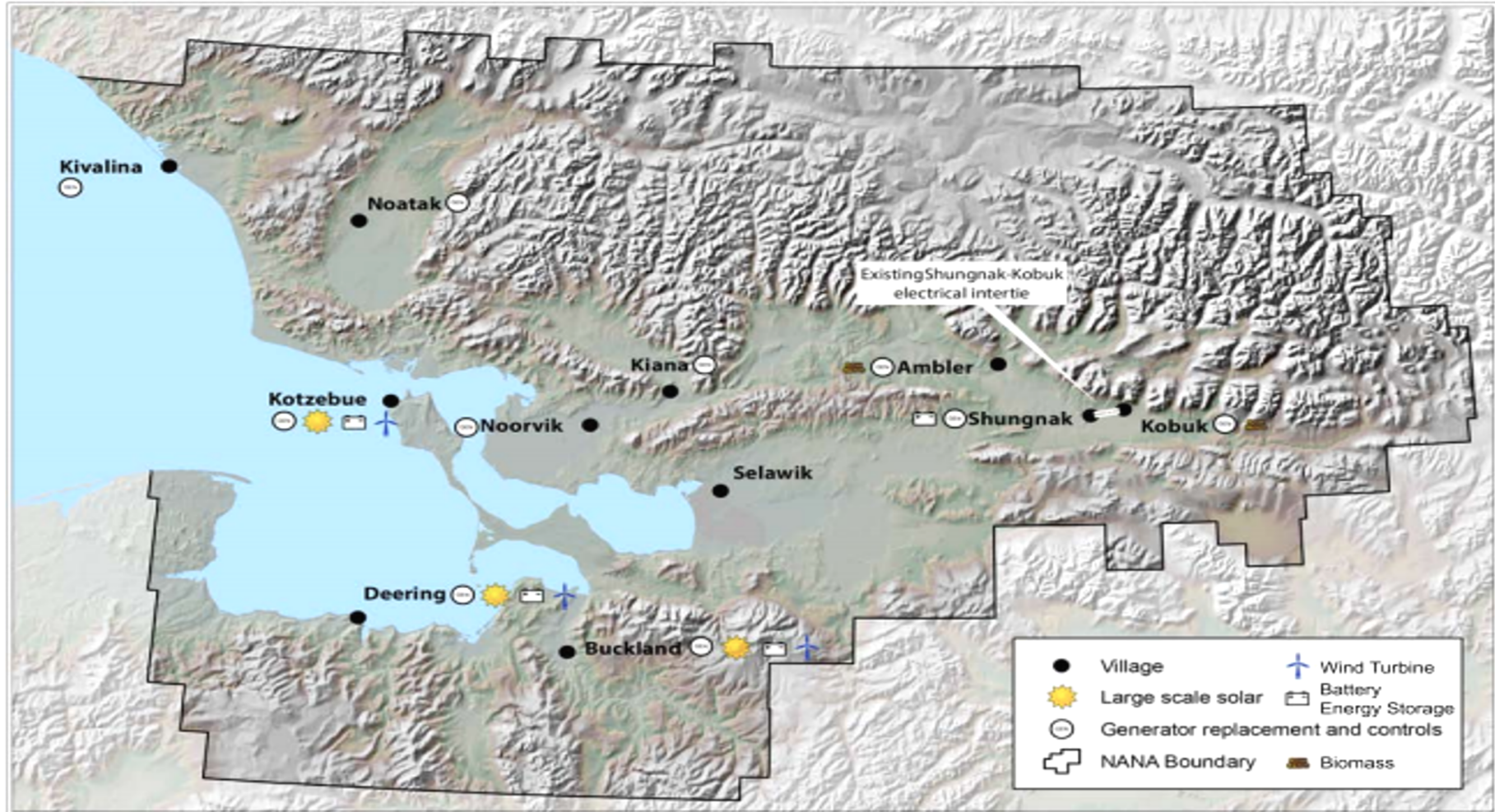
Sonny Adams – NANA Regional Corporation; Brian Hirsch – DeerStone Consulting
April 20, 2021 • Anchorage, Alaska



ANCSA – Alaska Native Claims Settlement Act



NANA REGION Introduction



Energy Projects in the NANA Region

NOT FOR NAVIGATION

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A Remote Region



- No roads connect communities
- 61 % more expensive than Anchorage
- High cost goods and fuel
- Diesel Dependence = Energy Insecure



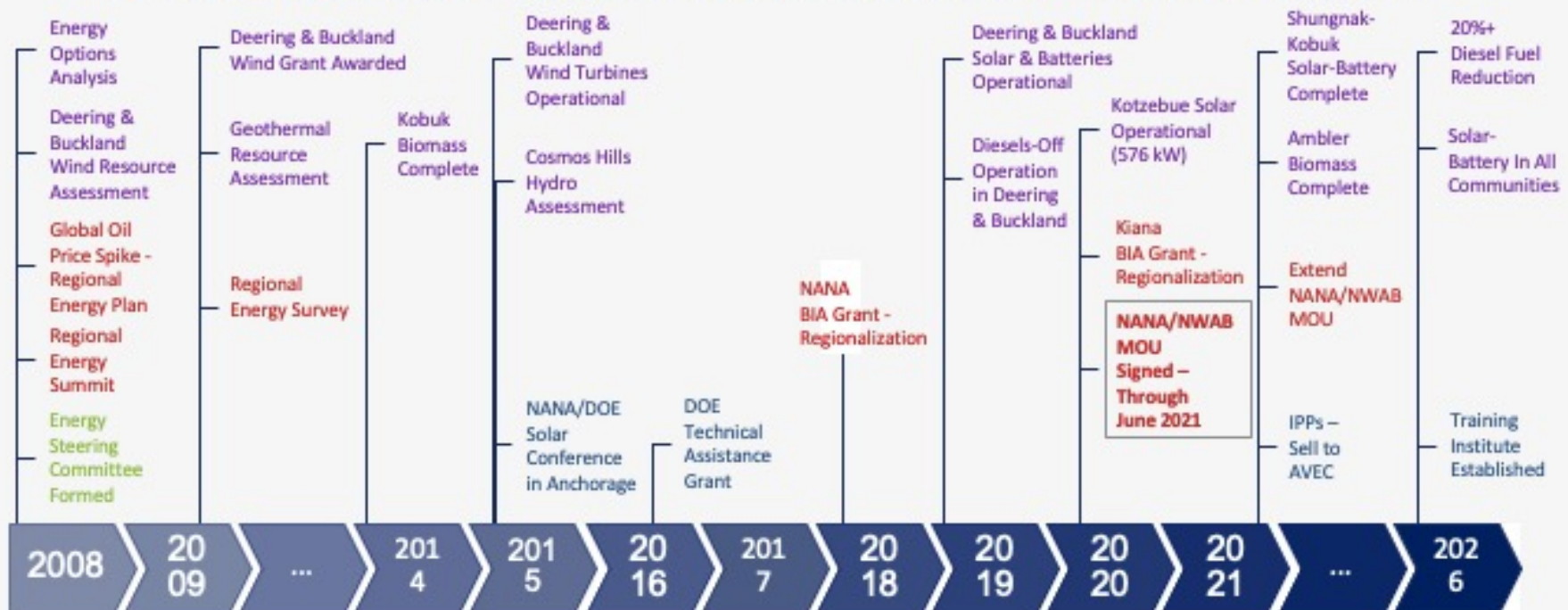
NANA's Energy Vision

- 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

NANA's Village Energy Program History

NANA Village Energy Program – Past, Present, Future

Focus Areas: **REGIONALIZATION** ❖ **TECHNOLOGY INNOVATION/COST REDUCTION** ❖ **WORKFORCE DEVELOPMENT**



WHY ARE WE DOING THIS???	Gas/G	Stove Oil/G	Kwh (1-500) PCE	Kwh (>501) NO PCE
2020 ENERGY PRICES IN...				
Kotzebue	\$5.88	\$5.92	\$0.19	\$0.41
Ambler	\$10.30	\$10.30	\$0.23	\$0.64
Kobuk	\$9.27	\$9.27	\$0.23	\$0.70
Shungnak	\$8.50	\$8.50	\$0.23	\$0.70
Kiana	\$5.15	\$5.67	\$0.22	\$0.54
Noorvik	\$6.06	\$5.64	\$0.22	\$0.56
Selawik	\$5.30	\$6.36	\$0.22	\$0.54
Buckland	\$6.15	\$6.15	\$0.26	\$0.47
Deering	\$3.35	\$3.35	\$0.39	\$0.67
Kivalina	\$5.10	\$4.53	\$0.22	\$0.52
Noatak	\$9.26	\$9.26	\$0.21	\$0.91

Regional Energy Costs in 2019

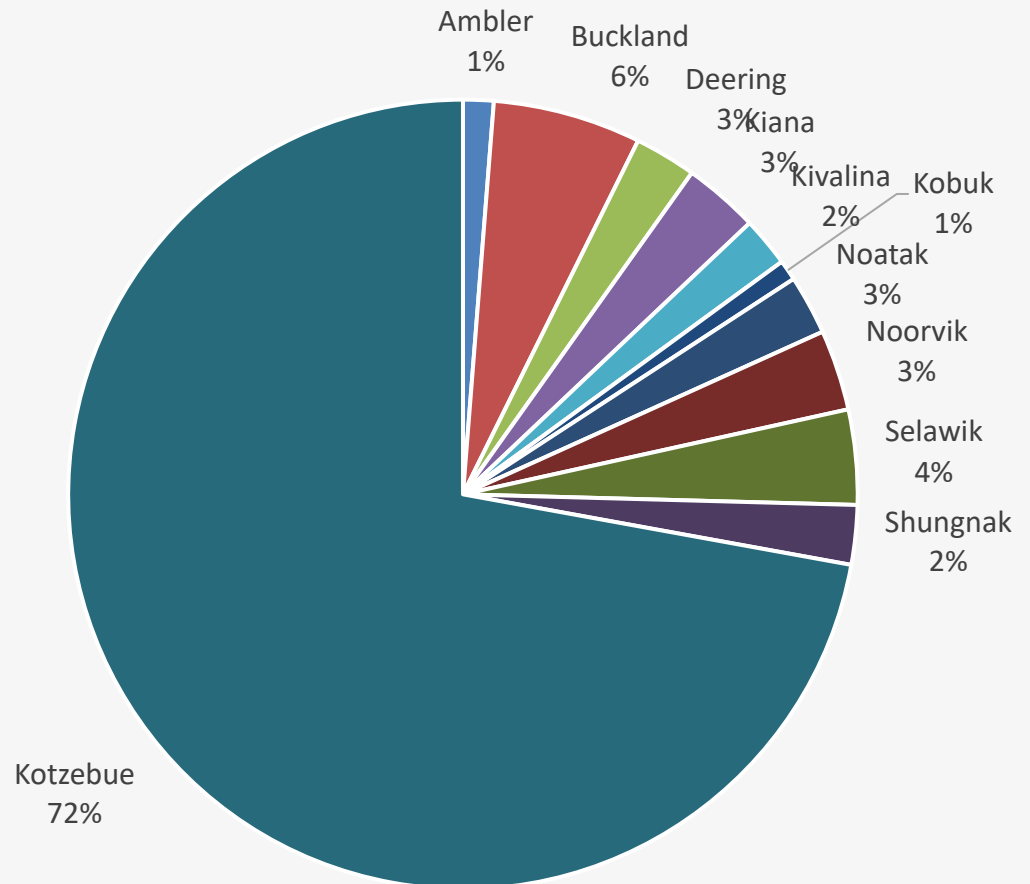
Power Generation Fuel Costs \$12,766,366

- AVEC Utilities
\$5,284,984
- Independent Utilities
\$7,481,381

Heating Fuel Costs \$23,213,120

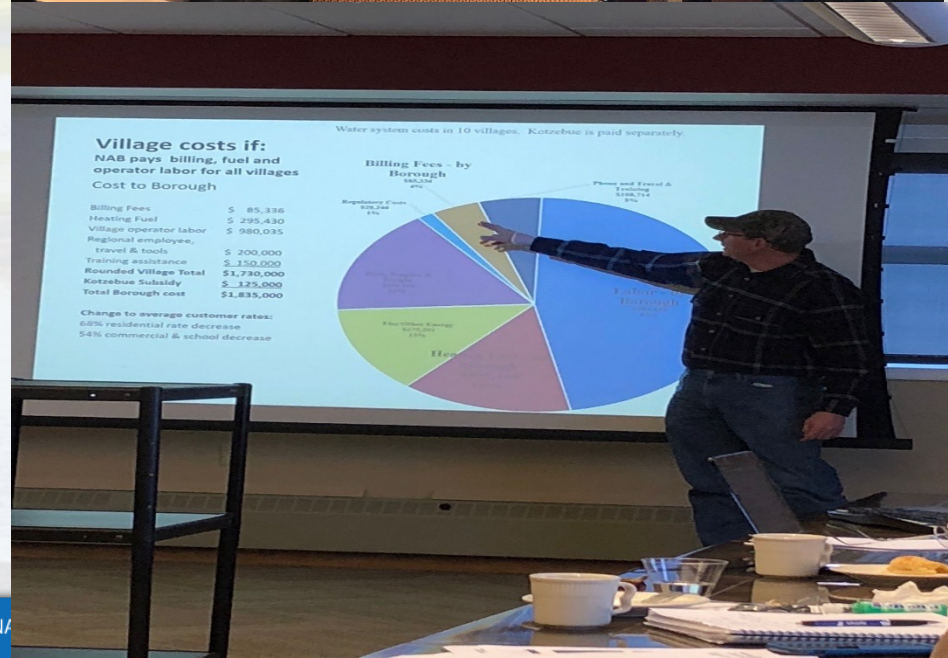
- NWAB School District
\$3,058,900
- All other customers
\$20,154,220

Percentage of Fuel Usage By Community



DOE Inter-Tribal Technical Assistance Grant

- Department of Energy has awarded NANA \$495,460 to create an Inter-Tribal Network in the Northwest Arctic
- 5-year effort (began in October 2016); ending in Sept 2021
- **Local capacity building and economic development**
- Regional Coordination for all 11 communities
- Other AK Regionals also received grant (with potential for cross regional collaboration), including in Bering Strait & Calista regions, attendance at ESC meetings in Kotzebue



APPLIED ARCTIC TECHNOLOGY

Alaska Mini-Split Heat Pump Calculator

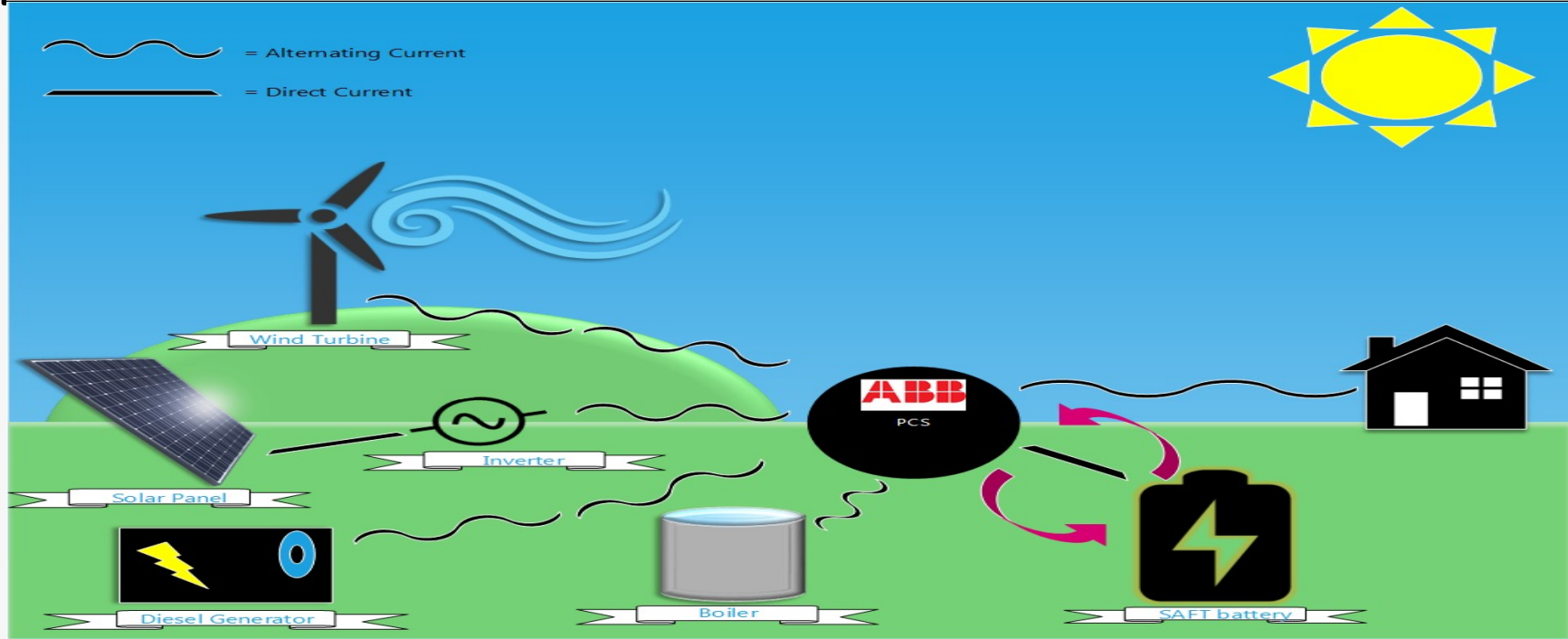
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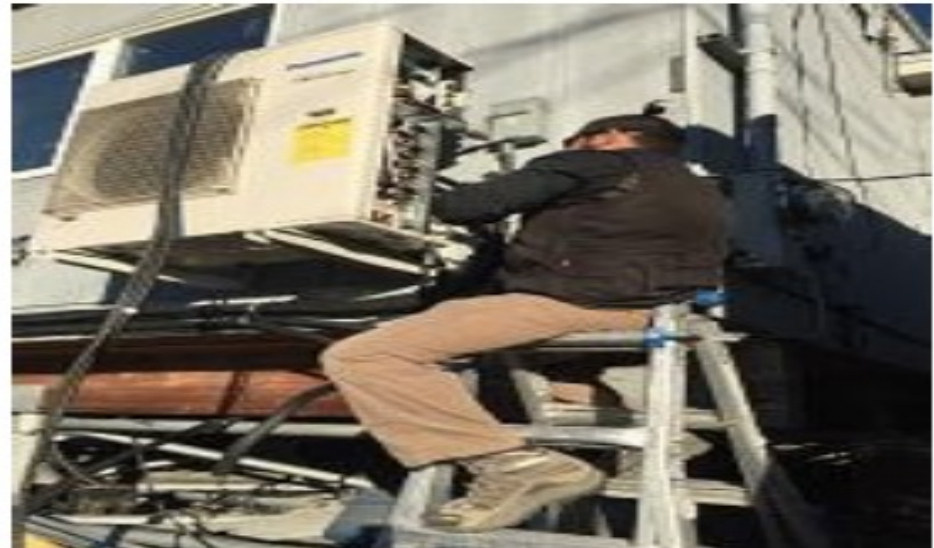


Homer Electric
Association, Inc.
A Touchstone Energy® Cooperative



ESC Priorities → Action Plan

- Critical path to Village Economic Development: Roads and Interties
- Business Case for High Penetration Renewable Energy (must include heat)
- Lower/stabilize energy costs! (Regional cooperation, new technologies, efficiencies, business structures, financing and grants, economies of scale)
- Powerhouse Upgrades to Integrate Renewables
- Workforce Development - Utility management, Powerhouse operators/mechanics
- Renewable Energy training – wind technicians, solar technicians, energy storage battery maintenance, heat pumps



Accomplishments

- Community Meetings:
 - Shungnak
 - Kobuk
 - Selawik
 - Noatak
 - Deering
 - Buckland
 - Kotzebue
 - Ambler
 - Kiana
- Solar on Water plants in every village
- Multi-agency collaboration
- Secured funding/supported diesel powerhouse and distribution system upgrade – Deering, Shungnak
- Project development with NWArcctic Borough on Regionalization & Independent Power Producer formation – Future Sustainability for Inter-Tribal effort, BIA TEDC funding secured, Phases 1 & 2
- Submitted DOE-OIE grant for Noatak
- Supported Buckland solar installation & Shungnak Solar application; Deering, Buckland and Kotzebue solar installations complete
- 6 ESC meetings held, over 200 people in attendance
- Additional funding secured (~\$4 million) for targeted projects
- Ambler Biomass Support – \$443,476 received from USDA HECG – construction complete summer 2021
- Heat Pump Calculator & Study Complete – www.heatpump.cf
- Refining diesel-off technology & renewables integration in Deering, Buckland, Kotzebue, Shungnak
- Diesel upgrades & generator replacements in Buckland – EPA DERA
- Over 15 public presentations + Battery and Inverter/Power Conversion hardware technology (ESNA & ABB) conferences for staff capacity development

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



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



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



Replication in Process!

- Communities of Shungnak & Kobuk interconnected via 10-mile distribution line
- Received \$1.3 million from USDA High Energy Cost Grant for 150 kW solar and ~650 kWh battery for Shungnak & Kobuk, plus VIF/NAB/NANA funding
- 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



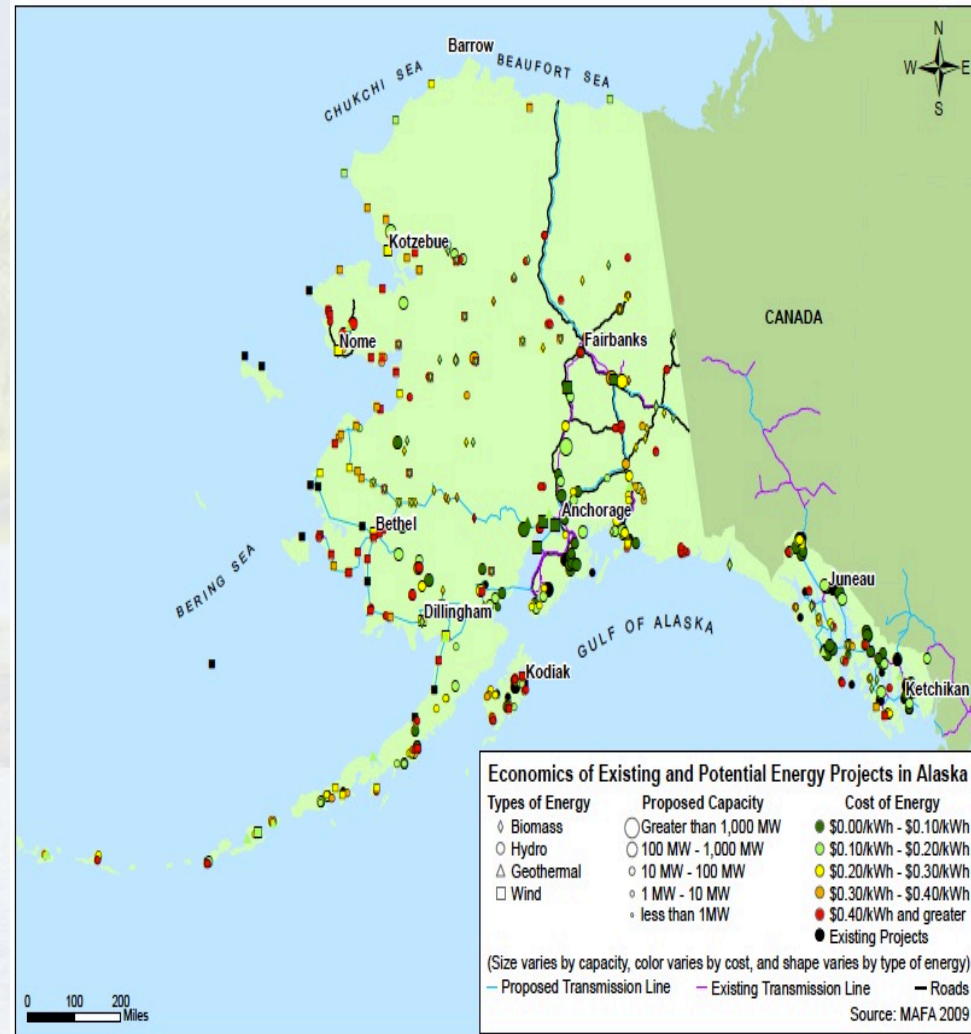
USDA High Energy Cost Grant – Breaking Trail

- 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



Recommendations

- Critical path to Village Economic Development: Roads and Interties
- Powerhouse Upgrades to Integrate Renewable Energy
- Workforce Development - Utility management, Powerhouse operators/mechanics
- Renewable Energy training – wind technicians, solar technicians, energy storage battery maintenance, heat pumps



Leveraging Regional Lessons to Inform Policy

- ✓ Grants are still necessary
- ✓ Be creative to create economies of scale (e.g., Energy & Utilities can include power, heat, transportation, water, sewer, broadband; aggregate across communities & regions)
- ✓ Reduce complexity of grants, cost share
- ✓ Tax credits are not very useful in rural AK
- ✓ Economic justification for renewables should include not just fuel savings, but also jobs, energy security, fuel diversity, reduced impact on diesel equipment
- ✓ Workforce development is crucial for long term project success (and often neglected, with limited funding opportunities)
- ✓ Provide long term funding & technical support – not annual cycles



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Taikuu!