NANA




Arctic Slope
Red Dog Mine
Kivalina
Noatak
Noatak River
Doyon
Kiana
Ambler
Kobuk River
Kotzebue
Noorvik
Kobuk
Shungnak
Selawik
Selawik River
Deering
Buckland
Buckland River
NANA Region
Bering Straits Native Corporation
Arctic Slope
NANA
Doyon
Bering Straits
Calista
CIRI
AHTNA
BBNC
Chugach
Sealaska
Aleut
Koniag

A Remote Region





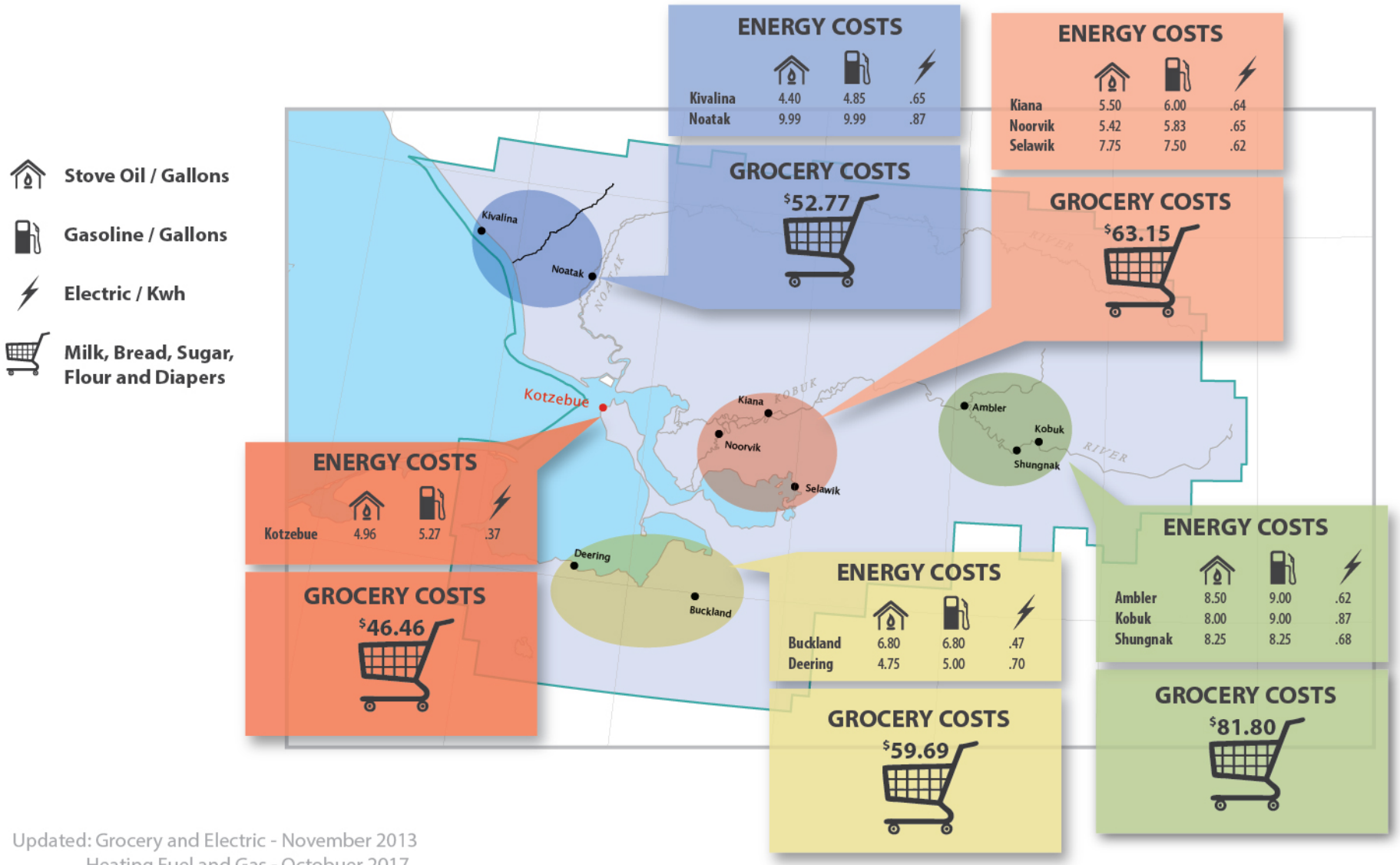


- No roads and few electrical interties to connect communities
- 61 % more expensive than Anchorage
- High cost goods and fuel

NANA
REGIONAL CORPORATION, INC.

Fuel Prices in NANA Region, i.e., Why We're Doing This

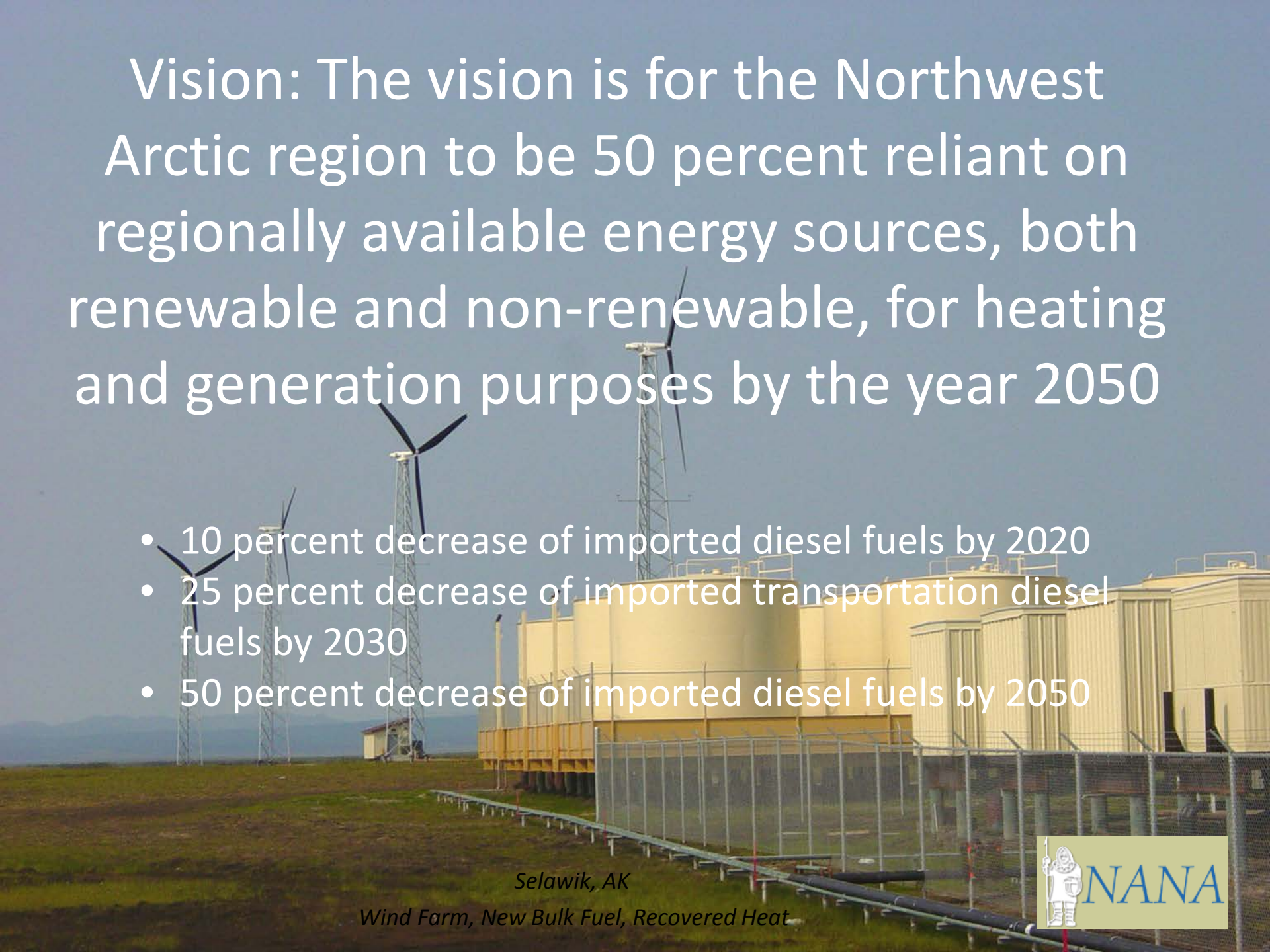
Community	Gas	Stove oil	Utility buy/G 2016
Kotzebue	$5.27	$4.96	$ 2.91
Ambler	$9.00	$8.50	$ 4.65
Kobuk	$9.00	$8.00	$ 5.22
Shungnak	$8.25	$8.25	$ 5.22
Kiana	$6.00	$5.50	$ 3.43
Noorvik	$5.83	$5.42	$ 3.67
Selawik	$7.50	$7.75	$ 3.65
Buckland	$6.80	$6.80	$ 3.77
Deering	$5.00	$4.75	$ 3.25
Kivalina	$4.85	$4.40	$ 3.52
Noatak	$9.99	$9.99	$ 6.77



Updated: Grocery and Electric - November 2013
Heating Fuel and Gas - Octobuer 2017

Vision: The vision is for the Northwest Arctic region to be 50 percent reliant on regionally available energy sources, both renewable and non-renewable, for heating and generation purposes by the year 2050

- 10 percent decrease of imported diesel fuels by 2020
- 25 percent decrease of imported transportation diesel fuels by 2030
- 50 percent decrease of imported diesel fuels by 2050



Selawik, AK

Wind Farm, New Bulk Fuel, Recovered Heat

Energy Plan & Project Development Methodology & Approach (from 2008-09 Energy Planning)

- Community Outreach, Resolutions, & Surveying
- Energy Options Analysis
- Energy Resource Data Collection and Forecasting
- Regional Energy Plan – Solar Energy identified as an option
- Energy Summit
- Energy Steering Committee
- Project Development
  - Feasibility Studies
  - Modeling
  - Conceptual Designs
  - Secure Funding
  - Detailed Design
  - Construction
  - Commissioning & Operations



Northwest Arctic Borough - Solar

All regional water/sewer systems use solar-PV by 2016 and run solely on solar in summer

Pioneered “solar in the round” to ease grid integration and reduce impacts to diesel generation

- Reduce foundation costs
- Eliminate solar tracker
- Optimize summer production
- Smaller ramp rates when clouds cover sun – easier on diesel generators

Solar PV Performance

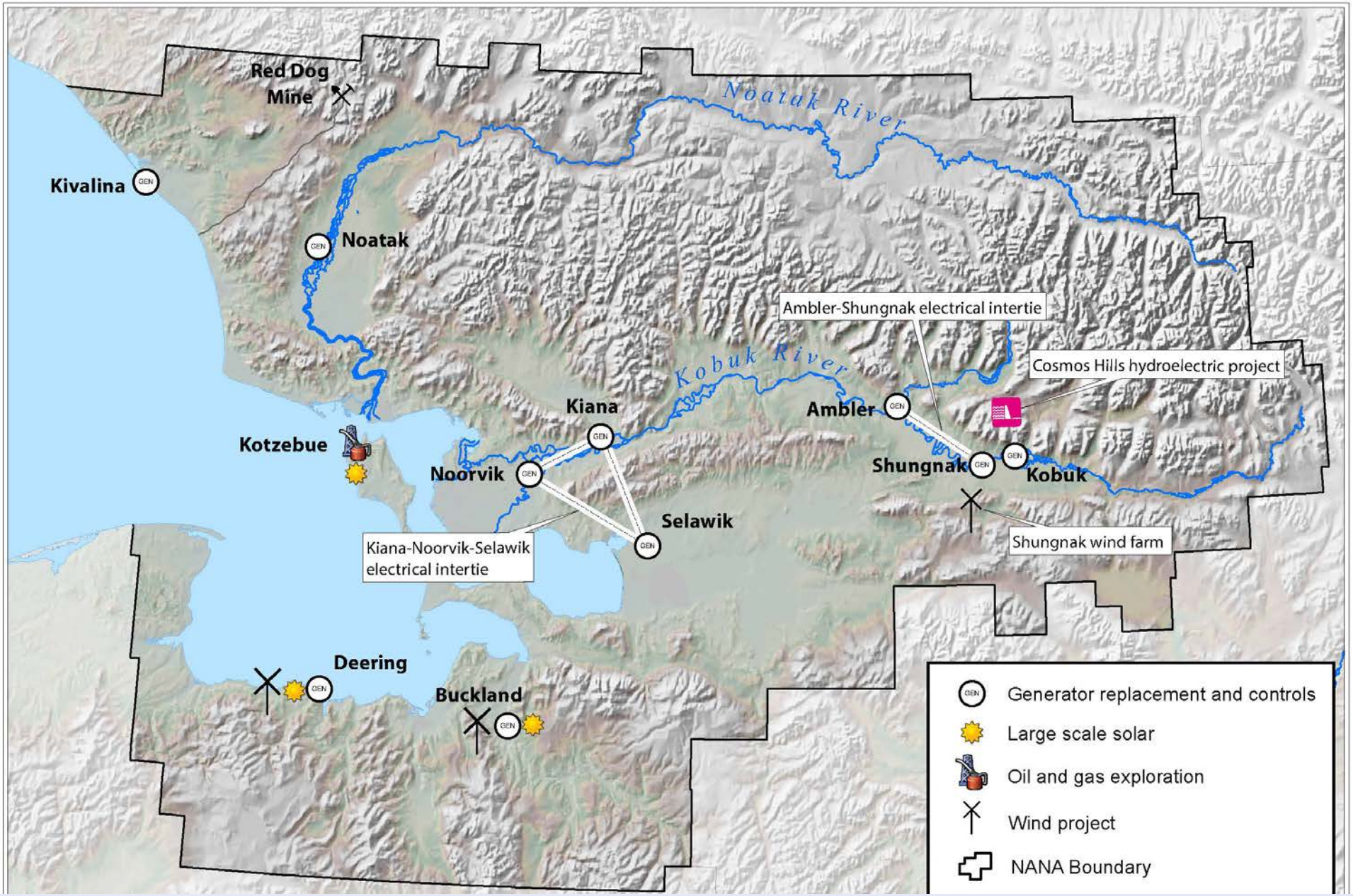
Solar PV for NAB Waterplants

5/23/2016			9/5/2016							Average
Community	installed	installed size Kw	production MWh	Current $/Kwh retail	Value $	CO 2 offset lb	Disel offset Gallon	Cost $	Cost/watt installed	Performance Kwh/day
Ambler	3/1/2013	8.4	21.69	0.67	$14,532.30	63,794	1606.67	75,000	8.928571	18.39694656
Kobuk	5/1/2013	7.38	16.32	0.73	$11,913.60	48,000	1208.89	75,000	10.1626	14.59749553
Shungnak	10/1/2014	7.5	9.97	0.73	$7,278.10	29,324	738.52	75,000	10	16.61666667
Noorvik	10/1/2013	12	23.29	0.55	$12,809.50	68,500	1725.19	75,000	6.25	24.13471503
Noatak	11/1/2013	11.27	23.44	0.78	$18,283.20	68,941	1736.30	75,000	6.654836	25.09635974
Deering	11/1/2013	11.13	27.56	0.71	$19,567.60	81,059	2041.48	75,000	6.738544	29.50749465
Kotzebue-1	10/15/2015	10.53	8.69	0.45	$3,910.50	25,559	643.70	83,000	7.882241	39.32126697
Kotzebue-2	11/10/2015	10.53	8.28	0.45	$3,726.00	24,353	613.33	83,000	7.882241	42.46153846
Selawik	11/20/2014	9.72	17.45	0.51	$8,899.50	51,324	1292.59	83,000	8.539095	31.72727273
Kiana	8/13/2015	10.53	11.22	0.56	$6,283.20	33,000	831.11	83,000	7.882241	39.50704225
Buckland	4/1/2016	10.53	6.22	0.47	$2,923.40	18,294	460.74	83,000	7.882241	119.6153846
Kivalina	2/15/2016	10.53	6.5	0.55	$3,575.00	19,118	481.48	83,000	7.882241	66.32653061
Total		120.05	180.63		$113,701.90	531,265	13380.00	948,000	7.437296	467.3087138

Anchorage Solar Conference

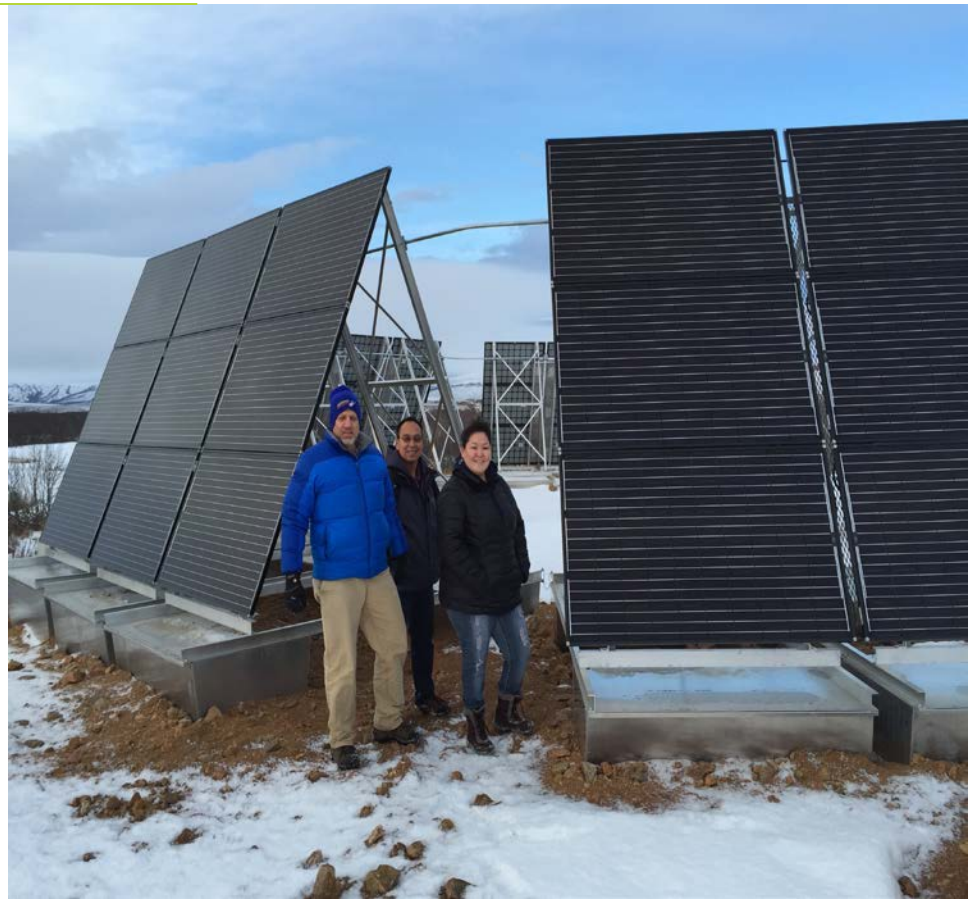
NANA co-sponsored solar energy conferences in Anchorage to educate and develop solar energy concepts.

Participants included DOE, NREL, solar developers, investors, villages, and other stakeholders.


Red Dog Mine
Noatak River
Kivalina
Noatak
Ambler-Shungnak electrical intertie
Cosmos Hills hydroelectric project
Kobuk River
Kiana
Ambler
Kotzebue
Noorvik
Shungnak
Kobuk
Selawik
Kiana-Noorvik-Selawik electrical intertie
Shungnak wind farm
Deering
Buckland
Generator replacement and controls
Large scale solar
Oil and gas exploration
Wind project
NANA Boundary

NANA Solar with DOE IE Support

- NANA partnered with KEA and tribes to apply for DOE funding; to install solar energy into Deering, Buckland, and Kotzebue
- Will be largest solar PV project in Alaska
- Public-Private Partnership – Evaluated, loans, grants, and investment tax credits
- Community & Business Development
  Total Project Cost: $2.2M
- Local/Village commitment of VEDC funds in Buckland & Deering



Goals & Objectives

The Primary goals of the solar energy project are to:

1. Lower energy costs for the communities of Kotzebue, Buckland, and Deering
2. Reduce diesel fuel use and increase renewable energy deployment in these communities
3. Develop clean energy job skills and expertise among residents in the three communities
4. Demonstrate the success of high penetration solar-wind-storage-diesel hybrid systems in remote high latitude locations for broad replication (aiming for “diesel-off” for some period of time)

Northern Lights, Noorvik AK

Funding, Financing, & Partnerships

- Project Partners:
  - Kotzebue Electric Association; Deering & Buckland Tribal Councils, Cities, Utilities; KIC
  - Technical Team: ABB, DeerStone Consulting, Intelligent Energy Systems, Northwest Arctic Borough, Adaptive Microgrids

- Funding: DOE-IE ~$1 million

- Financing/Cost Share:
  - Deering & Buckland - ~$200K from VEDC (NANA)
  - KEA - $1 million (CFC Bank) - May Require Joint Venture between NANA & KEA



Gaps

- Renewable energy projects need smaller generators and battery packs – battery funding has been secured for all 3 communities
- Need operator training/follow up and run measures for power generation
- Power Cost Equalization could be reformed to not penalize integrating renewable energy (reward diesel savings)



Opportunities

- Develop solar project for Deering, Buckland, and Kotzebue; promote public/private partnership and local capacity for funding & replication elsewhere
- Diesel – off operation in the summer time
- Change the culture: Grants vs. loans

Taikuu