The Road to the development of

Northwest Arctic Independent power producers (NWAIPP)

Buckland Solar arrays, Courtesy NANA

IPS Cordova 2022

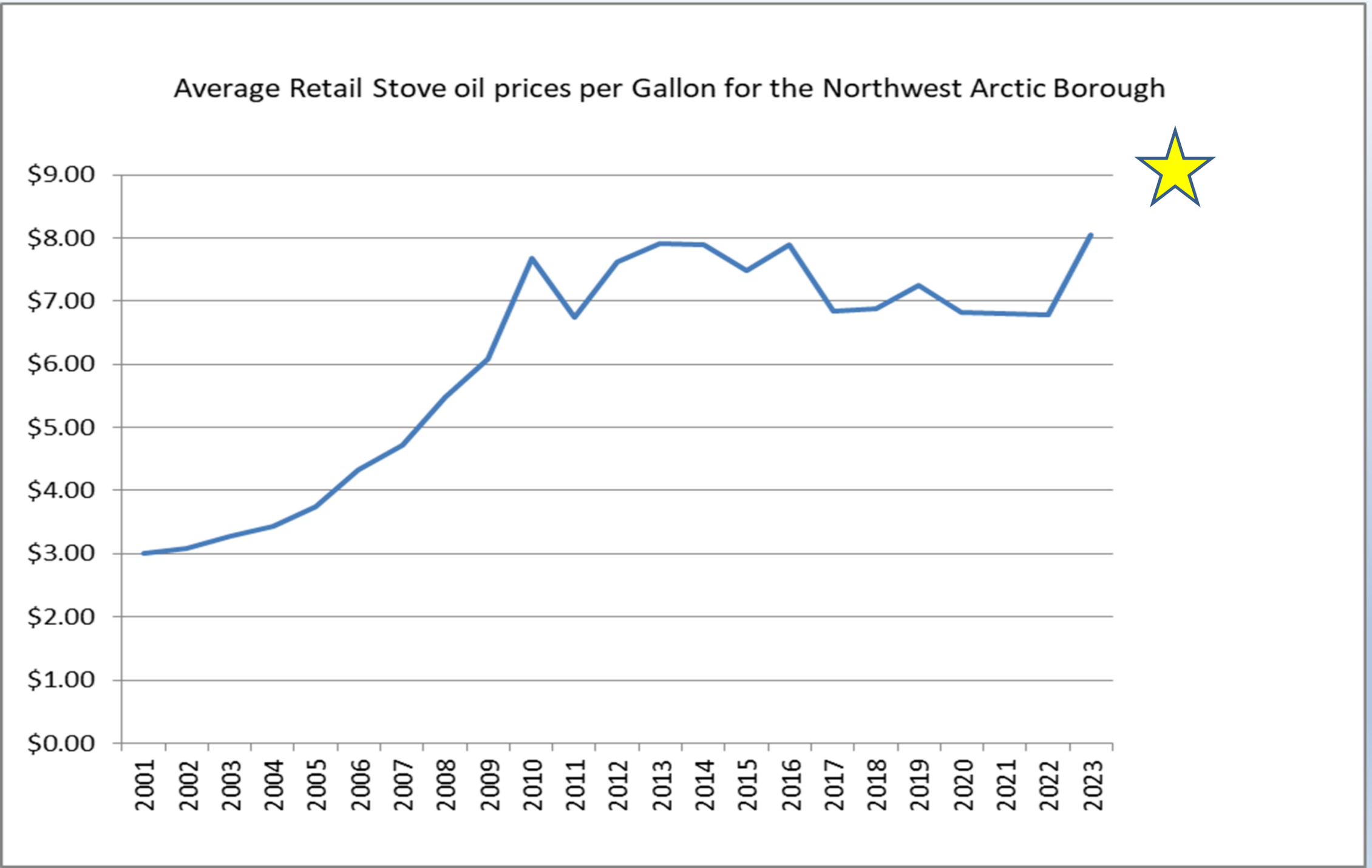
SUSTAINABLE ALTERNATE ENERGY DEVELOPMENT IN NWAB


Red Dog Mine
Kivalina River
Noatak River
Kivalina
Noatak
Northwest Arctic Borough
Kobuk River
Ambler
Kiana
Shungnak
Kobuk
Kotzebue
Noorvik
Kotzebue Sound
ARCTIC CIRCLE
Selawik
Selawik River
Deering
Buckland
Buckland River
30 miles

Some background

Crude oil prices over time

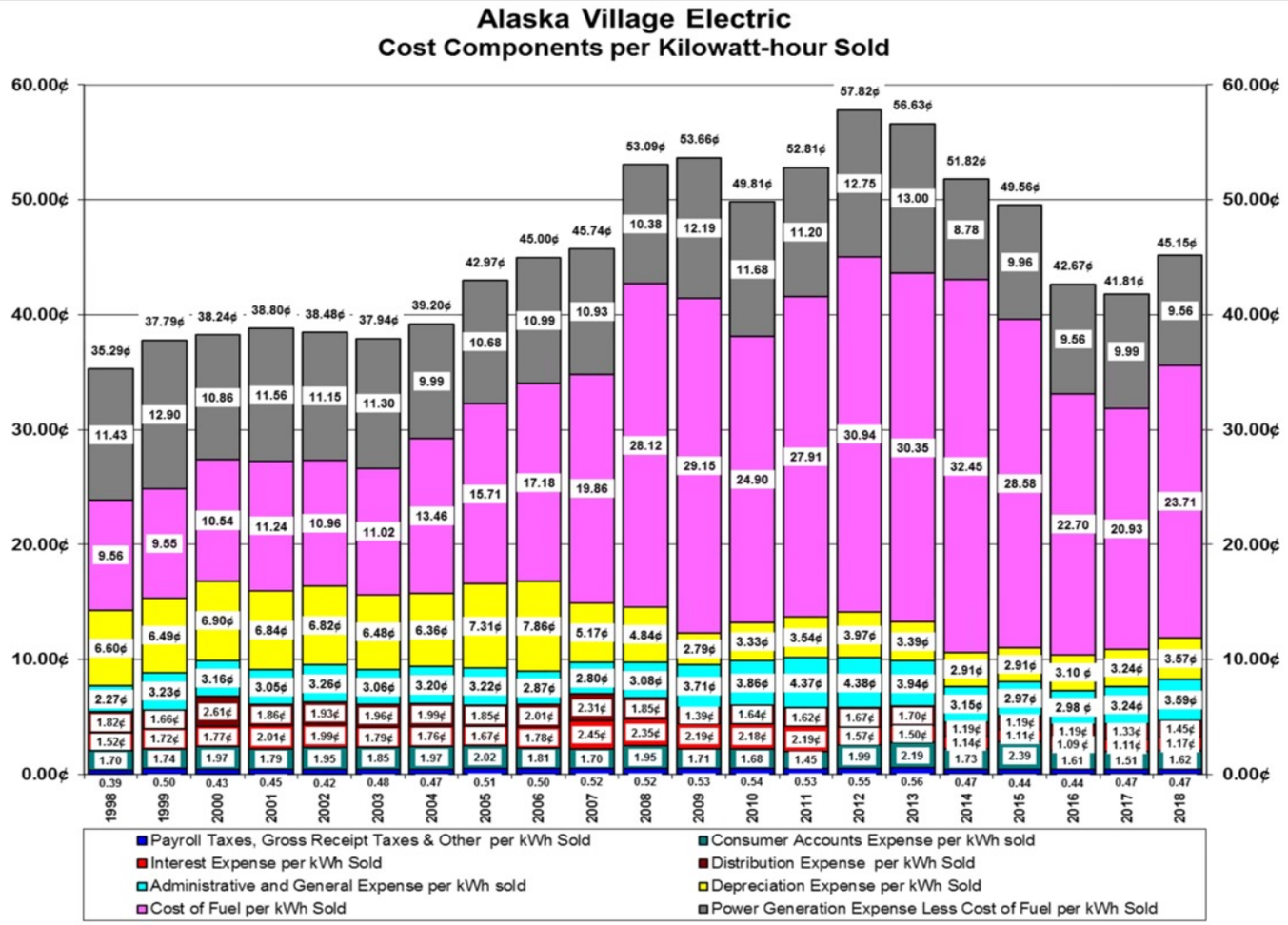
source: tradingeconomics.com


Average Retail Stove oil prices per Gallon for the Northwest Arctic Borough
$9.00
$8.00
$7.00
$6.00
$5.00
$4.00
$3.00
$2.00
$1.00
$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

Data from AVEC operations corroborate the cost increase by the fuel component in operations

Fuel cost increase over time (Curtesy AVEC)

Click to save a picture to your desktop.



Fuel prices (tax included on retail) July 2022

Community	Gasoline $/G Retail	Stove oil $/G Retail	Sales Tax included	Util. & AVEC Cost $ Barge/Air FY2022- FY2023	NWABS Cost $ FY2022- FY2023
Kotzebue KIC	8.04	8.60	6%		2.75-4.54
Kotzebue Vitus	8.09	7.57	6%		
Kotzebue Crowley	6.81	6.74	6%		
Ambler	14.42	14.42	3%	4.49 /7.31	4.06-6.07
Kobuk	10.82	10.82	3%	N/A	4.06-6.07
Shungnak	8.42	8.42	2%	5.45 / 9.46	4.06-6.07
Kiana	6.69	6.19	3%	2.82	2.68-4.71
Noorvik	5.20	5.64	4%	2.96	2.68-4.71
Selawik	6.39	7.72	6.5%	2.85	2.68-4.71
Buckland	6.89	6.36	6%	2.13-3.547	2.89-5.25
Deering	4.00	4.65	3%	2.13-4.057	2.68-4.71
Kivalina	5.23	4.56	2%	2.78	2.68-5.16
Noatak	13.77	13.77	6%	17.50Air	7.24

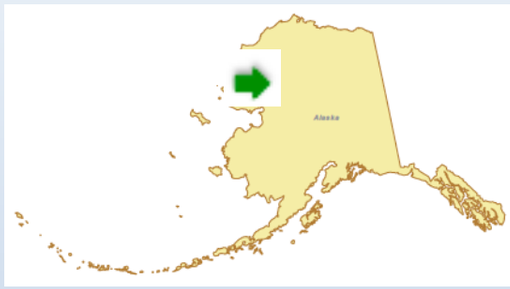
NAB Electric rates July 2022

Community	1-500 $/Kwh	Tax	1-500 Kwh Actual cost/Kwhwith tax	501-700 $/Kwh No tax	700-up $/Kwh No tax	Utility Non firm power purchase rate $/Kwh 7/1/2022
Kotzebue	0.2057	6%	0.2180	0.3412	0.3412	N/A
Ambler	0.2473	3%	0.2547	0.8198	0.7198	0.3714
Kobuk	0.2505		0.2505	0.6776	0.7842	N/A
Shungnak	0.2505	2%	0.2555	0.6776	0.7842	0.4670
Kiana	0.2318		0.2318	0.5083	0.4083	0.1557
Noorvik	0.2329	4%	0.2422	0.5309	0.4309	0.1685
Selawik	0.2316	7%	0.2478	0.5058	0.4058	0.1433
Buckland	0.2823		0.2823	0.4900	0.4900	0.2823
Deering	0.3575		0.3575	0.6747	0.6747	0.3575
Kivalina	0.2317	2%	0.2363	0.5063	0.4063	0.1552
Noatak	0.2518	6%	0.2669	0.9093	0.8093	0.4868

Local Harvest of alternate Energy is available

So far our alternate energy projects have hedged against rising cost of diesel fuel and stabilized cost some, but have failed to bring down the cost of electricity for the households due to the loss of PCE.

2012 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

Deering WP

After a year we knew what we had 10 Mwh from a 10 Kw array

Status

4

MEDIUM

Power Right Now

-- kW

Energy Generation

TODAY	LIFETIME
0.0 kWh	10.0 MWh

Yahoo! Weather
near Deering, AK United States

26 °F
Cloudy

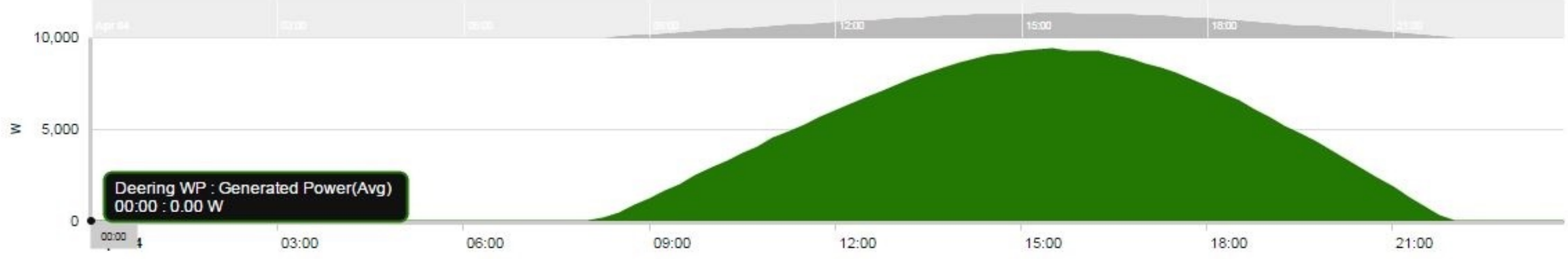
Atmosphere
Humidity: 85%
Pressure: 2.43 '
Visibility: 6.00 mi

Wind
Speed: 22.00 MPH
Direction: 50

Power

1D 7D 30D 12M WTD MTD YTD

Apr 04, 2015 - Apr 04, 2015



Modules

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

	Installed Kw	Production Kwh	Value/Kwh	Value Per year
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	PCE value / Kwh	Avoided Diesel rate $/Kwh	Value under IPP Management $/Kwh
Shungnak Ut	233	200,000	$51,100.00	0.4670	$ 93,400.00
Noatak Ut	275	250,000	$66,725.00	0.4868	$ 121,700.00
Noorvik Ut	23.4	23,400	$5,667.48	0.1685	$ 3,942.90
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
KEA Ut	566	530,000	$115,540.00	0.1607	$ 85,171.00
Total	237.94	227,940	$ 269,074.73		$ 334,256.15

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 in renewable Energy production.

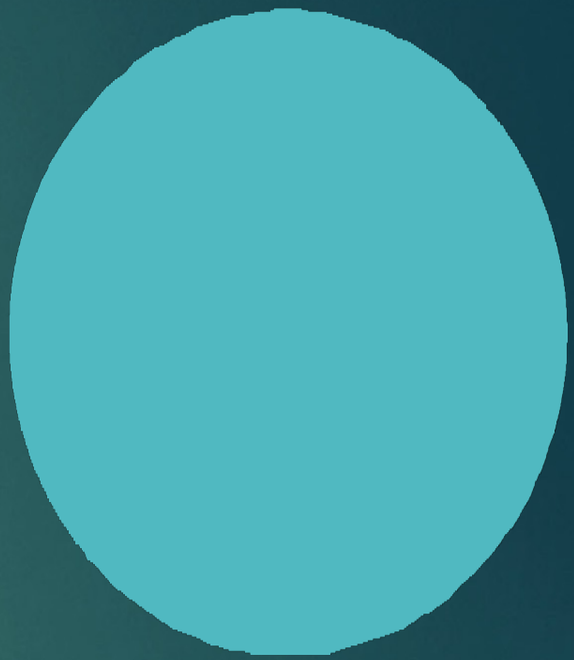
Reasons for Regional approach to Alternate Energy Development

- *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.
- This is needed to lower the increasing cost of living and hedge against fuel increases and supply disruptions.



Steps 2020-21

- Funding from BIA-TEDC (Kiana Tribal grant) covered research through 2020, which included the financial spreadsheets and foundational (legal) documents for participants to consider.

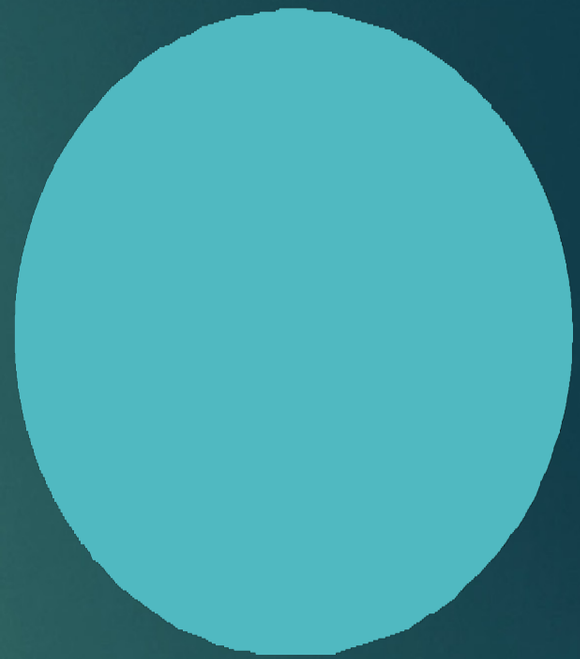
- Estimated timeline for formation;
  - With decision by NAB & NANA leadership the stakeholder engagement started during 2020 with an initial Energy Steering Committee meeting
  - Jan-May 2021 Finished formation documents for IPP pilot project in Shungnak & Kobuk, Deering, Buckland & Noorvik.
  - By the end of 2021 had at least one IPP operational.

Operational differences NWAIPP versus Coop

Northwest Arctic Independent power producers (NWAIPP)	Traditional COOP
Different kind of members allowed. NANA, IRA's, Cities, Independent Power Producers, etc. Modeled on the Energy Steering Committee.	All members are the same (ex. Individual Households)
Debt and Liability can be separated out and assigned to individual projects; entire membership is NOT burdened with individual project debt but can leverage larger group to borrow $$	Debt and Liability shared equally among all members and can NOT be separated
Allows for membership of Independent Power Producers (IPPs) to develop renewable energy and sell back to the grid, preserving Power Cost Equalization payments.	**IPP's cannot be a member of a utility Coop; PCE payment is not preserved when renewable energy production is part of grid operation**
Can support different energy-related activities within the region, such as bulk fuel buying, energy training, equipment maintenance, electricity production	Cannot support different energy-related activities selectively Everyone have to have the same opportunity and share in liability.
Equipment and liability insurance can be separated out for each individual project, not burdening entire membership	Equipment and liability insurance are based on entire coop's assets.

Key Conclusions

- Without the Regional approach we cannot successfully implement Independent Power Production (IPP's)
- We are missing out on approximately $ 334,000.00/year that could be collected implementing IPP's under a joint operation like the Northwest Arctic Independent Power producers.
- Additionally the approach allows for small Fuel Coops to exist under the umbrella structure.
- NAB involvement provide the assurance that financial benefits will be distributed appropriately



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 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 Project

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

Blue Planet environmentally friendly 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

Construction 2021

One week in March

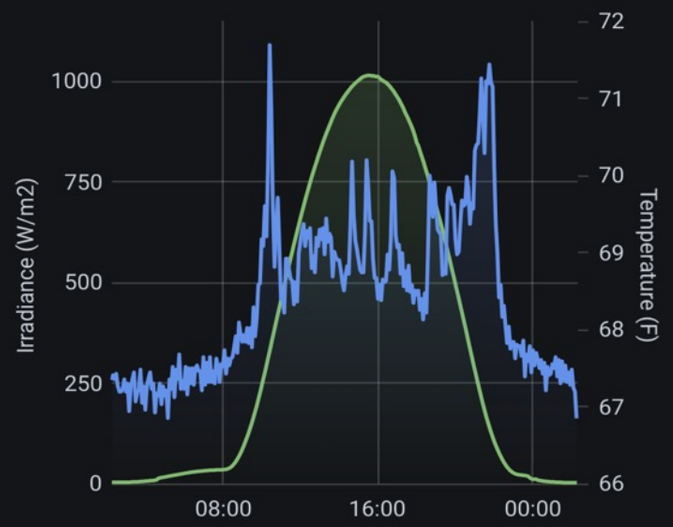
6:17 LTE

10027 Shungnak 2

20s

	min	max	avg	current
PV1	0	96.9	34.5	0
PV2	0	95.2	34.6	0

Irradiance and Temperature



	min	max	av
Irradiance (W/m2)	2.0	1015.1	36
Battery building temp (F) (right-y)	66.8	71.7	6

AA initium.agetoenergy.com

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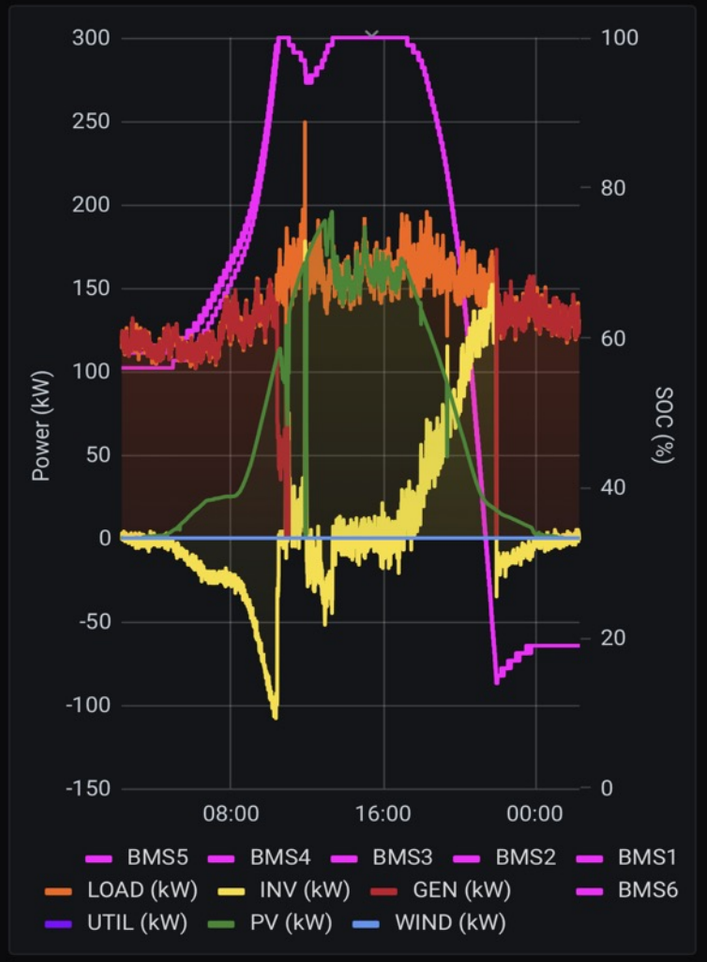
20s



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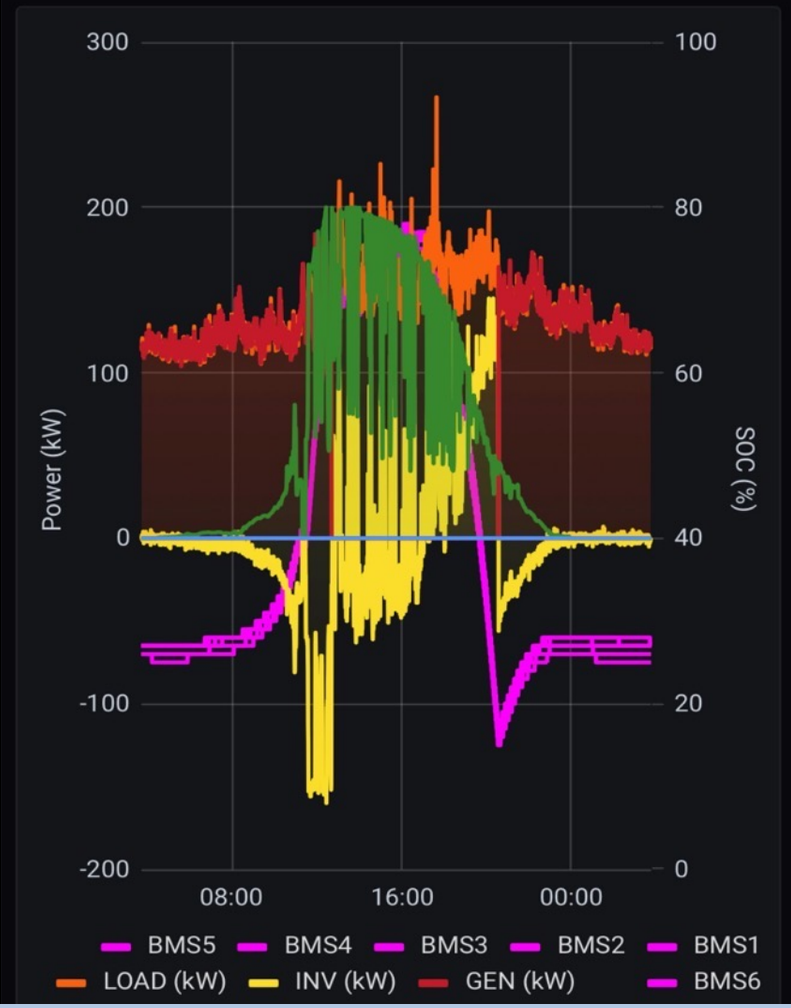
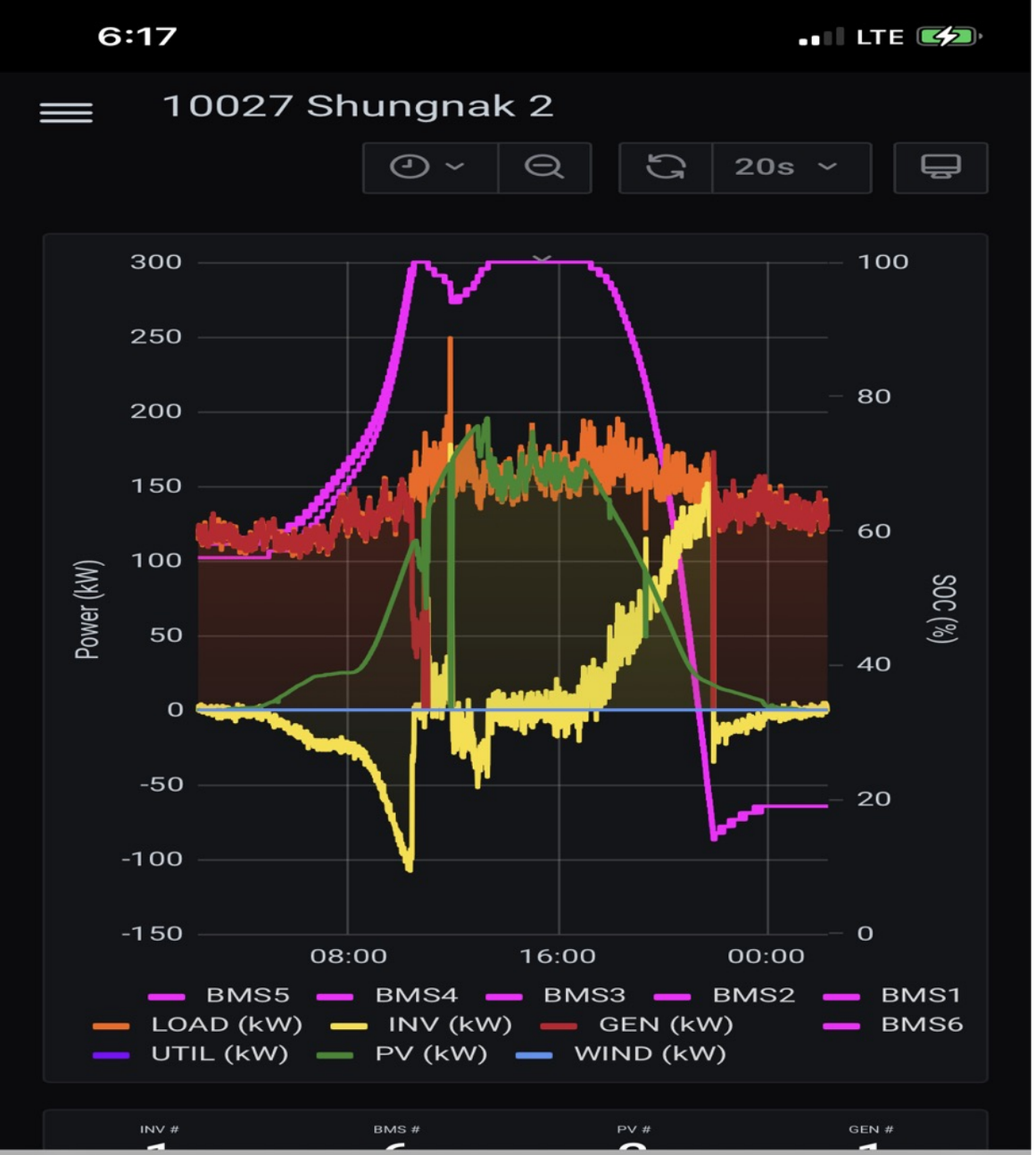
10027 Shungnak 2

20s





Shungnak

Monthly Energy Report
Jun 01, 2022 - Jun 30, 2022

June 2022

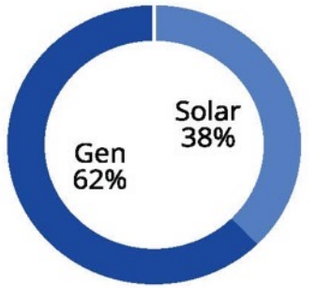
ageto

Your microgrid this month

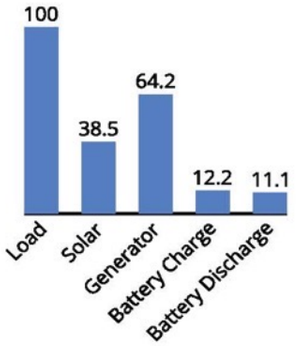
Produced	Offset	Avoided
38.5 MWh	29.7 tons	2,851 gal
of solar	of CO_2	of fuel

That's like planting 31 trees!

Energy produced



Energy totals (MWh)



You went renewables only!

This month your system operated

213 hours

generators off

Weather

No data for location

Renewables accounted for **38%** of your energy consumption this month resulting in **$14,950** in fuel savings

All values and amounts listed in this report are generated based on estimated constants, variables, and assumptions. The avoided fuel value is based on diesel equivalent. While this report is meant to closely and accurately represent the actual amounts saved or earned, Ageto assumes no responsibility or liability for any errors, omissions, or misrepresentations of data used to generate this report.

Questions in the works for Shungnak-Kobuk IPP.

- How do we capture the heat from the Battery
- and the Inverters ?

&

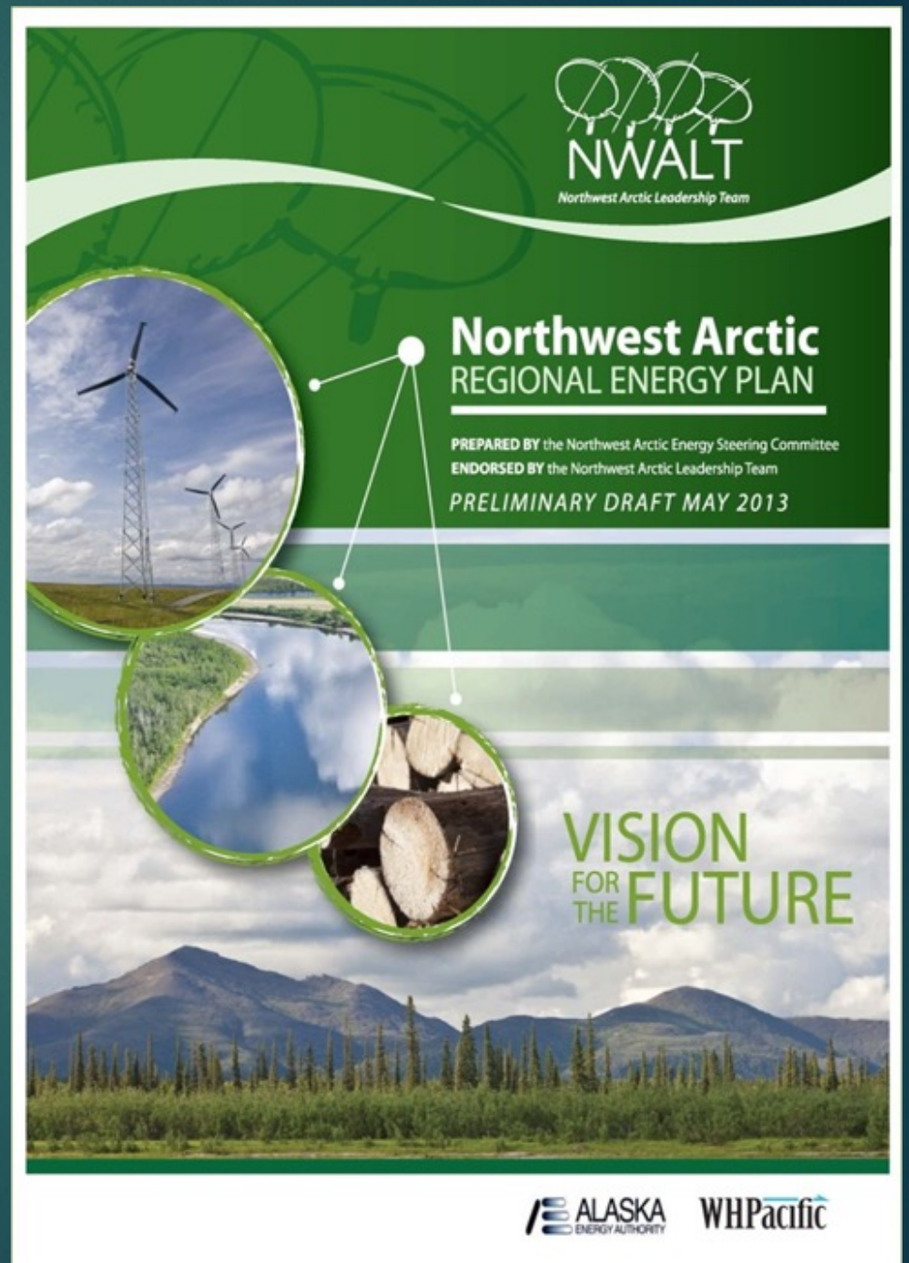
- In relation to the communities load
- what is the optimum configuration of;
- Solar PV size
- Battery capacity
- Max Diesel off time
- Cost of equipment

- And what is Diesel off worth / Hour ?

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.



Going forward

- **Continue with build out of Solar/Battery IPP's for all communities, approximate average cost per community needed is $ 2.8 Mil**

- **Continue working with communities that have wind resources to possibly fund Wind turbines in Noorvik, Selawik and Kivalina.**

- **Continue working on a solution for an**
- **Electrical Intertie between Ambler and Shungnak**

- **Together with all Stakeholders in the upper Kobuk investigate the possibility of developing the Kogoluktuk hydro potential for electric power for Kobuk, Shungnak and Ambler.**

- **Continue to evaluate the use of Heat-pumps for energy efficiency in space and water heating applications.**

Proposed DC underground Intertie to Ambler


Kogoluktuk River 6 miles from Kobuk
Arctic Dreams can come true

It’s not the Smartest or the Strongest that survive, It’s the one that adapt that survive. C. Darwin

Questions ?

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