

MAKING
GEOTHERMAL
PENCIL
OUT



“There is nothing more powerful than an idea whose time has come”

- French poet and author Victor Hugo



Construction

OCCP has been building a road to the drill site and obtaining necessary permits. The City of Unalaska has begun upgrading the distribution grid to handle the full load of the proposed geothermal plant.



PPA Signed / Amendments

PPA signed on August 31, 2020. Amendment's 1 & 2 gave OCCP an additional year to obtain financing and achieve commercial operation, respectively.



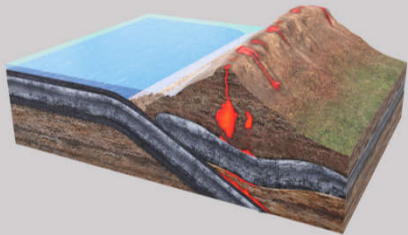
PPA Negotiations

City of Unalaska and OCCP negotiated from January to August 2020 to finalize a Power Purchase Agreement (PPA)



Missing Piece Found

Attempts to develop the Makushin geothermal resource have been on-going since the early 1980's. OCCP was able to pull all the pieces together by acquiring land rights.

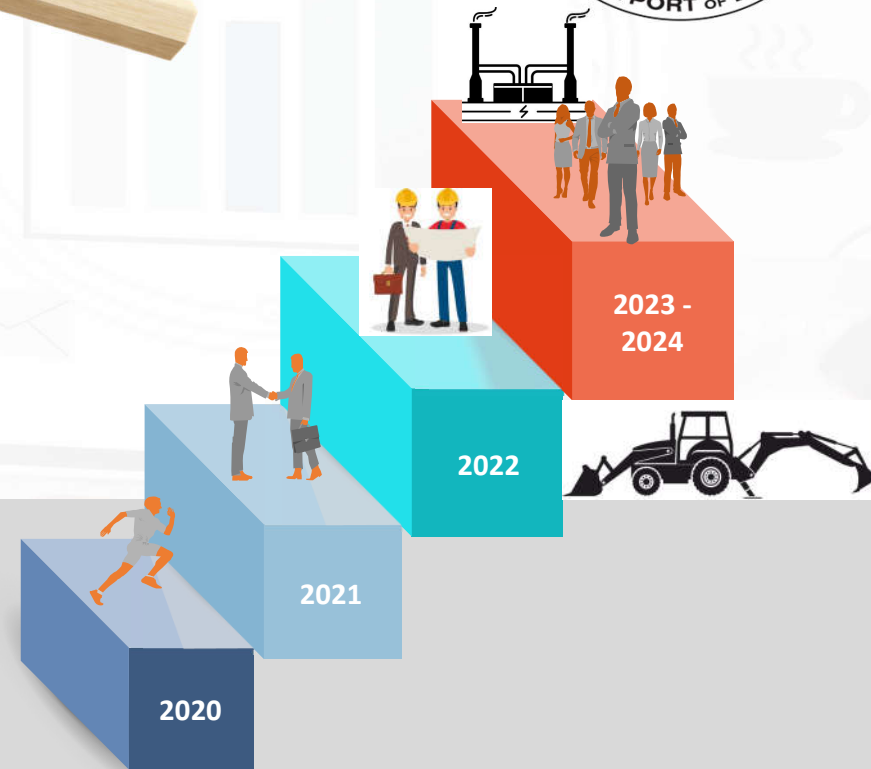


Five Year Action Plan



Overview

- Take a closer look at actions taken to date
- Review other milestones in the years ahead
- Keeping in mind the Four Pillars for Increasing Clean Energy Usage – Technology, Funding, Policy, and People



Our **Value Proposition** is to Support Economic Growth

“Value Proposition” is a marketing term that refers to a promise of value to be delivered, communicated, and acknowledged. For example, McDonald’s value proposition is food of a constant quality served quickly and consistently across the globe.

Year 1 – Establish a Foundation



01

Technology

- OCCP worked on Feasibility Phase.
- OCCP completed summer field work in support of permitting and engineering definition.
- OCCP issued RFP to technology providers.
- OCCP commissioned an Air Source Heat Pump Study within one month of executing the Power Purchase Agreement.
- City issued PO #21400004 to EPS on September 16, 2020 to perform integration study.

02

Funding

- OC advanced funds to OCCP to allow summer field work.
- City began developing a capital project in the CMMP to fund the City portion of the upgrade and integration costs.
- OCCP began financing review and application process.

03

Policy / Process

- City and OCCP signed a Power Purchase Agreement on August 31, 2020. City agrees to pay \$16.3 million annually for 30 years (1% increase per year = \$22 million payment in year 30).

04

People

- Formed a working group for interconnection/integration plan development



Year 2 – Finetuning the Agreement



01

Technology

- EPS issued a Geothermal Plant Electrical Intertie Study Interim Report on April 15, 2021 identifying critical projects needed to connect to the proposed geothermal plant.
- The City and OCCP entered into a Memorandum of Agreement on July 15, 2021 outlining the cost sharing on the needed distribution upgrades required.
- OCCP conducted summer field work involving permitting and road construction.
- OCCP chose Ormat Technologies as their technology provider for the geothermal plant.
- OCCP issued a RFP for the submarine cable for East Channel crossing and from Broad Bay to Unalaska.

02

Funding

- OCCP Submitted their project finances to the Regulatory Commission of Alaska in February, 2021.
- OCCP formally requested a one year extension to obtain financing on February 25, 2021.
- City granted financing extension from June 10, 2021 to requested June 10, 2022 with PPA Amendment #1.
- Qawalangin Tribe applied for IRT support for the geothermal plant road construction.
- OCCP made first payment of \$150,000 to the City on September 1, 2021 towards needed grid improvements.
- OCCP learns they have qualified for Phase II of DOE funding application on September 10, 2021.
- With funding in place, City begins issuing purchase orders for engineering studies and long lead time items.

03

Policy / Process

- PPA Amendment #2 extended commercial operation deadline to May 31, 2025

04

People

- DOE Department of Indian Energy commissioned a study of the socioeconomic impact of geothermal power on Unalaska. The City, OCCP, and areas businesses have been answering structured data requests to assist with the study.



Year 3 – Time to Build!



01

Technology

- Both City and OCCP will be busy with equipment procurement and construction.
- With funding in place, final details on Ormat geothermal plant integration are worked out.
- City teams with DOE National Renewable Energy Lab to perform feasibility studies on electrofuels and other technologies to advance Unalaska to carbon neutral.
- City begins upgrading the distribution backbone to accommodate the increased loads.

02

Funding

- Deadline for OCCP to obtain project funding under PPA is June 10, 2022.
- Year two of City CMMP spending
- City seeks grant funding to implement new technologies.

03

Policy / Process

- Necessary easements will be established for cable landings and new service connections.
- City will research impact of intermittent interruptible power rates.

04

People

- With project funding secured, City will increase marketing efforts to self-generators.
- Hopefully can emphasize positive results from DOE socioeconomic study to increase acceptance.



Years 4 & 5 – Continued Built Out



01 Technology

- City will work closely with OCCP to ensure our distribution network is upgraded sufficiently to accept the full 30 MW output of the geothermal plant in advance of the May 31, 2025 commercial deadline.
- Possibly start implementing Air Source Heat Pump installations under cost share basis with OCCP.

02 Funding

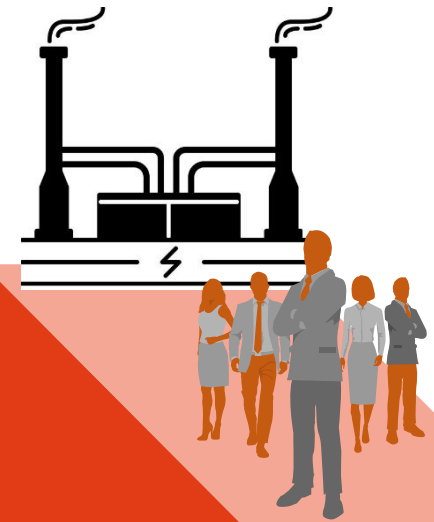
- City may commission an electric-utility-only rate study to reinforce our internal studies relative to rate impacts from geothermal payments to OCCP.

03 Policy / Process

- City may wish to discuss raising the 100 million kWh/year threshold for split revenues with OCCP, in order to pass savings on to customers and achieve project goals.

04 People

- Form a Climate Action Task Force to brainstorm ideas to increase clean energy use in Unalaska.



2023 -
2024

Unalaska Transitions Towards Carbon Neutrality



MGP On-Line
Main focus is on connecting as many customers as possible to renewable energy

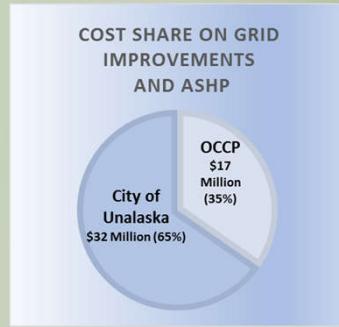
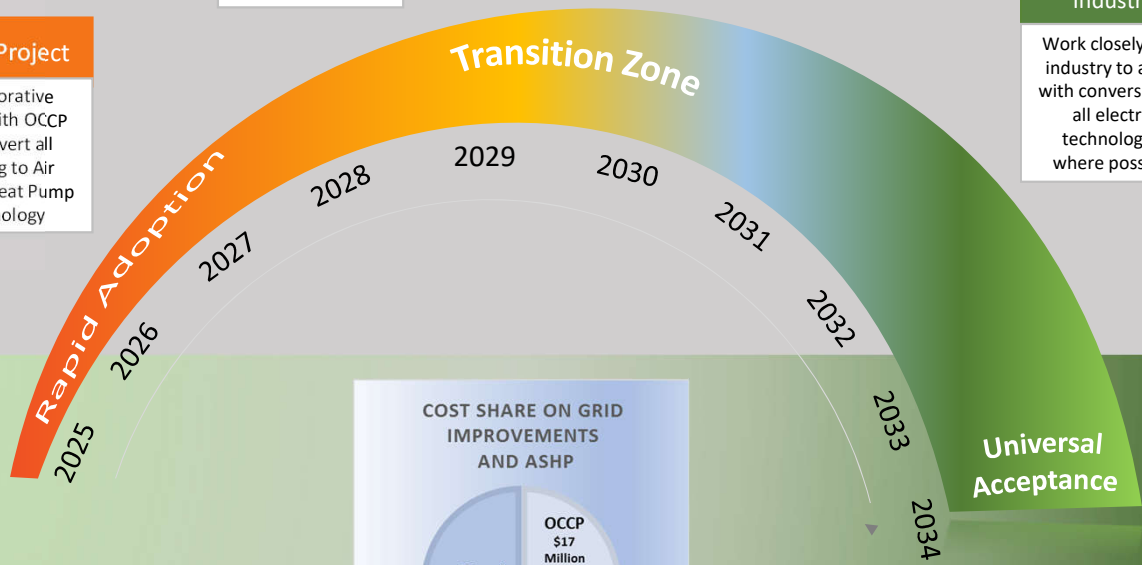
ASHP Project
Collaborative effort with OCCP to convert all heating to Air Source Heat Pump technology

Solid Waste
Anaerobic Digester and Gasifier technology drastically reduce GHG emissions

Rolling Stock
Concerted effort to electrify the City fleet, and encourage electric vehicle adoption by all sectors

Industry
Work closely with industry to assist with conversion to all electric technologies where possible

Fine Tuning
Continued fleet conversion and industry integration. Adopt new technologies as needed to achieve carbon reduction goals



So, this all sounds amazing – what is there to pencil out??

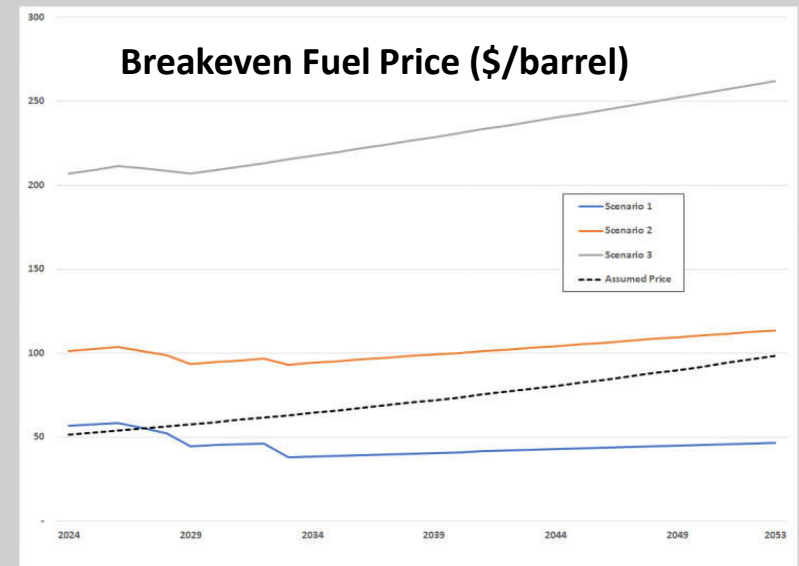
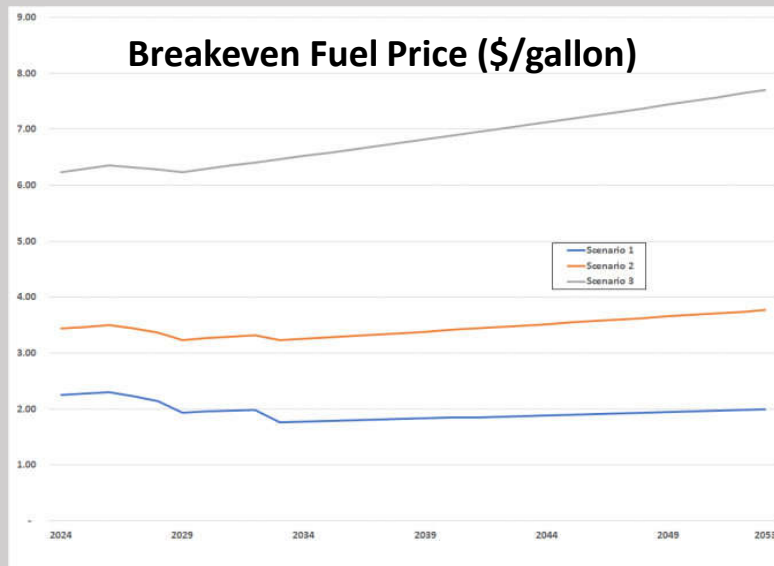


This Might Look Familiar to Some



Sales to Self Gen		Cumulative Combined Benefits (000)						First Op Yr w/ Savings
		5-yr	10-yr	15-yr	20-yr	25-yr	30-yr	
Scenario 1 60,000,000	City	\$ (680)	\$ 4,845	\$ 14,358	\$ 25,791	\$ 39,474	\$ 55,785	5
	Self Gen	4,214	8,399	12,528	19,429	29,635	43,753	1
	Combined	\$ 3,534	\$ 13,244	\$ 26,886	\$ 45,220	\$ 69,109	\$ 99,537	1
Scenario 2 30,000,000	City	\$ (16,001)	\$ (27,610)	\$ (37,306)	\$ (46,022)	\$ (53,472)	\$ (59,330)	>30
	Self Gen	(8,343)	(17,233)	(26,709)	(35,386)	(43,027)	(49,359)	>30
	Combined	\$ (24,344)	\$ (44,843)	\$ (64,015)	\$ (81,408)	\$ (96,499)	\$ (108,690)	>30
Scenario 3 0	City	\$ (52,325)	\$ (103,143)	\$ (155,250)	\$ (208,498)	\$ (262,710)	\$ (317,672)	>30
	Self Gen	-	-	-	-	-	-	>30
	Combined	\$ (52,325)	\$ (103,143)	\$ (155,250)	\$ (208,498)	\$ (262,710)	\$ (317,672)	>30

Presented to City Council on July 21, 2020



When Does Geothermal Power Actually Pencil Out?

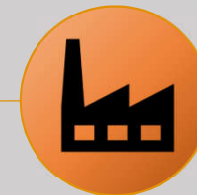


Could be Reached by a Combo of New Customers or ASHPs
Pencils Out at **\$2.09 - \$2.39** per Gallon Diesel

\$50 - \$62 per Barrel Oil

**100
Million
kWh
per Year**

100 MWh per year



Most Easily Reached by Adding Westward & Alyeska
Pencils out at **\$3.20 - \$3.83** per Gallon Diesel

\$92 - \$116 per Barrel Oil

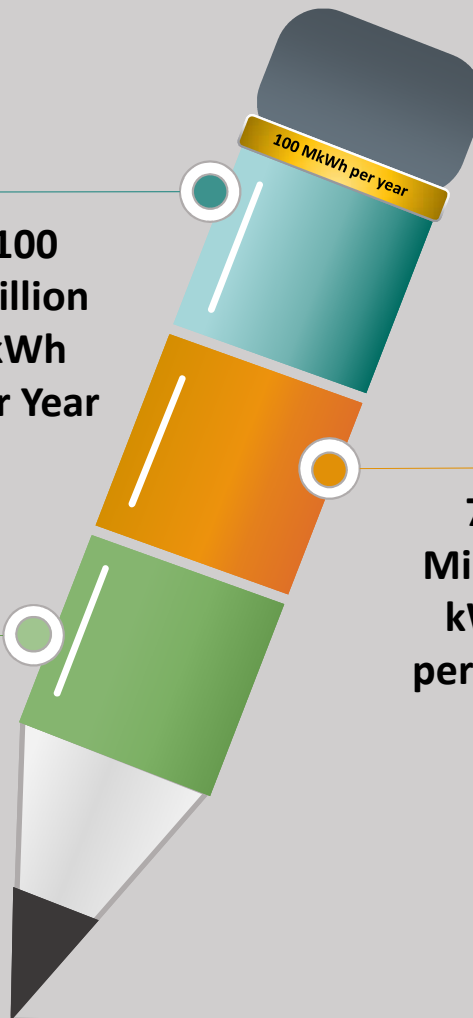
**70
Million
kWh
per Year**



Today's Electrical Sales to Existing Customers
Pencils Out at **\$6.30 - \$7.70** per Gallon Diesel

\$207 - \$262 per Barrel Oil

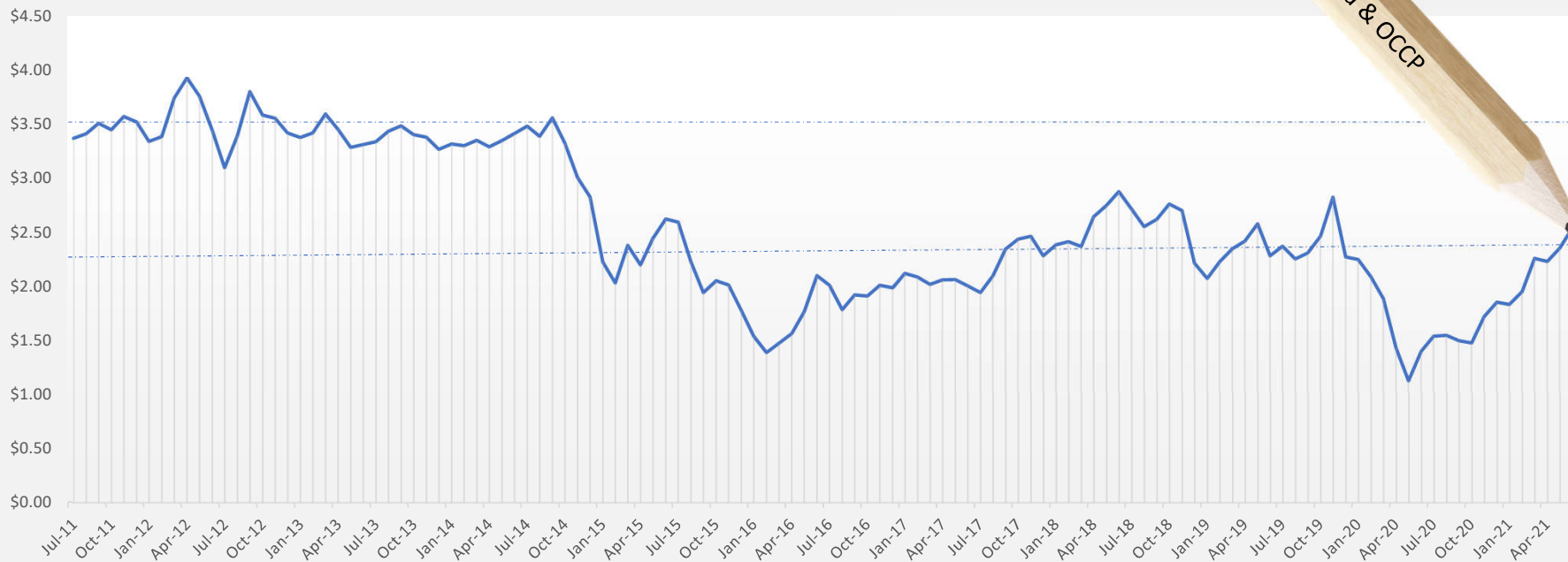
**40
Million
kWh
per Year**



Predicting the future is hard



Unalaska Diesel Price - 10 Years

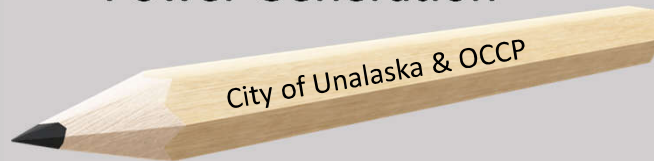


City of Unalaska & OCCP

70 million kWh per year
100 million kWh per year



Penciling Out the Power Bill Under Diesel Power Generation



City of Unalaska
 Department of Utilities
 ATTN: Utility@ci.unalaska.ak.us
 P.O. Box 610
 Unalaska, Alaska 99685
 (907) 581-1251 FAX (907) 581-3102

UTILITY BILL

Customer Copy

Please keep this portion for your records

AUTO-PAY! DO NOT PAY!

CUSTOMER NAME			SERVICE LOCATION						
BILL NUMBER	BILL DATE	ACCOUNT #	CUSTOMER #	DUE DATE					
240992	07/31/2021	A0126		08/31/2021					
PREVIOUS READ DATE	CURRENT READ DATE	CODE	CHARGE DESCRIPTION	METER NUMBER	READ CODE	PREVIOUS READING	CURRENT READING	USAGE	CHARGE AMOUNT
06/29/2021	07/29/2021	1EL08	ELECTRIC RESIDENTIAL	330958717	A	6782	7101	319	87.70
06/29/2021	07/29/2021	1EL18	PCE RESIDENTIAL						0.00
06/29/2021	07/29/2021	1EL40	ELECT RESIDENTIAL COPA						58.84
06/29/2021	07/29/2021	2WA30	WATER RESIDENTIAL						36.87
06/29/2021	07/29/2021	3WW20	WASTEWATER RESIDENTIAL						121.63
06/29/2021	07/29/2021	4LF01	LANDFILL MAINTENANCE FEE						30.28
									\$146.54

Cost of Power Adjustment = Total Cost of Fuel divided by Total kWh Generated

"Base Rate" per kWh is set by City Ordinance and stays constant for the Fiscal Year.

- This pays for:
- Electric Admin Personnel
 - Electric Admin Operating
 - Power House Personnel
 - Power House Operating
 - Line Crew Personnel
 - Line Crew Operating
 - Bond Payments
 - Electric Asset Depreciation (2/3rds are not related to power generation)

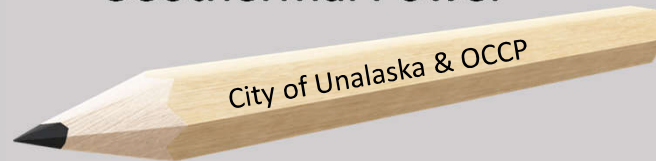
This varies each month with the price of diesel

July 2021 COPA = \$669,002 (fuel cost) / 3,609,461 (kWh sold) = \$0.18535 per kWh

July 2021 Residential Service Rate = \$8.49 (customer charge) + \$0.2483/kWh (energy charge)



Penciling Out the Power Bill Under Geothermal Power



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06/29/2021	07/29/2021	1EL18	PCE RESIDENTIAL						0.00	
06/29/2021	07/29/2021	1EL40	ELECT RESIDENTIAL COPA						58.84	
06/29/2021	07/29/2021	2WA30	WATER RESIDENTIAL						36.87	
06/29/2021	07/29/2021	3WW20	WASTEWATER RESIDENTIAL						121.63	
06/29/2021	07/29/2021	4LF01	LANDFILL MAINTENANCE FEE						30.28	
									\$146.54	\$194.99

Cost of Power Adjustment =
 Total Cost of Fuel divided by Total kWh Generated

This varies each month depending on the total kWh sold.

- This still pays for:
- Electric Admin Personnel
 - Electric Admin Operating
 - Power House Personnel
 - Power House Operating
 - Line Crew Personnel
 - Line Crew Operating
 - Bond Payments
 - Electric Asset Depreciation (2/3rds are not related to power generation)
- But will decrease \$0.04 per kWh with vastly reduced O&M costs.

July 2021 COPA = \$1,358,333 ("fuel" cost) / 3,609,461 (kWh sold) = \$0.37633 per kWh

July 2021 Residential Service Rate = \$8.49 (customer charge) + \$0.2083/kWh (energy charge)

+ \$48.45



Penciling Out the Power Bill Under Diesel Power Generation #2



This example is from last December, when residential power usage is up, and overall power sales are down.

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UTILITY BILL

Customer Copy
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AUTO-PAY! DO NOT PAY!

CUSTOMER NAME		SERVICE LOCATION							
BILL NUMBER	BILL DATE	ACCOUNT #	CUSTOMER #	DUE DATE					
232699	12/31/2020	A0126		01/29/2021					
PREVIOUS READ DATE	CURRENT READ DATE	CODE	CHARGE DESCRIPTION	METER NUMBER	READ CODE	PREVIOUS READING	CURRENT READING	USAGE	CHARGE AMOUNT
11/29/2020	12/30/2020	1EL08	ELECTRIC RESIDENTIAL	330958717	A	3966	4516	550	136.67
11/29/2020	12/30/2020	1EL18	PCE RESIDENTIAL						-30.15
11/29/2020	12/30/2020	1EL40	ELECT RESIDENTIAL COPA						62.78
11/29/2020	12/30/2020	2WA30	WATER RESIDENTIAL						35.59
11/29/2020	12/30/2020	3WW20	WASTEWATER RESIDENTIAL						114.04
11/29/2020	12/30/2020	4LF01	LANDFILL MAINTENANCE FEE						27.97
									\$199.45

Notice also the effect of the PCE credit – it was not applied in this example but is a much needed supplement to our high electrical rates

December 2020 COPA = \$372,630 (fuel cost) / 2,874,320 (kWh sold) = \$0.12964 per kWh

December 2020 Residential Service Rate = \$8.00 (customer charge) + \$0.23395/kWh (energy charge)



Penciling Out the Power Bill Under Geothermal Power #2



This example is from last December, when residential power usage is up, and overall power sales are down.

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UTILITY BILL

Customer Copy
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AUTO-PAY! DO NOT PAY!

CUSTOMER NAME SERVICE LOCATION

BILL NUMBER 232699 BILL DATE 12/31/2020 ACCOUNT # A0126 CUSTOMER # DUE DATE 01/29/2021

PREVIOUS READ DATE	CURRENT READ DATE	CODE	CHARGE DESCRIPTION	METER NUMBER	READ CODE	PREVIOUS READING	CURRENT READING	USAGE	CHARGE AMOUNT
11/29/2020	12/30/2020	1EL08	ELECTRIC RESIDENTIAL	330958717	A	3966	4516	550	136.67
11/29/2020	12/30/2020	1EL18	PCE RESIDENTIAL						-30.15
11/29/2020	12/30/2020	1EL40	ELECT RESIDENTIAL COPA						62.78
11/29/2020	12/30/2020	2WA30	WATER RESIDENTIAL						35.59
11/29/2020	12/30/2020	3WW20	WASTEWATER RESIDENTIAL						114.04
11/29/2020	12/30/2020	4LF01	LANDFILL MAINTENANCE FEE						27.97

\$114.67

\$259.92

~~-\$199.45~~

\$374.59

+ \$175.14

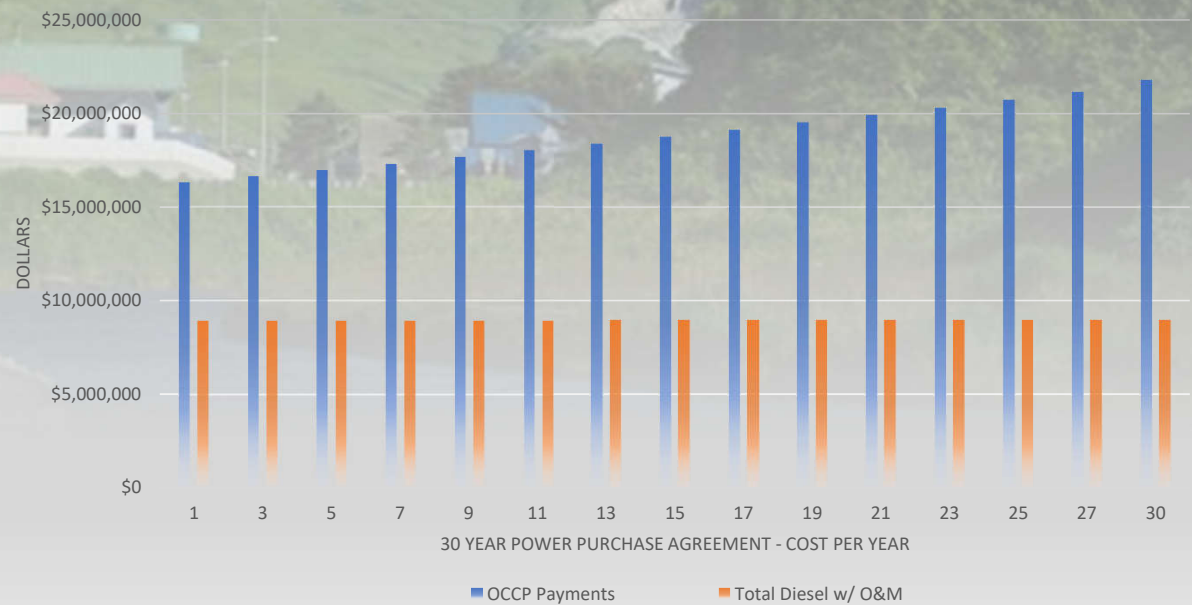
December 2020 COPA = \$1,358,333 ("fuel" cost) / 2,874,320 (kWh sold) = \$0.47258 per kWh

December 2020 Residential Service Rate = \$8.00 (customer charge) + \$0.19395/kWh (energy charge)



What if we don't sell more power?

GEOTHERMAL VS. DIESEL GENERATION AT CURRENT LOADS



Barriers to Adding New Customers

Price

With no customer PPAs in place, it has been challenging to overcome “wait and see” attitude. Processors are very good at knowing and controlling their costs.

City of Unalaska & OCCP

Contract length

Prospective customers unwilling to enter into long-term purchase arrangements.



Project Financing is Still Unknown

Final resolution on project financing may not come until May of 2022.

Sometimes Processors Burn Fish Oil

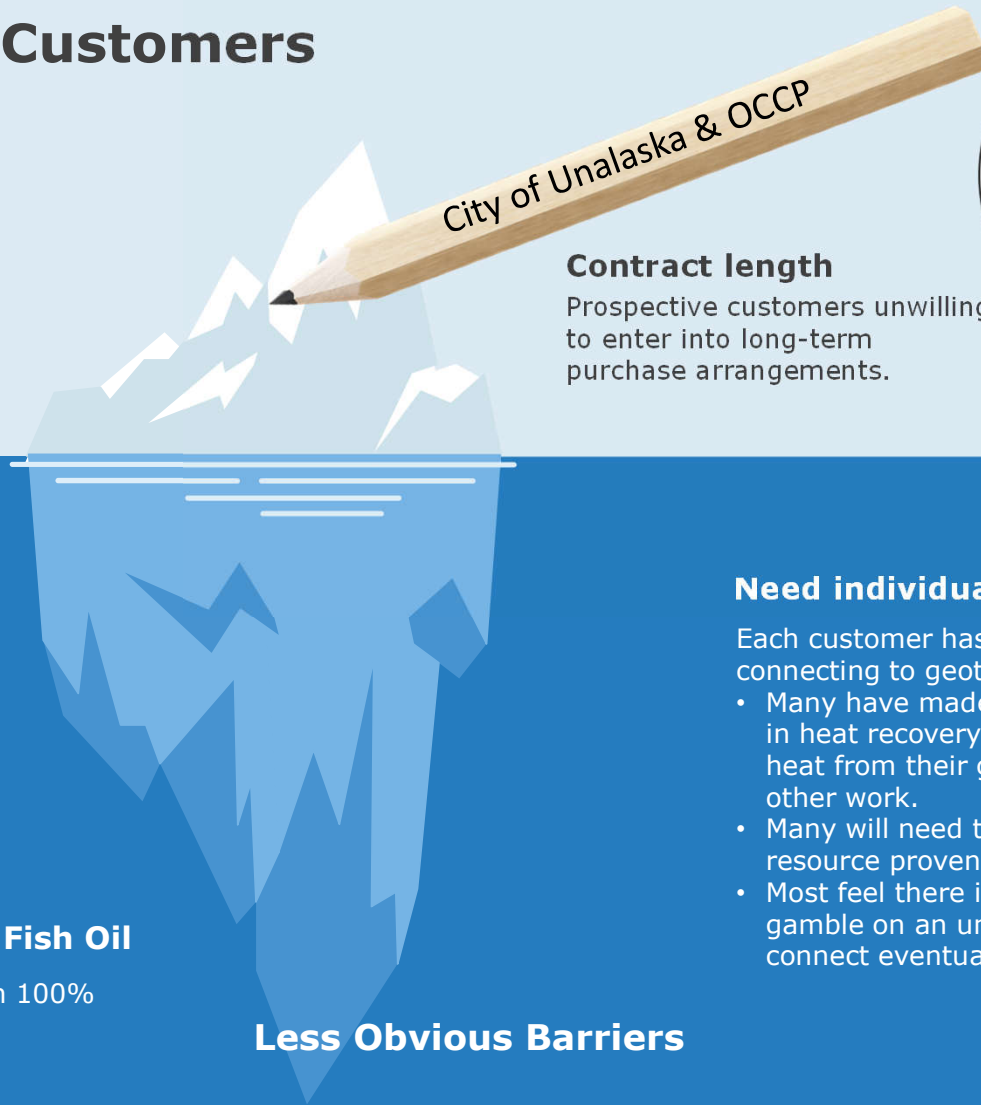
May not be reasonable to insist on 100% participation.

Need individualized solutions

Each customer has unique barriers to connecting to geothermal:

- Many have made very large investments in heat recovery projects that use waste heat from their generators to perform other work.
- Many will need to see the geothermal resource proven before they connect
- Most feel there is too much at stake to gamble on an unknown, but will probably connect eventually at the right price.

Less Obvious Barriers



FINDING OUR WAY FORWARD



Solution

- Form a climate action task force to crowd source solutions.
- Positive results from Socioeconomic Study with DOE Department of Indian Energy may help increase acceptance.
- Grow base customer load independently of other large self-generators (i.e. USCG Dock upgrade, intermittent interruptible power rates, adding smaller self-generators).
- Possibly partner with the Tribe and IRT as we move forward.

Problem

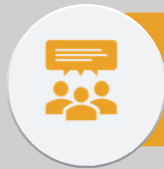
- Geothermal power needs a larger customer base to be economical.
- The City does not have Power Purchase Agreements in place to sell more power.



Pencil Points to Remember



We finally have the right team in place to transition to geothermal power!



Renewable energy is a natural fit for our population and location!



Our Value Proposition for Geothermal Power is to support economic growth



Ultimate goal is a transition to carbon neutral with beneficial services for our community





Any Questions?

