

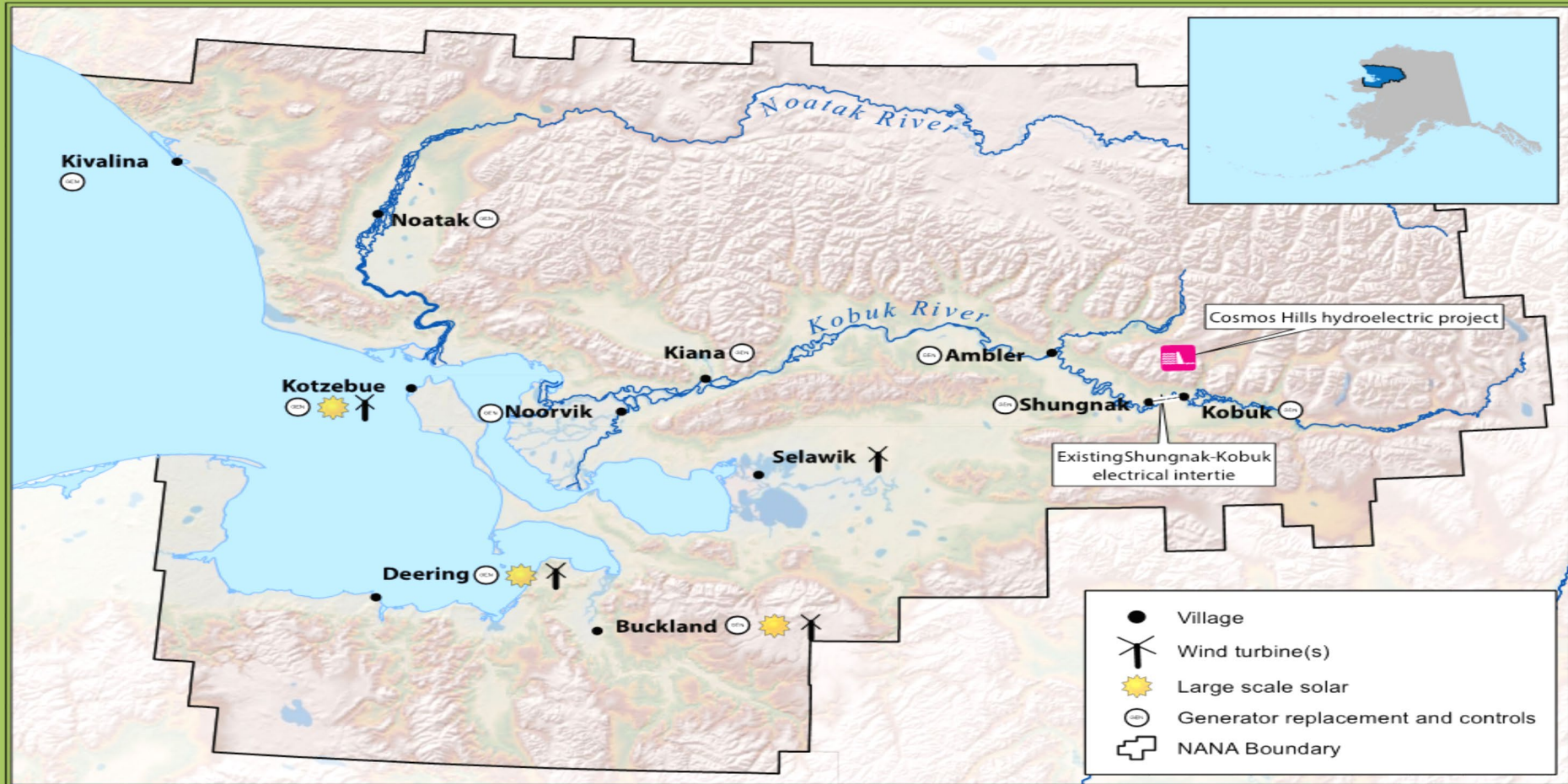


DOE Program Review

December 12, 2018 • 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

<u>WHY ARE WE DOING THIS???</u> 2018 ENERGY PRICES IN...	Gas/G	Stove Oil/G	Kwh (1-500) PCE	Kwh (>501) NO PCE
Kotzebue	\$5.75	\$5.26	\$0.18	\$0.45
Ambler	\$9.79	\$9.53	\$0.21	\$0.61
Kobuk	\$8.24	\$8.24	\$0.21	\$0.60
Shungnak	\$8.42	\$8.42	\$0.21	\$0.60
Kiana	\$6.18	\$5.67	\$0.20	\$0.57
Noorvik	\$6.06	\$5.64	\$0.20	\$0.57
Selawik	\$8.25	\$7.99	\$0.20	\$0.52
Buckland	\$6.89	\$6.89	\$0.20	\$0.48
Deering	\$5.15	\$4.90	\$0.32	\$0.71
Kivalina	\$4.95	\$4.49	\$0.20	\$0.56
Noatak	\$10.29	\$10.29	\$0.21	\$0.75

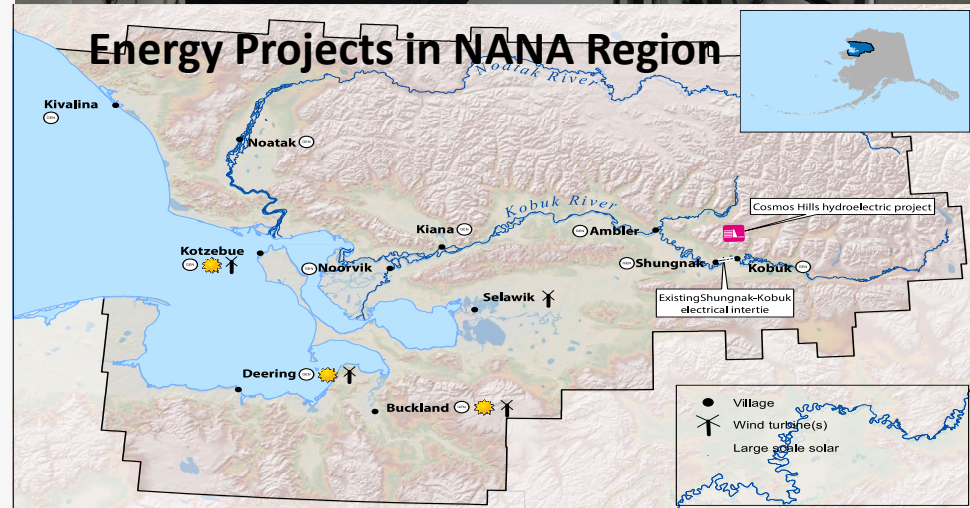
Department of Energy Solar Grant

- Department of Energy has awarded NANA \$1M to install community solar arrays in Deering, Buckland, and Kotzebue; Requires \$1 M cost share among the three communities
- Both Deering & Buckland are using Village Economic Development Committee (VEDC) \$ for their cost share, along with local village resources
- Buckland Solar installation complete, now producing clean energy!!!
- NANA is working with Kotzebue Electric Association to finance the remaining cost share for the project
- Considering forming a Joint Venture with KEA to meet terms of the Grant

Dept of Energy Solar Grant, contd

- Buckland & Deering:
 - ~50 kW solar array in both communities
 - Connect to existing wind-diesel hybrid systems
 - Adding Batteries for eventual “diesels-off” (other funding)

- Kotzebue:
 - ~300 kW solar array
 - Existing wind-diesel-battery hybrid system
 - Not enough renewables for “diesels-off” ...yet



Buckland Solar



Solar Array Components & Specs

- 277/480V, 60Hz grid compatible
- 15.12kW solar rating per unit
- System rated for 150 mph wind design load & 60 psf snow load
- Inverter rated for -25C to 60C operating temp
- Solar panels rated for -40C to 85C operating temp
- Solar panels rated for 150mph wind velocity & 110 psf snow load
- ABB Microgrid I/O compatible
- 3 ft min ground clearance for snow
- 45 degree panel tilt
- Equipped with monitoring capability

Component	Manufacturer	Model	Warranty
PV panels	Talesun*	TP-672M-360	10 year workmanship, 25 output
PV racking system	Ironridge	XR1000	3 year aesthetic, 10 structural
Inverter	SMA Tripower	15000 TL	10 year extended warranty
Container	Various	20ft standard	Current CSC inspection plating
Workmanship	BoxPower Inc	S3P15	10 year workmanship

Panel Efficiency	18.5%
Panel Tilt	45 degrees
Array Area	83.5 m ²
Array Capacity	15120 watts

Each 15kw BoxPower unit will produce 16,446 kWh/year in AC power, accounting for inverter efficiency and losses.

Season	Generation (kWh)
Spring	6,815
Summer	6,091
Fall	2,491
Winter	1,049
Annual	16,446

Following the Sun



Wind Loading Considerations – 150 MPH



Department of Energy Solar Grant – Deering & Buckland

- BoxPower solar array installed
– September/October 2018
- Deering solar on hold until
powerhouse upgrades occur
(new diesel engine, controls)
- Solar Energy International PV
101 training held in Kotzebue
in June 2018; 18 -20
participants





Local Crew & Training



Innovations & Lessons Learned – Buckland Solar

- **Foundation Design – Box x Box + Corner Locks (Avoid Concrete if possible)**
- **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 – Now evaluating performance**
- **Will be integrated with batteries, wind, grid-forming inverter, electric boilers in powerhouse and waterplant**
- **Aim to replicate: Deering, Kotzebue, Shungnak, ???**
- **Address vandalism through Education**

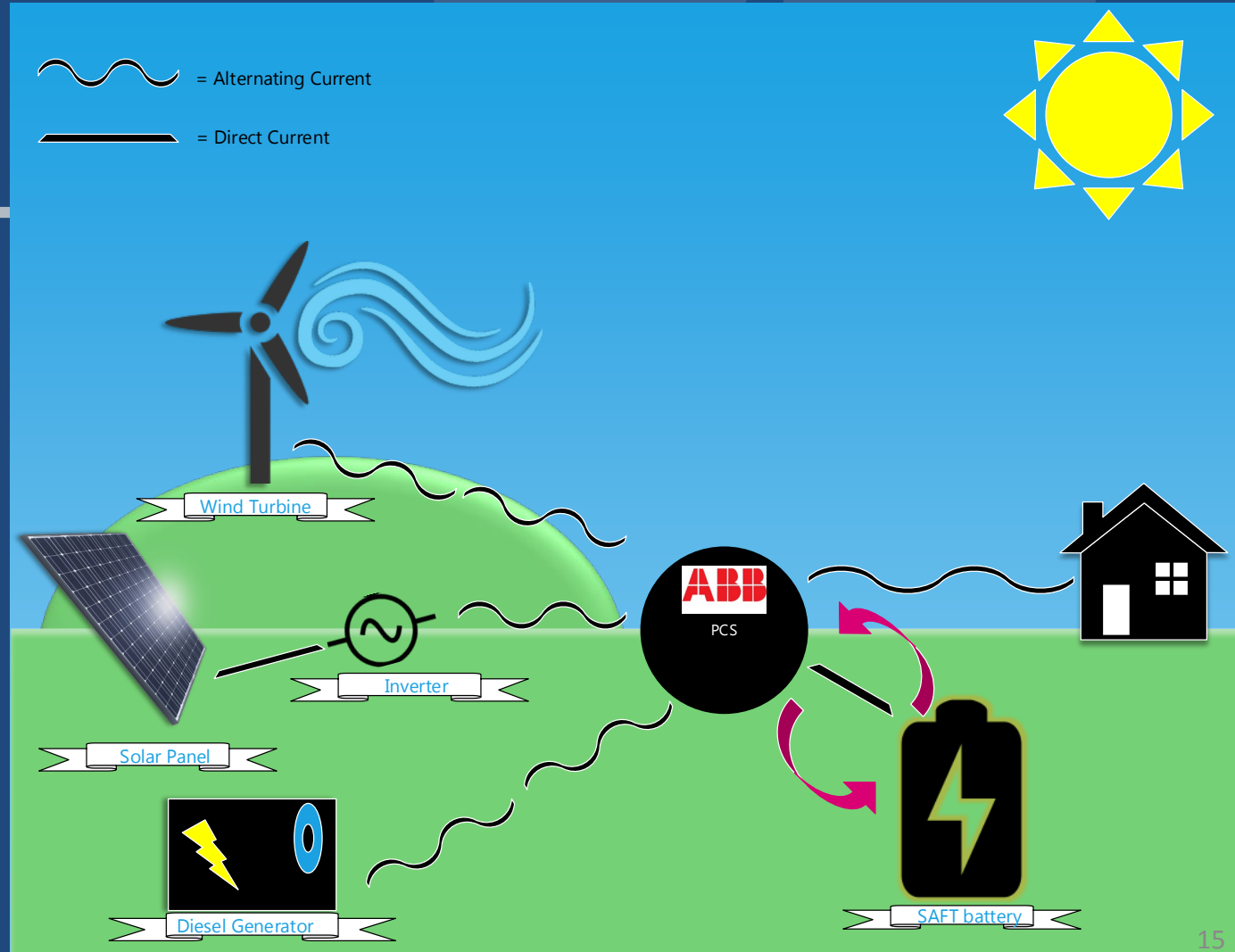


Expected Outcomes



- ~ 7 % Diesel fuel savings annually from solar (~35% savings total with solar, wind & batteries)
- Diesels-off in spring & summer
- Increased local capacity
- Diesel displacement at water treatment plant
- Reduced costs in Deering (~20-30%)

Basic Micro-grid



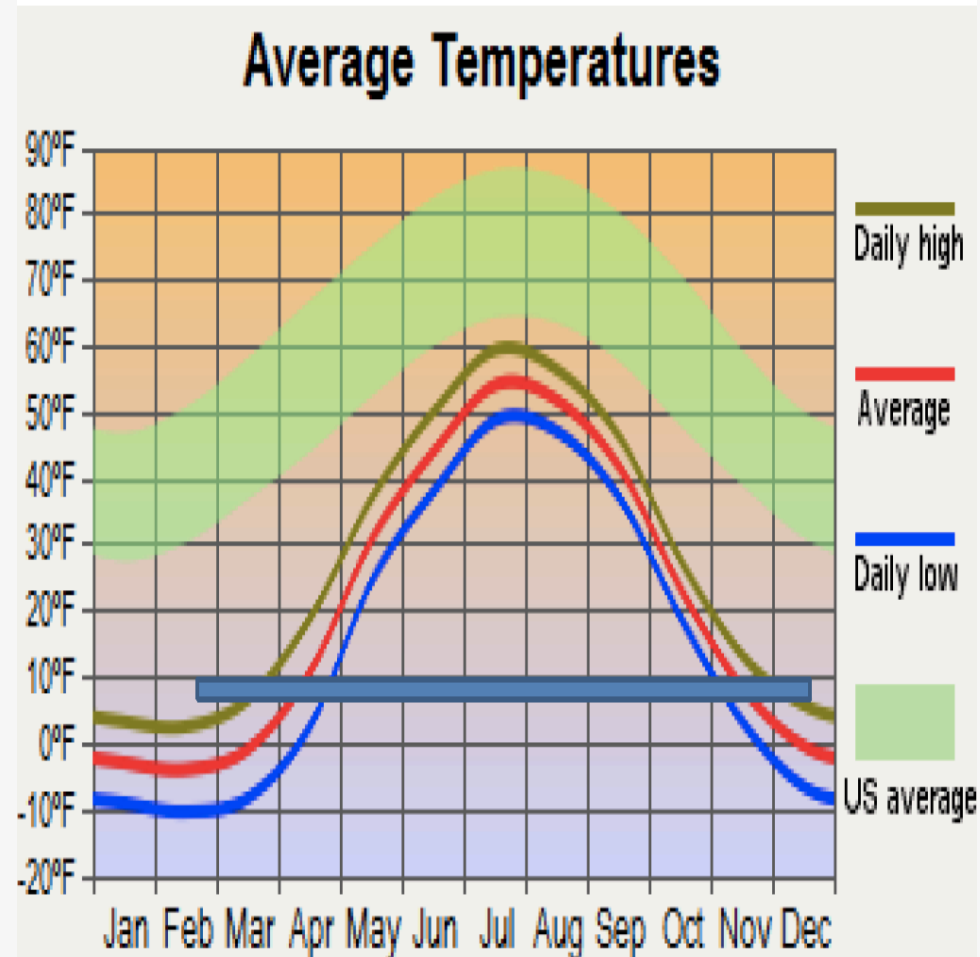


Energy- What We've Learned So Far

NANA/NWAB Role in energy for our region

1. Project development, including stakeholder coordination
2. Grant writer/fund seeker – innovative approaches
3. Advocating for change in State and Federal policies
4. Infrastructure planner
5. Communicating NWALT (NorthWest Arctic Leadership Team) energy priorities to stakeholders
6. Update Energy plan
7. Research arctic-appropriate technologies (e.g., heat pumps-NWAB, batteries, solar diesels-off)
8. Regional Energy Authority/Joint Action Agency

Harvest season for Solar PV & Heat-pumps



Regional Energy Priorities – The Big Picture!

- Critical path to Village Economic Development: Roads and Interties
- Determining Business Case for High Penetration Renewable Energy (must include heat)
- Lower costs! (Regional cooperation, new technologies, efficiencies, business structures, financing and grants, economies of scale)
- 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

Taikuu!