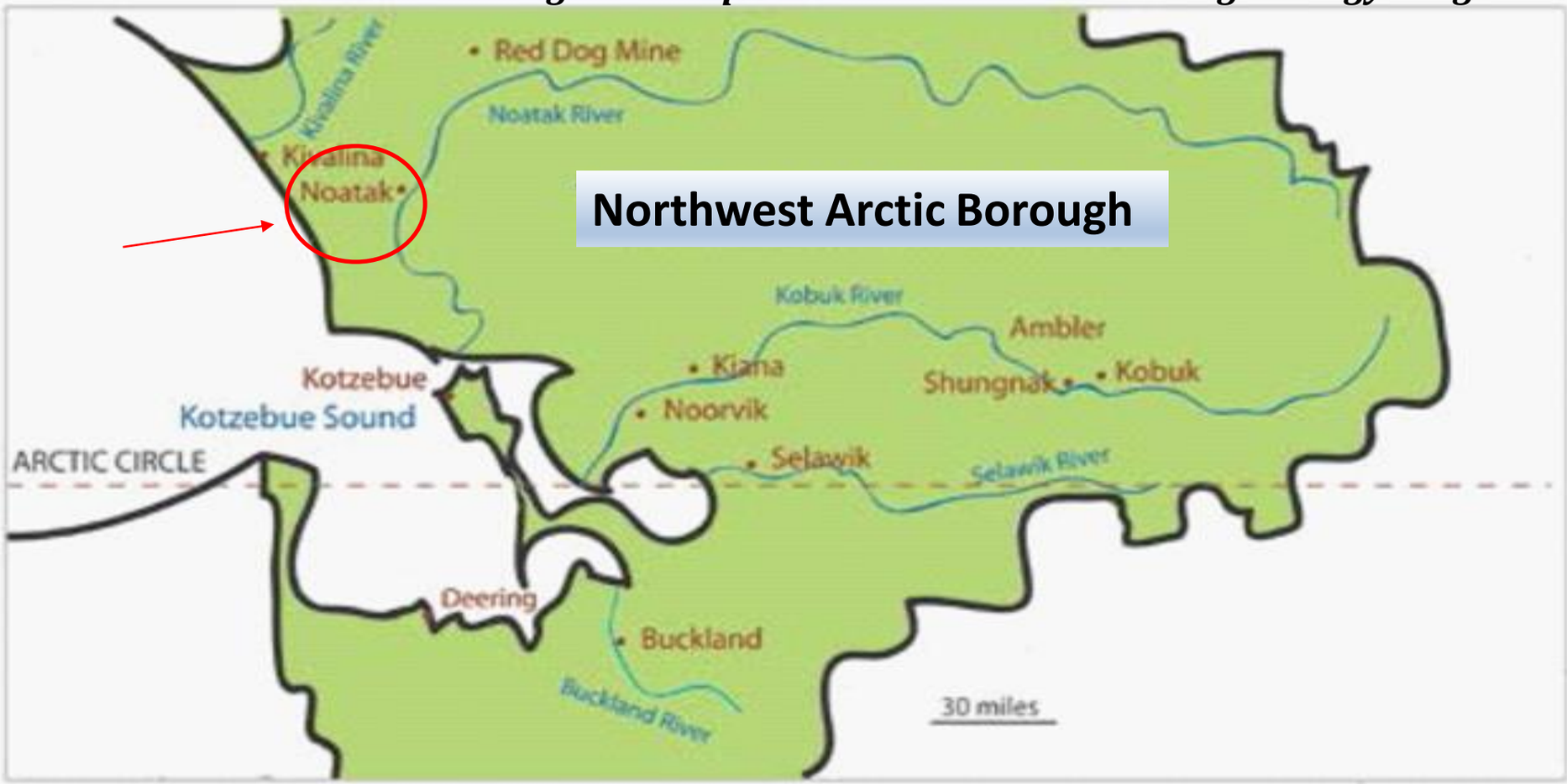
Northwest Arctic Energy program

Co-Hosted & Sponsored by:

Northwest Arctic Borough – Energy Program

NANA Regional Corporation – Alternative & Village Energy Program



DOE program review
Noatak Solar-Battery IPP project
11/15/2023 Denver, Co

Nautaaq “Noatak” Ak

Noatak was established as a fishing and hunting camp in the 1800s. Two identifiable groups of Inupiat resided on the Noatak River.

The *Nautaaġmiut* (called "Noatagamut" in the 1880 census), Inupiaq for "inland river people", lived upriver, and the *Napaaqtuġmiut*, meaning "people of the trees", lived downriver. By the early 20th century, the missionaries settled in what they called "Noatak". A United States post office was established in 1940.

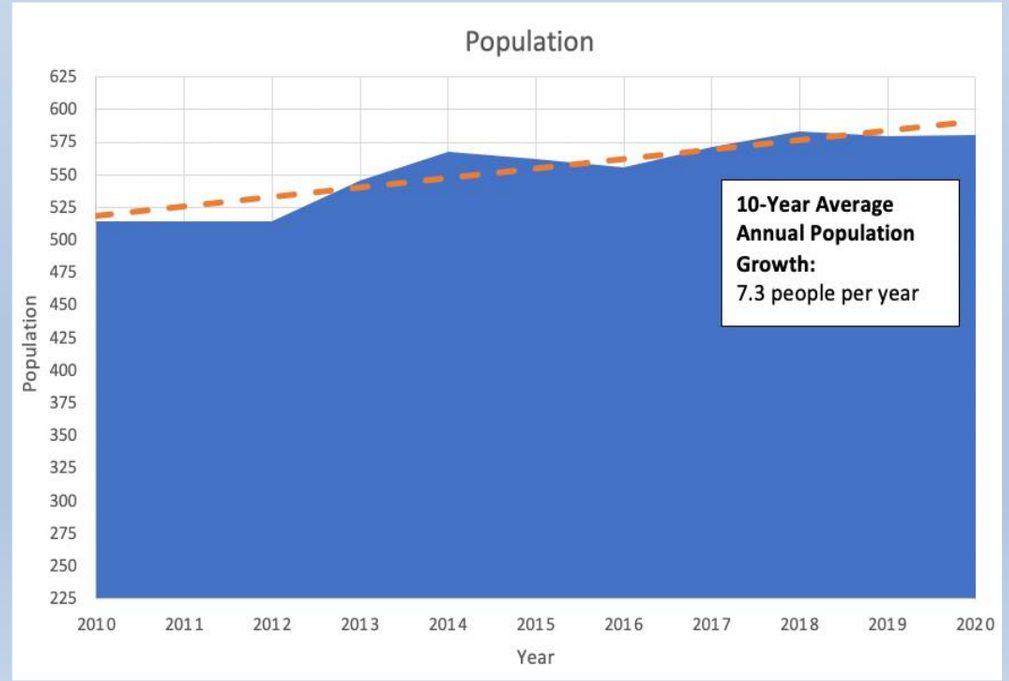
Nautaaq “Noatak” Ak

DEMOGRAPHICS AND SOCIOECONOMICS

Year Incorporated Not Incorporated

Federally Recognized Tribe
Native Village of Noatak
Population (2020) 570
Median Age (2016-2020) 26.4
Percent Alaska Native / American Indian alone or in combination (2016-2020) 95%
Average Household Size (2016-2020) 4.28

Fuel Cost (2022)
$13.77/gallon (Gasoline)
$14.44/gallon (Heating Oil)
$ 1.06/Kwh electric rate pre PCE
Median Household Income (2016-2020) $55,000
Denali Commission Distressed Community (2018) Yes

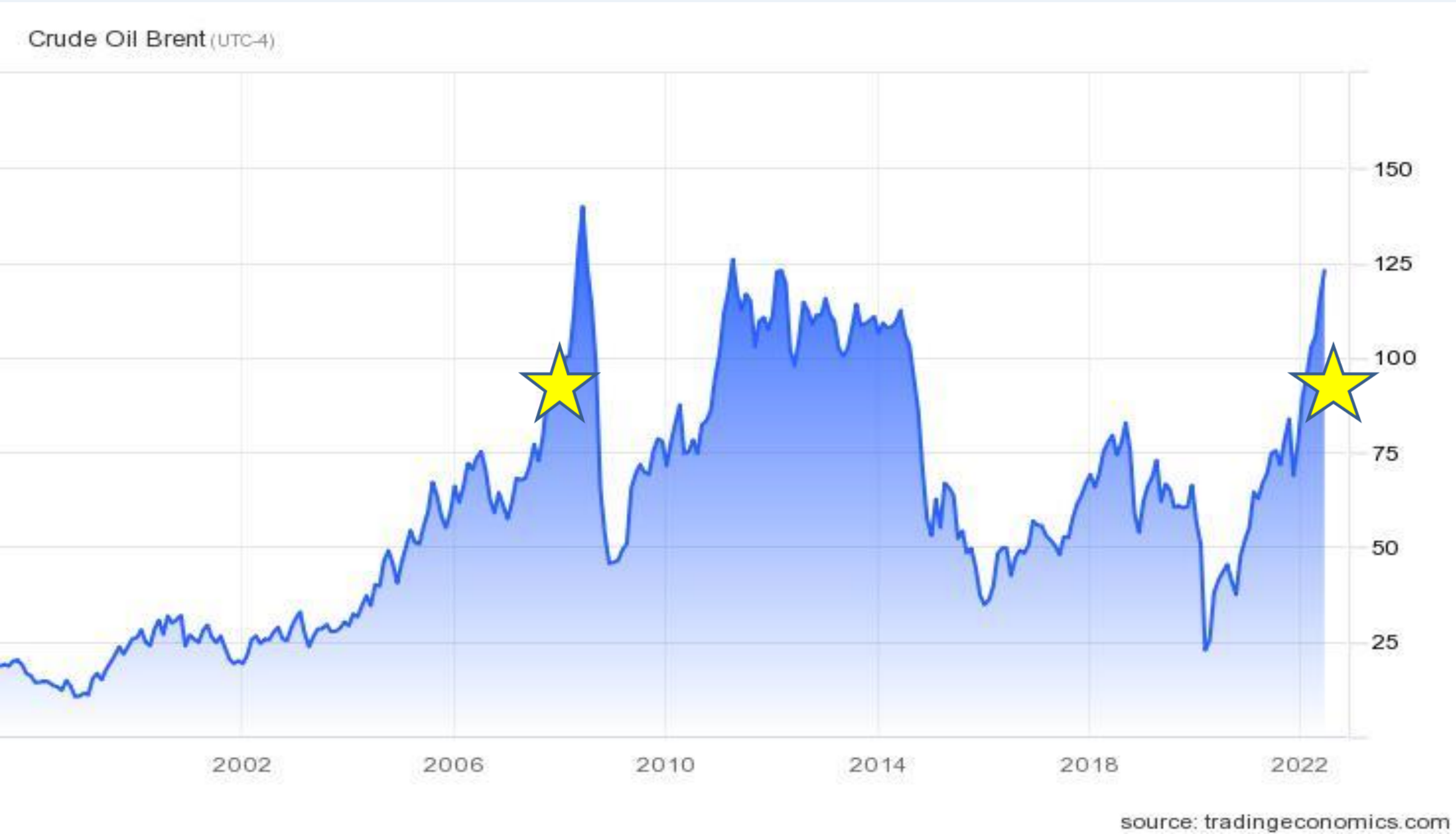


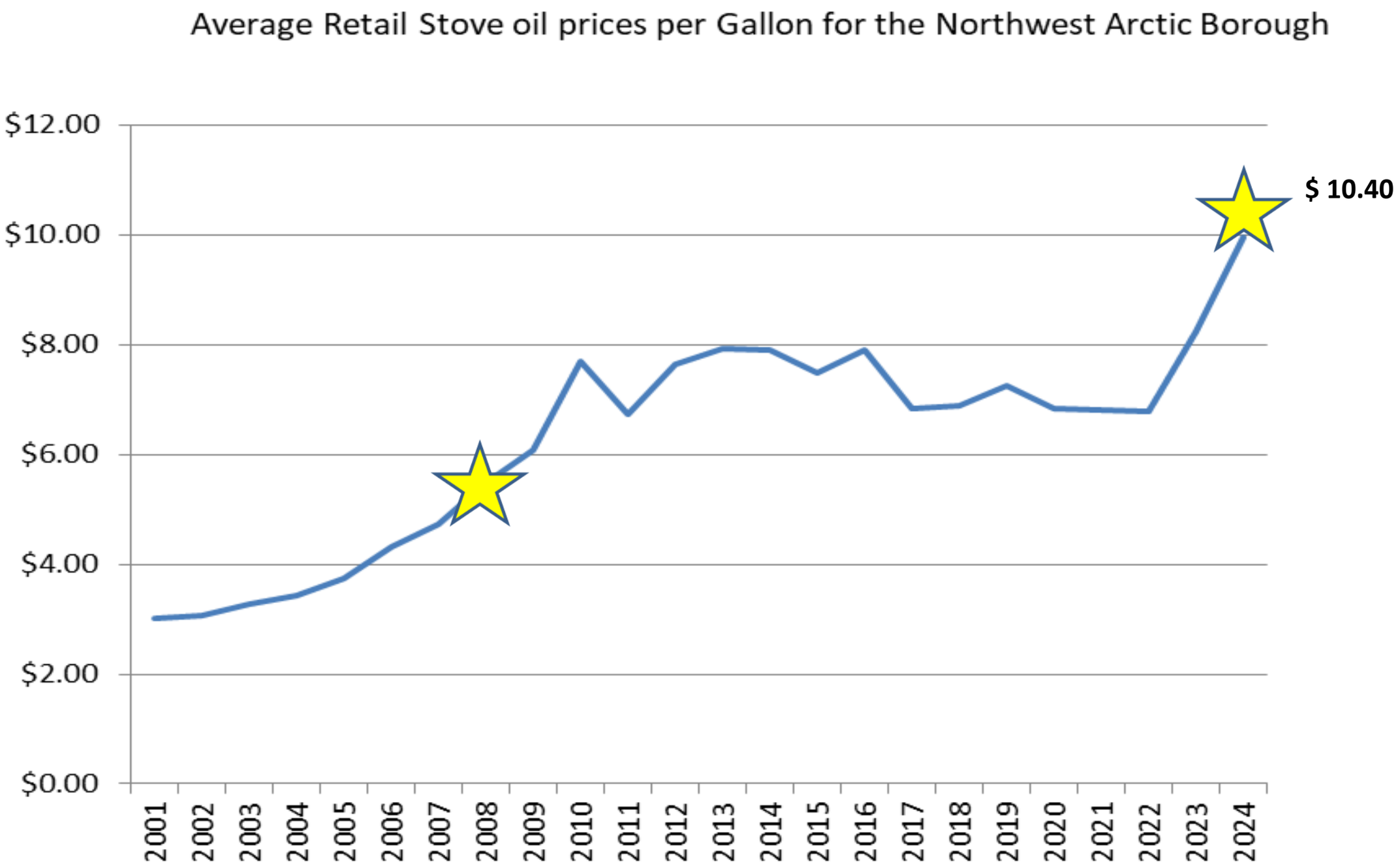
The Noatak River

Over several decades the river channels have been shifting and Noatak can no longer be accessed by barge service.

The Community is slowly moving west as seen by the new subdivision and new School building.
A new runway is planned 3 miles west of the community.

Some background




Average Retail Stove oil prices per Gallon for the Northwest Arctic Borough
$12.00
$10.00
$8.00
$6.00
$4.00
$2.00
$0.00
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
$ 10.40

Fuel prices (tax included on retail) Oct. 2023 & FY24

Community	Gasoline $/G Retail Aug 2023	Stove oil $/G Retail Aug 2023	Sales Tax included	Util. & AVEC Cost $ Barge/Air FY2022- FY2023	NWABS Cost $ FY2023- FY2024
Kotzebue KIC and KEA	8.99	9.12	6%	3.71 KEA/ 3.20	4.54/4.7605
Kotzebue Vitus	7.99	7.57	6%		
Kotzebue Crowley	7.80	7.97	6%		
Ambler	18.34	18.34	3%	4.49 /10.59	6.07/6.2505
Kobuk	13.91	15.45	3%	N/A	6.07/6.2505
Shungnak	14.03	16.14	2%	5.45 / 10.17	6.07/6.2505
Kiana	8.76	8.50	3%	2.82/4.18	4.71/5.0005
Noorvik	7.21	6.81	4%	2.96/4.63	4.71/5.0005
Selawik	6.39	7.72	6.5%	2.854.96	4.71/5.0005
Buckland	6.65	6.44	6%	2.13-3.547	5.25/5.0005
Deering	6.90	5.92	3%	2.13-4.057	4.71/5.0005
Kivalina	6.52	6.15	2%	2.78/4.18	5.16/5.0005
Noatak	13.47	14.44	6%	8.10/10.61	7.24/10.96

NAB Electric rates July 13 2023

Community	1-750Kwh $/Kwh with PCE	Tax	1-750 Kwh Actual cost/Kwh with tax	0-750 $/Kwh No tax	750-up $/Kwh No tax	Utility Non firm power purchase rate $/Kwh 1/30/2023
Kotzebue KEA	0.2275	6%	0.24	0.3949	0.3918	N/A
Ambler AVEC	0.2627	3%	0.2705	0.8580	0.7566	0.3285
Kobuk AVEC	0.3305		0.3305	1.0967	0.9912	N/A
Shungnak AVEC	0.3305	2%	0.3371	1.0967	0.9912	0.5736
Kiana AVEC	0.2561		0.2561	0.7254	0.6199	0.3003
Noorvik AVEC	0.2543	4%	0.2645	0.6896	0.5841	0.2606
Selawik AVEC	0.2534	7%	0.2711	0.6719	0.5664	0.2405
Buckland BEC	0.2781		0.2781	0.4900	0.4900	0.2823
Deering IEC	0.4081		0.4081	0.6747	0.6747	0.3575
Kivalina AVEC	0.2535	2%	0.2586	0.6295	0.5240	0.2442
Noatak AVEC	0.3982	6%	0.4221	1.1644	1.0589	0.6615

Noatak Solar IPP

Courtesy ANRI

The Noatak Solar IPP Project

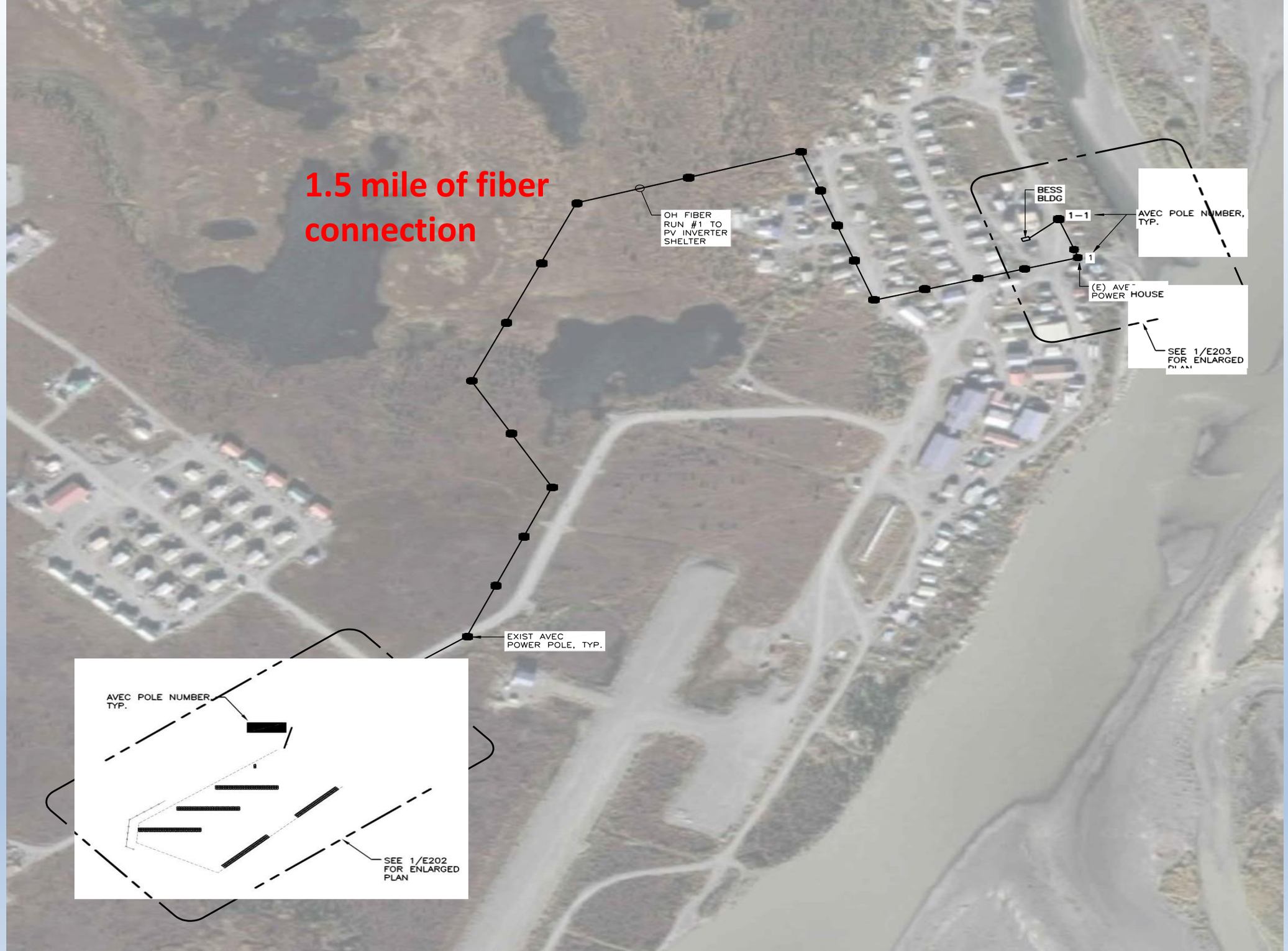
Noatak 280.6 DC/250Kw AC Kw Solar/battery PV array phase 1.
Using 432 pc Canadian solar Bifacial 650 W panels
Expansion to 380.6 Kw available for phase 2.

Kronus/Pylontech environmentally friendly LFP Battery 442Kwh
Capable of holding the to communities for 2 Hours without Generators or Solar power in the summer.
With room for expansion to Capacity 500Kw/352Kwh

Start of construction Sep 2022 and completed Aug. 2023.
Total project cost $ 2,946,886.00
Funded by DOE Tribal grant @ $ 2,008,765.00
Denali Commission $ 134,079.00
Teck (Red Dog) $ 100,000.00
NANA VEI and inkind $ 309,998.00
In-kind VIF and NAB funds $ 394,123.00

Designated area close to airport


Legend
Path Measure
Main St
Noatak Rd
30x20
fenced in
battery
building with
1- 4' gate
AVEC plant
Google Earth
Image © 2022 CNES / Airbus
N
200 ft


1.5 mile of fiber connection
OH FIBER RUN #1 TO PV INVERTER SHELTER
BESS BLDG
1–1
AVEC POLE NUMBER, TYP.
1
(E) AVEC POWER HOUSE
SEE 1/E203 FOR ENLARGED
EXIST AVEC POWER POLE, TYP.
AVEC POLE NUMBER, TYP.
SEE 1/E202 FOR ENLARGED PLAN

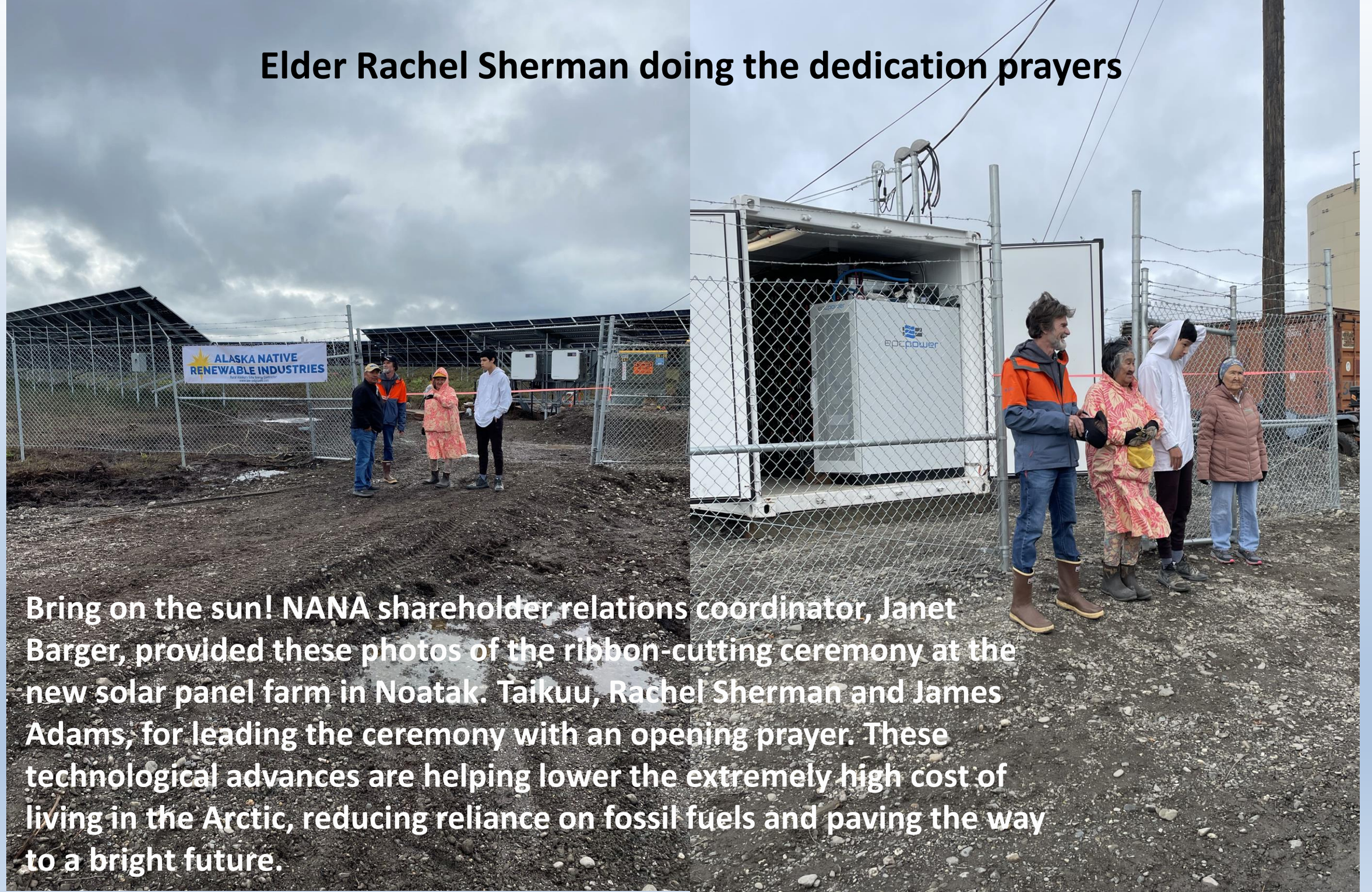

ON
OFF


PYLONTECH


epcpower
HM3A180


22G1
GROSS
OAD
CAP.

Ribbon cutting time and prayer for the Solar project

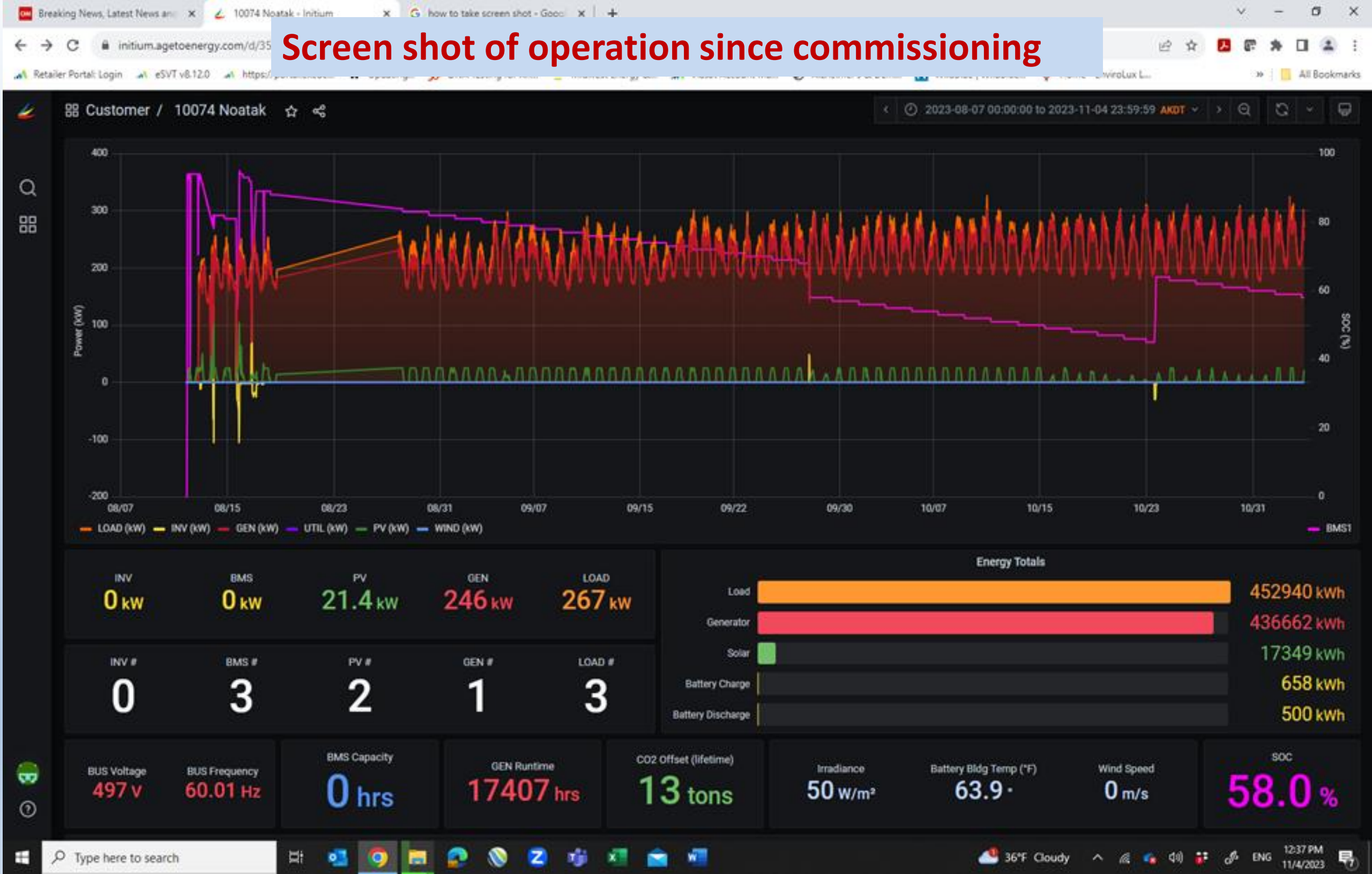


Elder Rachel Sherman doing the dedication prayers

Bring on the sun! NANA shareholder relations coordinator, Janet Barger, provided these photos of the ribbon-cutting ceremony at the new solar panel farm in Noatak. Taikuu, Rachel Sherman and James Adams, for leading the ceremony with an opening prayer. These technological advances are helping lower the extremely high cost of living in the Arctic, reducing reliance on fossil fuels and paving the way to a bright future.

And a Feast afterwards for everyone in the community Hamburgers and Hot dogs

Screen shot of operation since commissioning



Noatak Solar-Battery IPP project
Phase 1 2022-23

- **Noatak 280.6 DC/250Kw AC Kw Solar/battery PV**

- **Using 432 pc Canadian solar Bifacial 650 W panels**
- **Kronus/Pylontech environmentally friendly LFP Battery @ 442Kwh capable of holding the community for 2 Hours without Generators or Solar power.**
- **Capacity 492Kw/442Kwh with room for expansion.**
- **Inverter is an EPC 500Kw**

- **Start of construction Sep 2022 and completed end of Aug. 2023.**

- **Site clearing and 95% engineering completed as of end of October 2022.**
- **Equipment was secured during the winter for mobilization to Noatak March-April 2023.**
- **Construction and commissioning April-Aug 30th 2023.**

Noatak 280.6-380.6 Kw expansion
Phase 2 in 2024-25

- Initial Solar array size 280.6 Kw with expansion to 380.6 Kw
- Kronus Pylontech battery system – 123 kw/rack – 492 kwh 90% usable – 442 kwh
- with expansion to 738 kwh 90% = 664kwh
- Inverter is an EPC 500Kw

- This project is expected to displace 21,428 Gallons of diesel annually in phase 1.
- and 28,700 Gallons annually after phase 2 build out.

- 692,800 gallons over the 25-year life of the project.

Lessons learned

Logistics : Critical planning needed, a long way from Urban areas. Time is of the essence.

Distances : No roads, Air operation only
Budgets : Keep close account on cost and increases

Weather : Unreliable and short construction season

Community involvement : Make sure all stakeholders are involved for successful deployment and buy in.
Develop a partially local workforce to construct the system

Future Energy Projects –

Community-Wide Residential LED Lighting Upgrade

- Upgrade all residential lighting fixtures to energy efficient LED lighting
  - Survey type and quantity of lighting fixtures in all homes
  - Apply for Village Improvement Fund support
  - Procure and install energy efficient lighting
- Reduce residential electricity costs

Water Treatment Plant Upgrade

- Water treatment plant (WTP) will be reinforced or relocated due to unstable ground
  - Changes in permafrost and erosion threaten stability of WTP
  - The well is not producing enough water
  - Opportunity to prioritize energy efficiency upgrades in facility upgrade
- Energy efficient construction
- Optimize recovered heat system

New Fuel Line / Power Plant Relocation

- Construct a new fuel line from the new airport to the AVEC bulk fuel tanks
  - Flown-in fuel necessitates new fuel line from new airport
- Power plant relocation
  - Currently built on land that is eroding into the Noatak River and at risk of flooding
  - AVEC interested in relocating power plant and new bulk fuel tank siting

Thank you from The Tribal Council of Noatak, to all Noatak Solar/Battery IPP Partners

NANA

TECK

ALASKA NATIVE RENEWABLE INDUSTRIES

ageto

Deerstone Consulting

AVEC
ALASKA VILLAGE ELECTRIC COOPERATIVE

DAYLIGHT ENERGY SERVICES

The Road to the development of

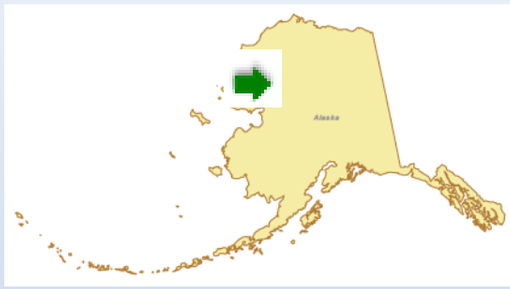
Northwest Arctic Independent power producers (NWAIPP)

Buckland Solar arrays, Courtesy NANA

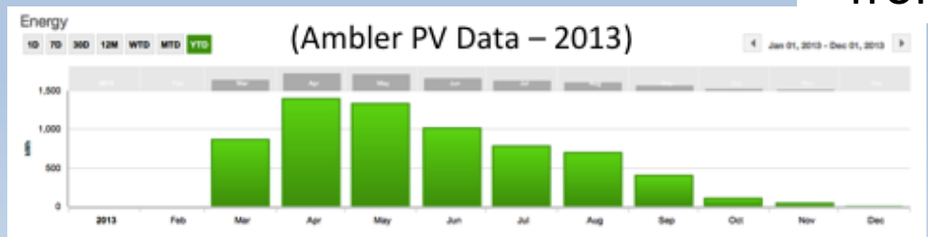
IPP

SUSTAINABLE ALTERNATE ENERGY DEVELOPMENT IN NWAB

2012-2013 NAB Synergy project



- Borough population: 7,810
- Electricity for village water / sewer plants
- Launched in Ambler, replicating across borough
- 10,000 kWh/year from 10 kW array
- Peak production April-July
- Long sunlight hours in summer + 30% reflection from snow-covered ground in spring



Powering water treatment facilities with renewable energy

Photos: Northwest Arctic Borough

Approximate minimum value per year of behind the meter Solar projects at NAB Water plants due to PCE. Based on actual value for consumer.

	Installed Kw	Production Kwh	Value/Kwh	Value Peryear
Ambler	8.4	8400	0.2547	$2,139.48
Kobuk	7.38	7380	0.2505	$1,848.69
Shungnak	7.5	7500	0.2555	$1,916.25
Noorvik	12	12000	0.2422	$2,906.40
Noatak	11.27	11270	0.2669	$3,007.96
Deering	11.13	11130	0.3575	$3,978.98
Kotzebue-1	10.53	10530	0.2180	$2,295.54
Kotzebue-2	10.53	10530	0.2180	$2,295.54
Selawik	9.72	9720	0.2478	$2,408.62
Kivalina	10.53	10530	0.2363	$2,488.24
Kiana	10.53	10530	0.2318	$2,440.85
Buckland	10.53	10530	0.2823	$2,972.62
Total	120.05	120,050		$30,699.17

Total Estimated savings per year

$ 30,699.17

However the production is invisible to the utility, and no PCE is collected for it from AEA.

Possible available funding for Solar projects under IPP management per year

Community	Installed Kw	Production Kwh	Behind meter PCE value / Kwh	Avoided Diesel rate $/Kwh	Value under IPP Management $/Kwh
Shungnak Ut	233	200,000	$51,100.00	0.5059	$ 108,180.00
Noatak Ut	275	250,000	$66,725.00	0.5518	$ 137,950.00
Noorvik Ut	23.4	23,400	$5,667.48	0.2510	$ 5,873.40
Deering Ut	48.5	48,500	$17,338.75	0.3500	$ 17,338.75
Buckland Ut	45.99	45,000	$12,703.50	0.2823	$ 12,703.50
Total	625.89	566,900	$ 153,534.73		$ 282,045.65

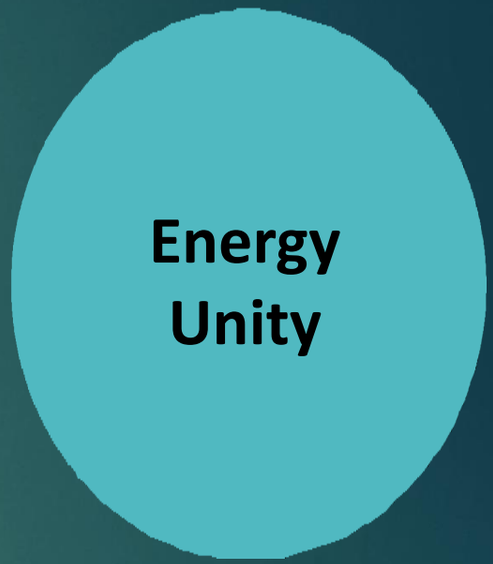
So why develop Independent power producers

- The Communities taking control of their Energy future, creates buy in and good relationships with the utility.
- Being able to sustain PCE support to the communities and stabilize energy cost.
- Better economics
- Funding collected pays for further development and local workforce expertise The money stays in the community instead of sending the money to far off countries.
- Circular economy sovereign

Energy Justice Or Sovereignty

Reasons for Regional approach

- *Regional* support to apply for and manage Energy grants, including access to Dept. of Energy and other funding.
- Economy of Scale and Increasing Efficiency
- (Small, single projects are too expensive).
- Develop Regional Energy infrastructure:
- Wind, Solar, Hydro, Interties, bulk fuel storage & direct Household involvement.



- Admin help for Independent power producers (IPP's) for PCE calculations, utility rates & billing.
- Job Creation - Workforce Development and Training/Capacity building.
- The Region speaking with one voice. Can advocate on behalf of PCE and State wide Energy Policy.
- This is needed to stop the increasing cost of Energy and hedge against fuel increases and supply disruptions.

Shungnak-Kobuk Solar-Battery IPP example 2021

- A Grant opportunity from USDA HECG was secured by the 2 Tribes by allowing NAB to apply on behalf of the Communities.
- The communities are interconnected with a power line so the proposed Solar project benefits both.
- Through an MOA a working agreement was executed between
- the 2 tribes to become an IPP (independent power producer)
- A power purchase agreement was executed with AVEC.
- AVEC pays for the Solar power and recover the cost partly
- from the PCE fund.
- Another MOA was executed with NAB for help with admin and investment of funds.
- An Investment Energy fund was established for the communities.
- Funds are dispersed as needed for insurance and maintenance and eventual further build-out of the Solar array.

The Shungnak_Kobuk Solar IPP Project

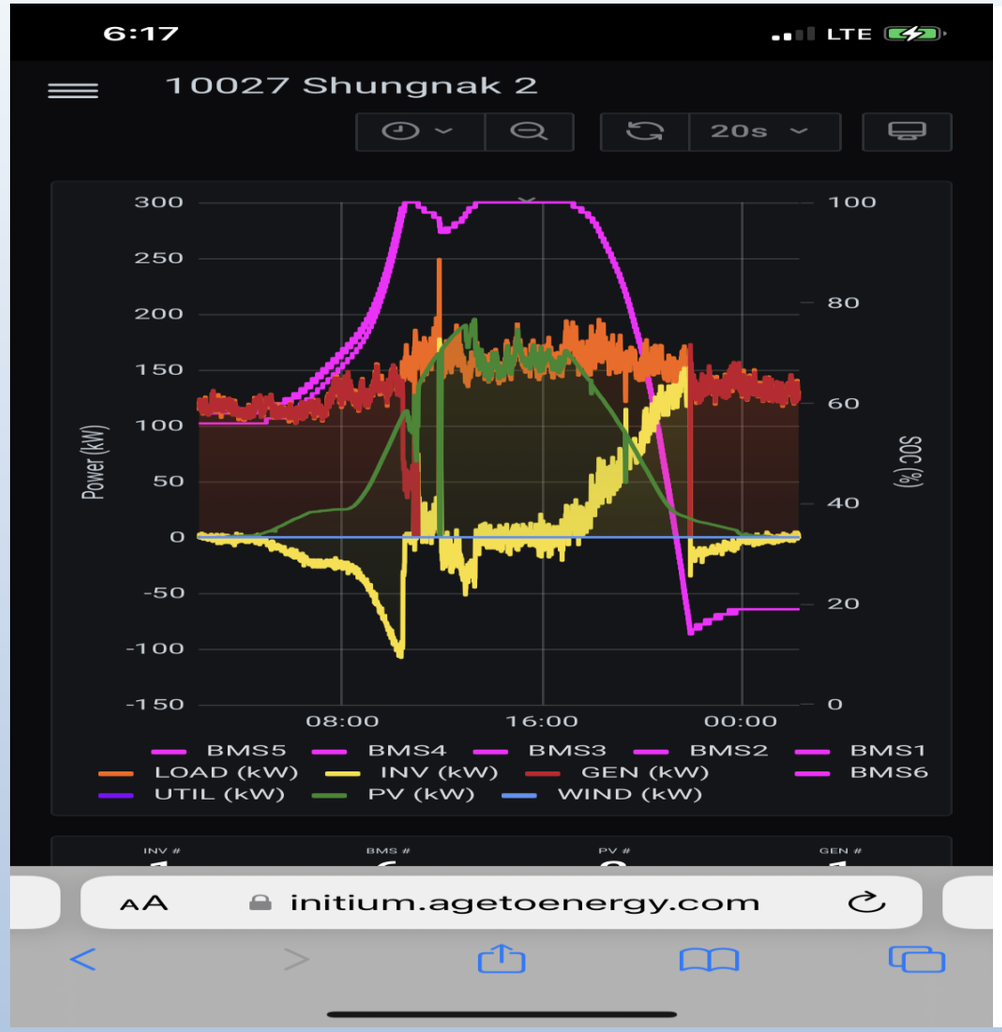
Shungnak-Kobuk 223.5 Kw Solar/battery PV array.
Using 550pc Bifacial 405W panels

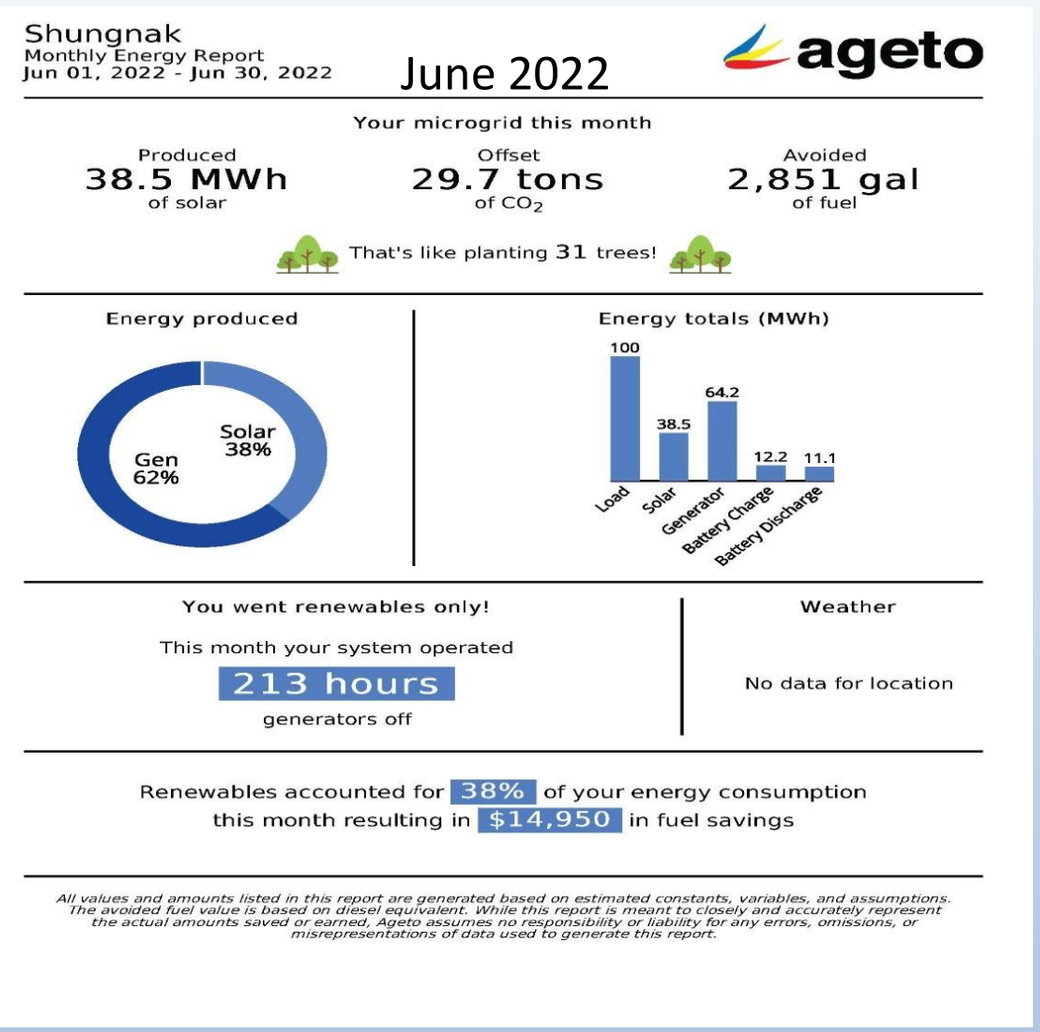
Blue Planet environmentally friendly LFP Battery.
Capable of holding the to communities for 2 Hours without Generators or Solar power.
Capacity 250Kw/352Kwh

Start of construction April 2021 completed Sep 2021.

Total project cost $ 2,363,215.11

Funded by USDA HECG @ $ 1,291,675.00
In-kind VIF and NAB funds $ 1,071,540.11





- **As of end of Sep. 2023, since commissioning in Sep. 2021.**
- **405 Mwh of electricity have been generated**
- **Equal to about 29,500 Gallons not needed & 300 Tons of CO2 offset**
- **Together with a total of 1452 Hours of Diesel/off operation. Equal to just about a Month and 1/2 of clean energy**

Shungnak Yearly financials FY22

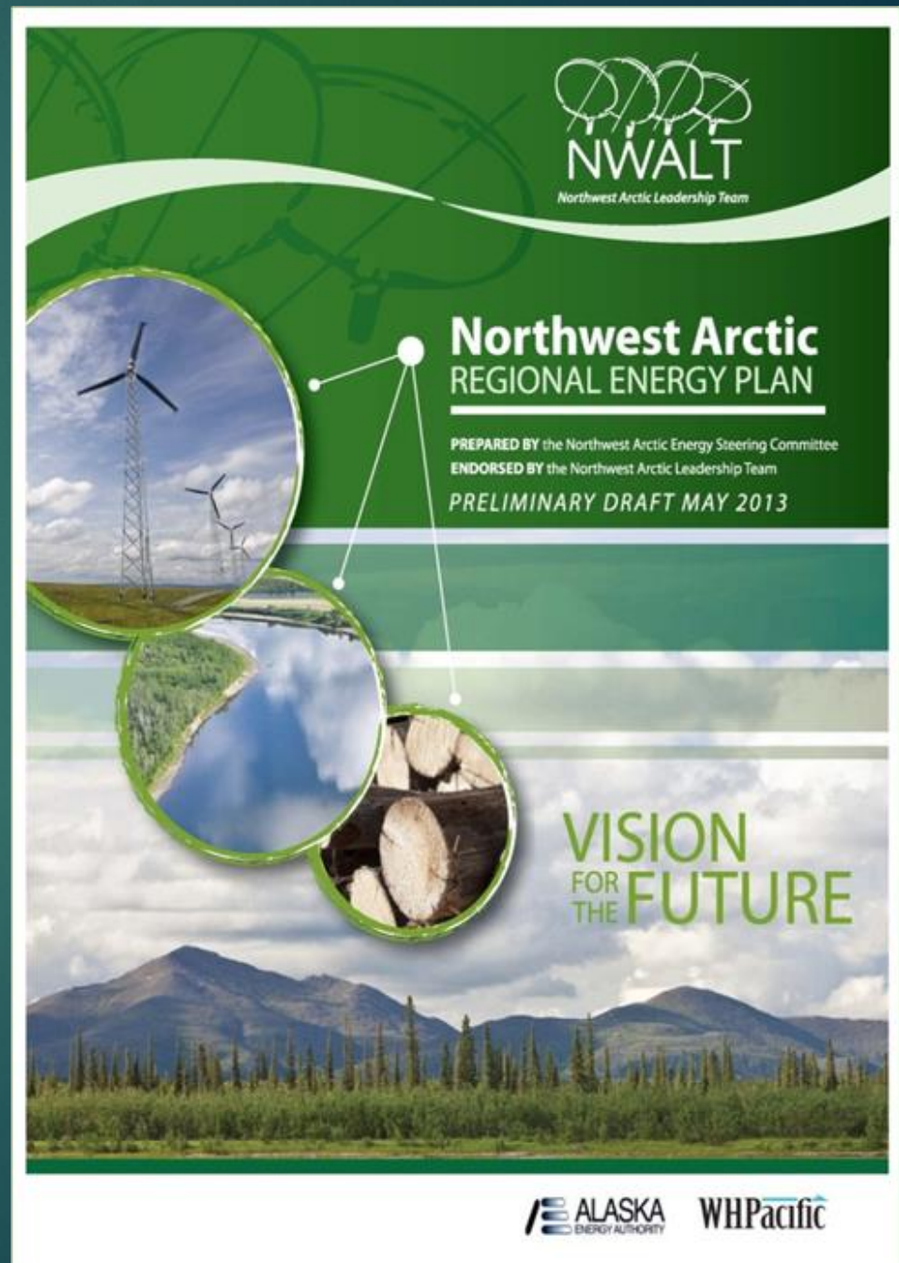
Estimated Gross Annual Revenue	$120,000.00
Insurance	$3,771.32
Electric	$1,958.05
Ageto service fee	$3,242.28
Tribe Employee	$8,683.44
Fuel	$3,150.00
Total Estimated Expenses	$20,805.09
Estimated Net Income	$99,194.91
Estimated Administrative Fee (10% Annual Net)	$9,919.49
Annual Income Less Admin Fee	$89,275.51

“Energy is our most precious resource, for it is the means by which we transform our creative potential into meaningful action.” Tarthang Tulku

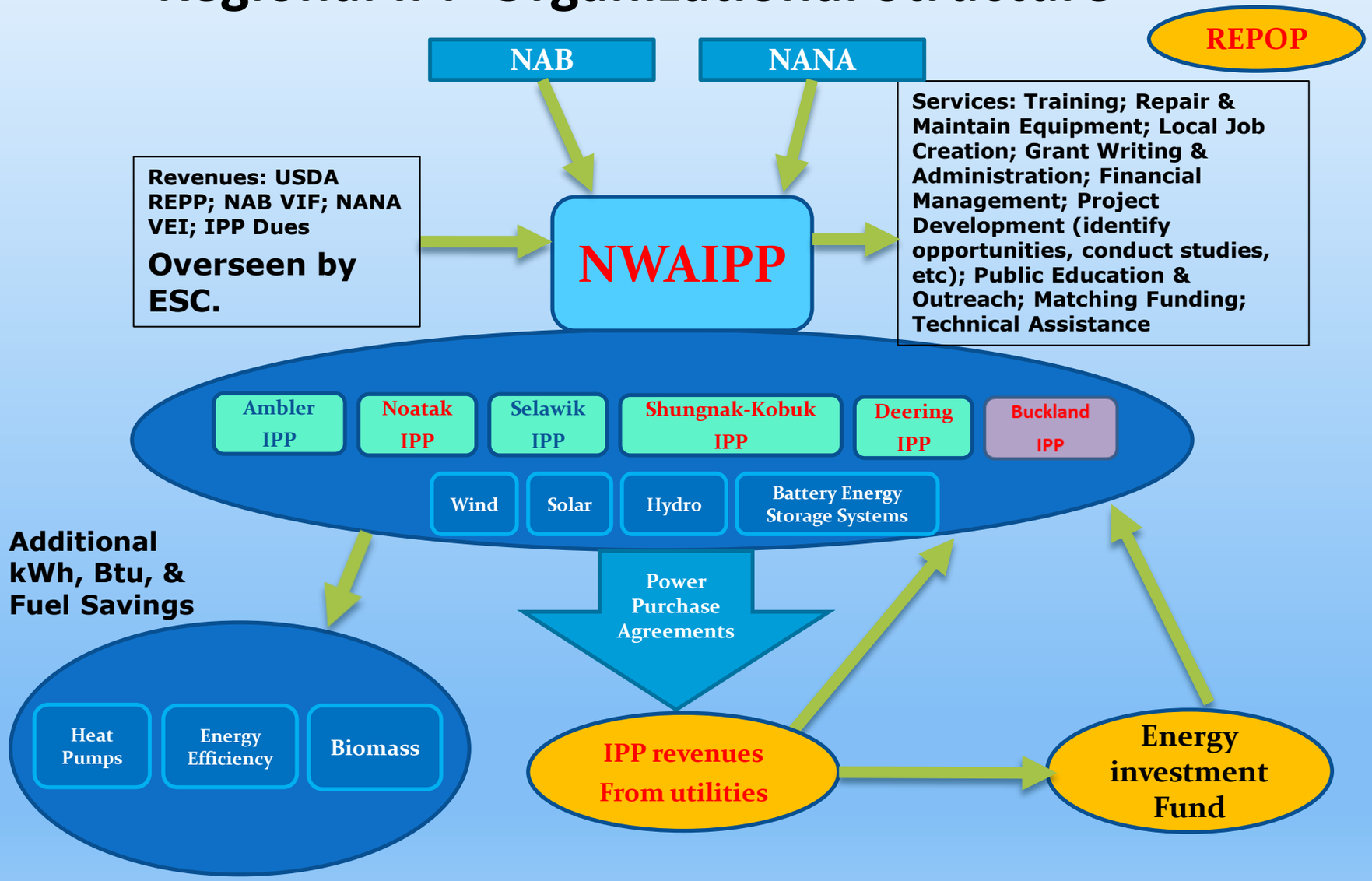
The Energy Plan & Management

Built on the success of the Regional Energy Steering Committee, the IPP's will be overseen by an executive board of Directors, one each from the regions Communities and Stakeholder entities that will meet twice a year to ratify the Regional Energy plan.

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.
And to combat rapid climate change due to greenhouse gas emissions like Co2, Methane and other harmful effects of fossil fuel usage.



Regional IPP Organizational Structure



Estimated Solar IPP production per year at full build out of all communities.

Community	Total			Total	Utility Non-Firm Power Purchase	Estimated IPP Annual Revenue
	Solar PV	BESS	Combined	Diesel offset		
	kW	MW	MWh/year	Gallons/year	$/kWh	$
Ambler	400	1	360	25,714	$ 0.3949	$ 142,164
Buckland	450	1	405	28,929	$ 0.2823	$ 114,332
Deering	250	0.5	225	16,071	$ 0.2733	$ 61,493
Kiana	400	1	360	25,714	$ 0.2733	$ 98,388
Kivalina	450	1	405	28,929	$ 0.2442	$ 98,901
Noatak	550	1	495	35,357	$ 0.6682	$ 330,759
Noorvik	550	1	495	35,357	$ 0.2507	$ 124,097
Selawik	500	1	450	32,143	$ 0.2053	$ 92,385
Shungnak-Kobuk	500	1	450	32,143	$ 0.6138	$ 276,210
TOTALS	4050	8.5	3645	260,357		$ 1,338,728
Kotzebue KEA	**966**	**8**	**950**	**67,857**	**$ 0.2321**	**$ 220,495**
Total Region	**5,016**	**16.5**	**4,595**	**328,214**		**$ 1,559,223**

A Dream you dream alone is only a dream.
A dream you dream together is reality. Yoko Ono

Cosmos Hills Hydro Project

Kogoluktuk River falls a possible Hydro project for future development

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AVEC CEO
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Credits to :
NANA ; Sonny Adams
Deerstone Consulting; Brian Hirsch
ANRI ; Edwin Bifelt

Thank You DOE