CHUGACH POWERING ALASKA'S FUTURE

CHUGACH ELECTRIC ASSOCIATION, INC.
ANCHORAGE, ALASKA

OPERATIONS COMMITTEE MEETING

AGENDA

Mark Wiggin, Chair	Erin Whitney, Director
Harold Hollis, Vice Chair	Sisi Cooper, Director
	Bettina Chastain, Director

October 19, 2022 | **4:00 p.m.** | **Chugach Board Room**

I. CALL TO ORDER *(4:00 p.m.)*

- *A. Roll Call*

II. APPROVAL OF THE AGENDA* *(4:05 p.m.)*

III. APPROVAL OF THE MINUTES* *(4:10 p.m.)*

- *A. August 10, 2022 (Cacy)*
- *B. August 23, 2022 (Quezon)*

IV. PERSONS TO BE HEARD *(4:15 p.m.)*

- *A. Member Comments*

V. NEW BUSINESS* *(scheduled) (4:20 p.m.)*

- *A. Heat Pump Feasibility Study (Henspeter/Skaling) (4:20 p.m.)*
- *B. Third Quarter 2022 BRU Production Update (Armfield) (4:40 p.m.)*
- *C. Quartz Creek Transmission Line Rebuild - Girdwood to Indian Project Authorization* (Laughlin/M. Miller) (5:00 p.m.)*

VI. EXECUTIVE SESSION* *(scheduled) (5:10 p.m.)*

- *A. One Campus Plan Update (Resnick) (5:10 p.m.)*
- *B. Gas Supply Update (Armfield/White) (5:55 p.m.)*
- *C. Decarbonization: Goals and Proposed Board Policy (Ayers) (6:15 p.m.)*
- *D. Renewable Portfolio Standard (Skaling/Ayers) (6:30 p.m.)*
- *E. Battery Energy Storage System Update (Laughlin) (6:50 p.m.)*

VII. NEW BUSINESS *(none)*

VIII. DIRECTOR COMMENTS *(7:10 p.m.)*

IX. ADJOURNMENT* *(7:30 p.m.)*

***** ***Denotes Action Items***
****** ***Denotes Possible Action Items***

CHUGACH ELECTRIC ASSOCIATION, INC.
Anchorage, Alaska

August 10, 2022
Wednesday
4:00 p.m.

OPERATIONS COMMITTEE MEETING

Recording Secretary: Sandra Cacy

I. CALL TO ORDER

Chair Wiggin called the Operations Committee meeting to order at 4:02 p.m. in the boardroom of Chugach Electric Association, Inc., 5601 Electron Drive, Anchorage, Alaska.

A. Roll Call

Committee Members Present:
Mark Wiggin, Chair
Harold Hollis, Vice Chair *(via teleconference)*
Erin Whitney, Director
Sisi Cooper, Director

Committee Members Absent:
Bettina Chastain, Director

Board Members Present:
Sam Cason, Director

Guests and Staff Attendance Present:

Arthur Miller	Matthew Clarkson	Karen Griffin
Sherri Highers	Kate Ayers	Dustin Highers
Andrew Laughlin	Teresa Kurka	Chantelle Lewis-Boutte
Sean Skaling	Julie Hasquet	Harry Crawford, Member

Via Teleconference:

Arden Quezon	Ashton Doyle	Luke Sliman

II. APPROVAL OF THE AGENDA

Director Cooper moved and Director Whitney seconded the motion to approve the agenda. The motion passed unanimously.

III. APPROVAL OF THE MINUTES

Director Whitney moved and Director Cooper seconded the motion to approve the June 8, 2022, Operations Committee Meeting minutes. The motion passed unanimously.

IV. PERSONS TO BE HEARD

A. *Member Comments*

None.

V. NEW BUSINESS

A. *Community Solar Project (Skaling)*

Arthur Miller, Chief Executive Officer (CEO) introduced the Community Solar Project and Sean Skaling, Sr. Manager, Business & Sustainable Program Development, discussed the project and responded to questions from the Committee.

B. *Bill Round-Up Program (Lewis-Boutte/Ayers)*

Kate Ayers, Key Accounts & Sustainability Manager, and Chantelle Lewis-Boutte, Member & Energy Programs Specialist, discussed the Bill Round-Up Program and responded to questions from the Committee.

C. *Overtime Labor Costs (Laughlin/Highers)*

Arthur Miller, CEO, gave an update on the Overtime Labor Costs.

Mr. Miller and Andrew Laughlin, Chief Operating Officer, responded to questions from the Committee.

D. *NRECA Compendium of Resolutions (Miller)*

Arthur Miller, CEO, discussed the NRECA Compendium of Resolutions and responded to questions from the Committee.

E. *Decarbonization Program Strategy (D. Highers)*

Dustin Highers, VP, Corporate Programs, discussed the Decarbonization Program Strategy and responded to questions from the Committee.

VI. EXECUTIVE SESSION

A. *Battery Energy Storage System (Laughlin)*
B. *Railbelt Reliability Council Update (Clarkson)*
C. *Chugach Realignment (Miller)*
D. *Targe Completion Dates for CEO Goals (Miller)*

At 5:49 p.m., Director Whitney moved and Director Cason seconded the motion that pursuant to Alaska Statute 10.25.175(c)(1), (3) and (4) the Board of Directors go into executive session to: 1) discuss and receive reports regarding financial matters, the immediate knowledge of which would clearly have an adverse effect on the finances of the cooperative; 2) discuss with its attorneys legal matters, the immediate knowledge of which could have an adverse effect on the legal position of the cooperative; and 3) personnel matters. The motion passed unanimously.

The meeting reconvened in open session at 7:00 p.m.

VII. NEW BUSINESS

None.

VIII. DIRECTOR COMMENTS

Comments were made at this time.

IX. ADJOURNMENT

At 7:13 p.m., Director Whitney moved and Director Cason seconded the motion to adjourn. The motion passed unanimously.

CHUGACH ELECTRIC ASSOCIATION, INC.
Anchorage, Alaska

August 23, 2022
Tuesday
11:30 a.m.

OPERATIONS COMMITTEE MEETING

Recording Secretary: Arden Quezon

I. CALL TO ORDER

Chair Wiggin called the Operations Committee meeting to order at 11:35 a.m. in the boardroom of Chugach Electric Association, Inc., 5601 Electron Drive, Anchorage, Alaska.

A. Roll Call

Committee Members Present:
Mark Wiggin, Chair
Harold Hollis, Director
Erin Whitney, Director
Sisi Cooper, Director
Bettina Chastain, Director

Board Members Present:
Sam Cason, Director
Rachel Morse, Director

Guests and Staff Attendance Present:

Arthur Miller	Sean Skaling	Bart Armfield, Consultant
Luke Saugier, Hilcorp	Kurt Gibson, Hilcorp	

II. APPROVAL OF THE AGENDA

Director Hollis moved and Director Chastain seconded the motion to approve the agenda. The motion passed unanimously.

III. APPROVAL OF THE MINUTES

None.

IV. PERSONS TO BE HEARD

A. Member Comments

None.

V. NEW BUSINESS

None.

VI. EXECUTIVE SESSION

A. Hilcorp and Beluga River Unit Related Matters

At 11:37 a.m., Director Chastain moved and Director Hollis seconded the motion that pursuant to Alaska Statute 10.25.175(c)(1), the Board of Directors' Operations Committee go into executive session to discuss and receive reports regarding financial matters, the immediate knowledge of which would clearly have an adverse effect on the finances of the cooperative. The motion passed unanimously.

VII. NEW BUSINESS

None.

VIII. DIRECTOR COMMENTS

None.

IX. ADJOURNMENT

At 1:09 p.m., Director Chastain moved and Director Cooper seconded the motion to adjourn. The motion passed unanimously.

Chugach Electric Association, Inc.

2022 Heat Pump Feasibility Study
Analysis and Pilot Program Recommendation

Mark Henspeter, Business Development, October 2022

Executive Summary

Chugach Electric Association, Inc. (Chugach) has examined heat pumps as a potential beneficial electrification service to its membership. This initial evaluation compared the cost-effectiveness for members using different heating fuel sources, potential reduction of carbon emissions, and the economic and load impacts to the Chugach system.

Heat Pumps are a feasible technology within the Chugach service area and could be cost effective for Residential and Small General Service (SGS) members depending on their current heating source. Heat pumps could reduce operating costs by 10-25 percent for Chugach members who currently heat with fuel oil but could increase operating costs by 10-25 percent for members who heat with natural gas.

To reach operating cost parity with natural gas heat, the energy charge for residential members in North and South districts would need to be reduced by 40 percent and 60 percent, respectively. The energy charge for SGS members in North and South districts would need to be reduced by 20 percent and 40 percent, respectively.

Heat pumps could reduce carbon emissions for Residential and SGS members by 20-40 percent and could contribute to a long-term reduction of Cook Inlet natural gas if widely adopted.

For optimal performance, Heat pumps in the Chugach service area would be installed as part of a hybrid heat system and serve as the primary heat source for days warmer than 5 degrees F, with an auxiliary heat source (natural gas, fuel oil, or wood stove) providing heat for colder days. Heat pumps likely will not have a significant impact on system loads during winter peaks, since they will primarily operate during more moderate temperatures. More analysis will be needed to understand local constraints on the distribution system.

The up-front cost to install a heat pump system will likely be the largest obstacle to adoption in the Chugach service area, but a rebate/ incentive program would help reduce this barrier and encourage heat pump adoption. A rebate/ incentive program would be more effective than an alternative rate design for encouraging heat pump adoption. Early adopters will likely be members who are most interested in reducing exposure to volatile heating fuel prices and reducing carbon emissions.

A pilot program of 100 residential and 20 SGS members could provide an additional 1,000 MWh of sales and positively contribute to fixed costs within three years. Increased sales during the three-year period are anticipated to exceed $121,000 and would offset a total incentive cost of $120,000 if fully subscribed. Following the payback period, the pilot would generate approximately $69,000 or more of new base rate revenue annually, even without further program growth. Year one of a pilot program would target 25 residential and five SGS members.

Recommendation

It is recommended that Chugach implement a three-year heat pump pilot program to encourage the adoption of heat pumps within the Chugach service area. A pilot program with a goal of 100 Residential and 20 SGS could include an annual subscription cap of 50 Residential and 10 SGS members. A rebate of up to $900 for Residential and up to $1,500 for SGS members is recommended, which would offset 10-20 percent of the total installed cost of a heat pump system. The pilot program could be open to all Residential and SGS members and would be anticipated to be most compelling to members without access to natural gas.

A participation target of up to 120 members would provide a combined incentive of up to $120,000 to members distributed over the course of the pilot program. It is anticipated this could provide a total increase in sales of over 1,000 MWh per year by the end of the three-year pilot program. Annual fixed-cost contribution from increased sales by the end of year three is anticipated to reach $18,000 - $29,000 depending upon participation level. The pilot program could function similar to the EV Charging Research Program and be administered by the Business Development team, with the potential for support from a third party such as Alaska HeatSmart.

Chugach members seeking to participate in the pilot program would request approval from Chugach to determine eligibility. An eligible heat pump system would require a Heating Seasonal Performance Factor (HSPF) rating of 10 or higher (*CEE Tier 3*, *SEER* 18 or higher) and be installed by a manufacturer-certified installer of the member's expense and choice. The rebate could be disbursed in two portions, with 50 percent applied towards the invoice from the certified installer, and 50 percent paid as an on-bill credit to the member upon verification of total installed cost and operational status. The member would be requested to provide data on heating fuel consumption for two years following installation of the heat pump system.

Feasibility Study Introduction

In late 2021, Chugach began investigating the feasibility of heat pump adoption within the Chugach service area with the goal of identifying the potential for 1,000 MWh of new sales to residential and commercial members. Electrified space heating may be beneficial for residential and commercial members as modern heat pumps can reduce utility costs compared to current heating fuels. Heat pumps have been successfully deployed in other jurisdictions as a modern efficiency tool in lowering energy consumption and reducing the carbon footprint for residential and commercial buildings. Heat pumps have traditionally been limited in their performance in cold climates, but with recent technological advancements and practical knowledge there is significant potential for Chugach members, particularly in more rural locations where natural gas is not available.

Heat pumps could provide value to members by reducing heating costs, limiting exposure to fuel price volatility, and reducing carbon emissions. Heat pumps provide year-round high-efficiency electric heating and cooling performance when compared to natural gas and fuel oil heating systems and are now commercially available in a range of configurations. Heat pumps can provide an array of services from residential space and water heating to commercial space heating and cooling. For purposes of this study the focus has been primarily on residential and SGS space heating applications since they are more homogenous in size and type and have off-the-shelf technology readily available. A second phase of the study could focus specifically on large commercial applications.

Within the realm of space heating, the two primary categories of heat pumps are classified as air-source heat pumps (ASHP) and ground-source heat pumps (GSHP). ASHPs operate through a system of heat exchangers, refrigerant loops, and a compressor to collect heat from ambient air and transfer it either into a building (for heating) or out of a building (for cooling). Since heat pumps are merely using electricity to perform the work of transferring heat from one location to another, they operate at a higher efficiency than traditional fossil fuel heating systems or electric resistance heaters. A typical natural gas boiler may be 80 percent energy efficient while a comparable heat pump system may be 200-400 percent efficient. This efficiency metric is represented as the Coefficient of Performance (COP). Heat pump systems are typically rated by the manufacturer with a HSPF value.

ASHPs can be either air-to-air or air-to-water, depending on the preferred application for a given building. GSHPs operate through a similar system of heat exchangers but transfer heat from refrigerant loops buried in the ground, or vertical wells. Both GSHPs and ASHPs are currently operating within the Chugach service area, although the cold climate and comparatively low cost of natural gas are the two primary obstacles to widespread adoption of heat pumps for space heating. Given the significant capital cost and physical constraints of GSHPs, this analysis focuses on ASHPs, which are available off-the-shelf for residential and commercial members. GSHPs are a viable and proven technology, but due to the site-specific nature of installations, further analysis will be required to develop a representative model.

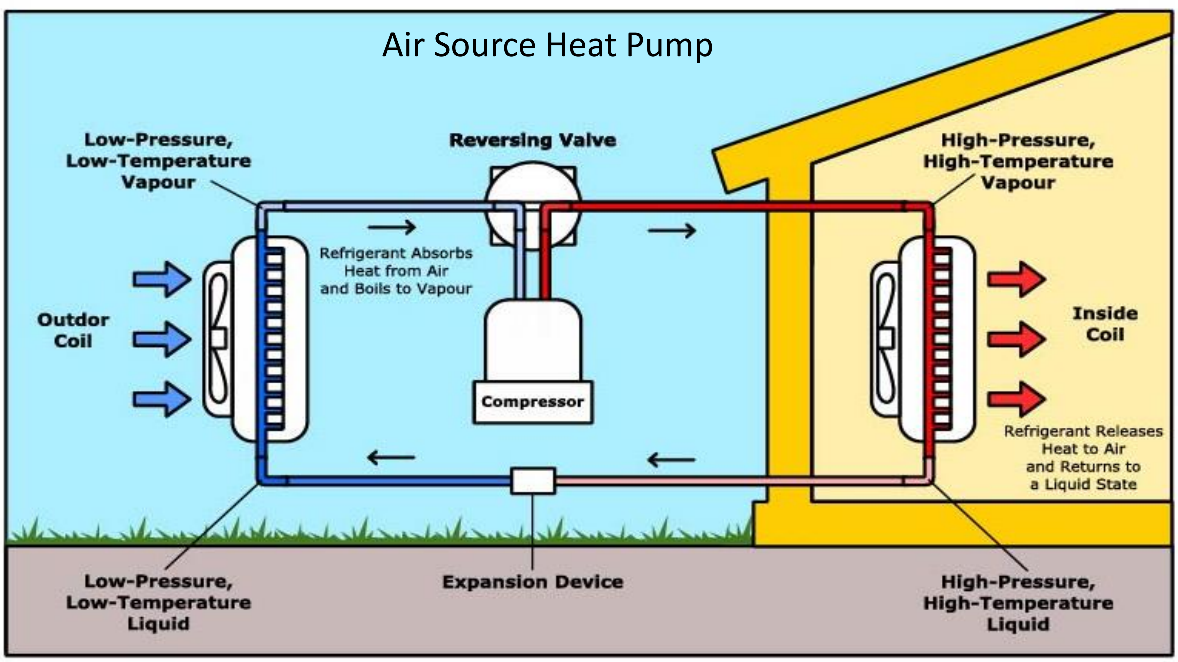


Figure 1.1 Air Source Heat Pump heating cycle. Source: DOE Energy Saver Program

Methods & Key Questions

Environmental Characteristics

Considering the cold climate of the Chugach service area, ASHPs are on the margin of their heating capability but have steadily improved in cold performance. Some models, such as the Mitsubishi H2i Plus, can operate at 100 percent capacity as low as -5°F. In performing this analysis, local climate conditions for the Chugach service area were evaluated based on 10 years of historical weather data.

The Merrill Field weather station near downtown Anchorage is a general representation of the climate conditions within the Chugach service area, although areas in west Anchorage may be warmer, and east Anchorage and the Kenai Peninsula are generally cooler. Climate data indicate 9,902 mean annual heating degree days (base 65) for the 1991-2020 period and classify the Chugach service area as ASHRAE Climate Zone #7 (9,000-12,000 HDD). The cold 99 percent design condition is -18.4°F. In the Anchorage area, 95 percent of annual hours are historically above 5°F, with the peak cold month of January remaining above 5°F for approximately 70 percent of monthly hours.

In modeling heat pump performance, it was assumed that a hybrid heating system was used with a 5°F transition temperature. The heat pump would support 100 percent of space heating loads at 5°F and above, and would transition to the auxiliary heating system (natural gas, fuel oil, or biomass) when the temperature drops below 5°F. When paired with an auxiliary heat system, a heat pump can support the majority of the annual heating loads without the need to significantly oversize the heating capacity for a structure. Although a heat pump may be capable of 100 percent of rated heating capacity at -15°F, the size of a heat pump system necessary to support a whole home heating load at that temperature would be significantly larger and more expensive. The performance of an ASHP significantly improves as the ambient temperatures increases, and the average seasonal COP will be higher than observed efficiency at the minimum rated temperature. An average seasonal COP of 2.85 was used for this analysis, which is generally representative of a cold-climate heat pump system with a HSPF rating of 10.

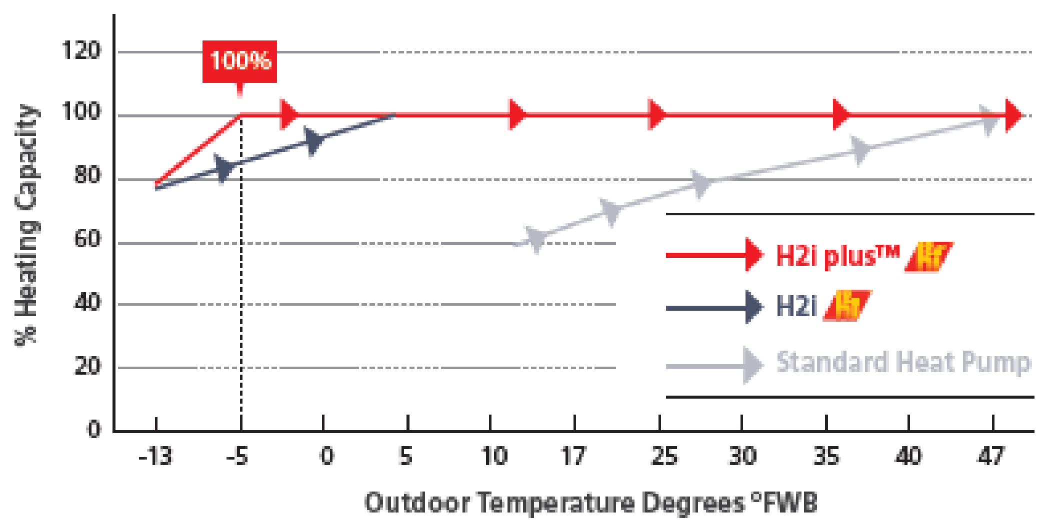


Figure 2.1 Manufacturer claimed performance for modern cold climate rated heat pump. Source: Mitsubishi Electric HVAC US Promotional material – 2020

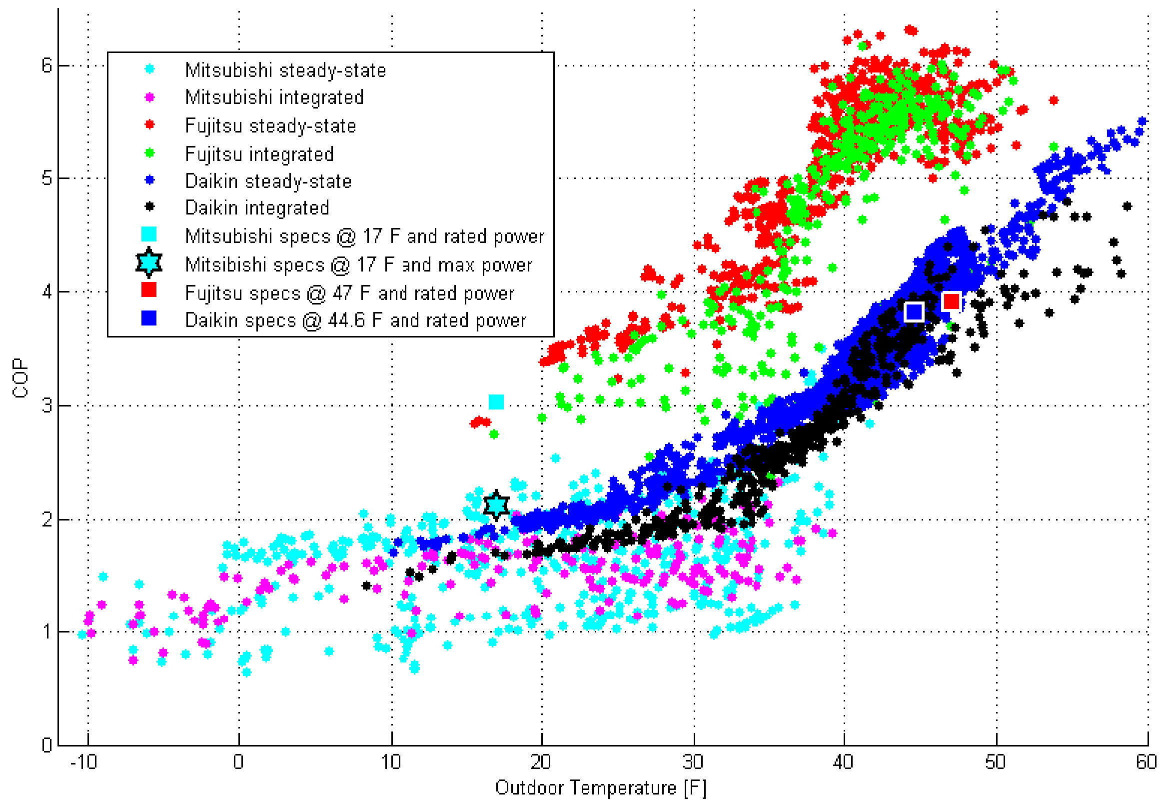


Figure 2.2 COP versus outdoor temperature for three Alaskan heat pumps in CCHR study. Source: Cold Climate Housing Research Center ASHP report - 2015

Cost Comparison - Natural Gas Heat

Natural gas has historically been and continues to be the most economical heating fuel for residential and commercial buildings within most of the Chugach service area. Given the design considerations of the Anchorage area, an ASHP system would optimally be paired with an auxiliary gas-fired heating system to provide economical heat during extreme low temperatures, and a wood or fuel oil heating system in the extended service area without access to natural gas. For existing structures this can typically be accomplished by retaining the existing fuel oil heating system when installing a heat pump system. Since most homes and businesses within the Chugach service area are not currently using electric hot water heaters, it is assumed that the portion of natural gas for hot water heating will not be offset by a heat pump system. AHFC data indicates that domestic hot water accounts for approximately 5 percent of total natural gas consumed for a typical household.

This analysis also assumes that an ASHP could be added to a structure where an existing natural gas or fuel oil system is used when the ambient temperature is below 5°F. A heat pump will therefore not displace all gas consumed for space heating but will share the heating load with the existing heating system automatically based on the ambient outdoor temperature. Most heat pump manufacturers, such as Mitsubishi, have integrated "hybrid" control systems that seamlessly handle the transition between heat systems. For this analysis it is assumed that a heat pump system would displace 80 percent of total heating fuels for residential members, and 90 percent of the heating fuels for SGS members on an annual basis.

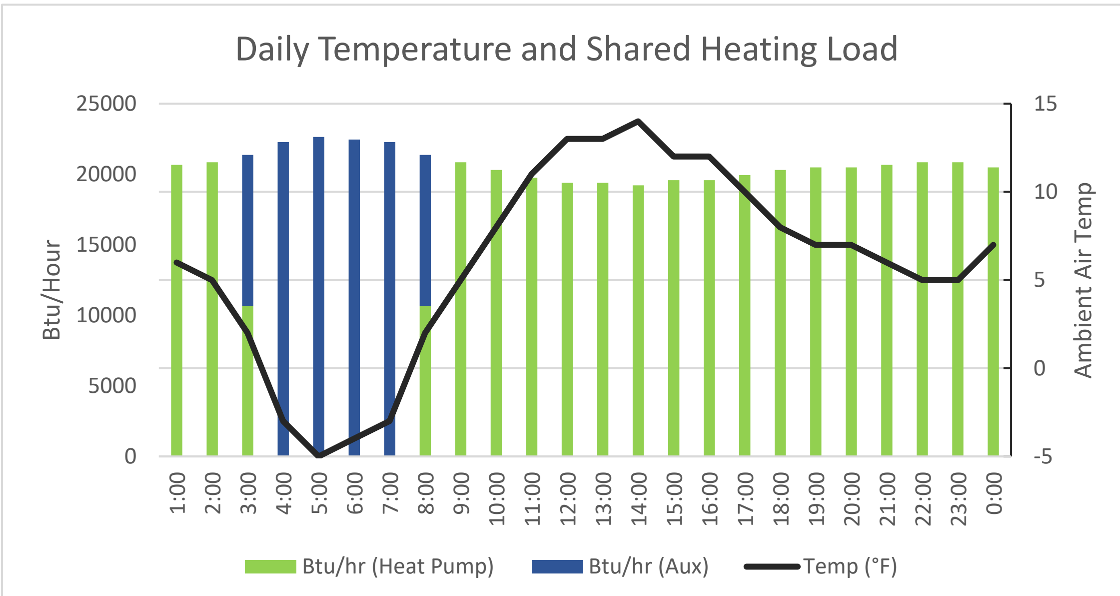


Figure 2.3 Modeled example of daily temperature and shared heating load transitioning at 5°F. Source: Model of 1800 square-foot home on a February day using AkWarm toolkit

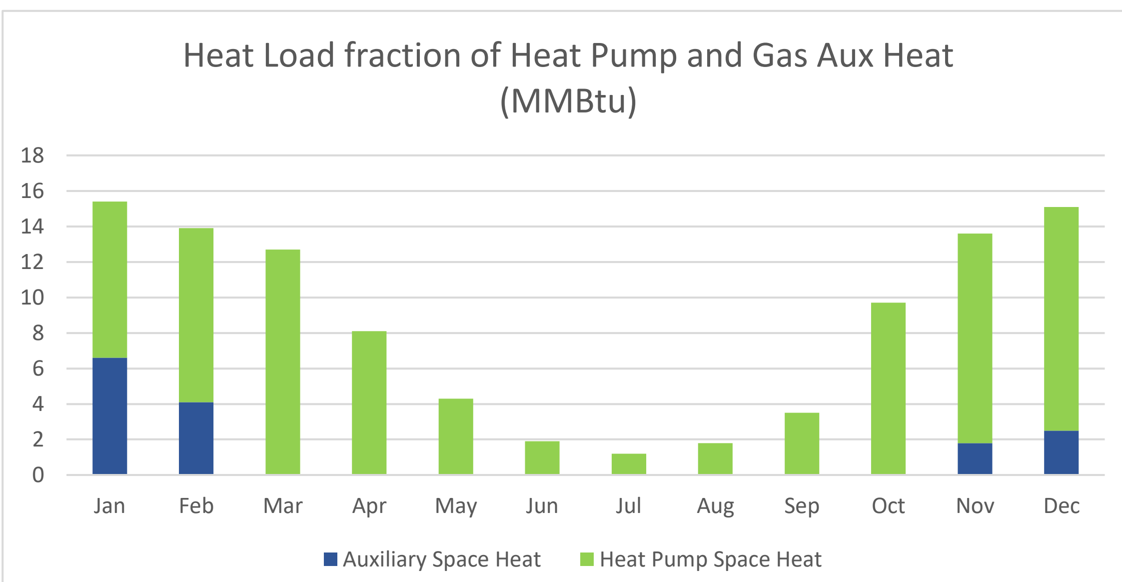


Figure 2.4 Example modeled annual heating load of Anchorage home with heat pump and natural gas auxiliary heat systems. Source: Modeled output from Alaska Mini-Split Heat Pump Calculator

General Service rates for ENSTAR Natural Gas Company (ENSTAR) are current as of July 1, 2022. General Service is represented by four primary tiers, and the effective rate is determined by the sum of the service charge plus the supplier gas cost according to the current tariff. Rate schedules are determined by meter flow rating, and prices are per hundred cubic feet of gas (Ccf) per month.

G1	$0.986/Ccf	< 400 cubic feet/hour (cfh) up to 590 cfh for locations with on-demand water heater
G2	$0.933/Ccf	401 to 649 cfh, up to 839 cfh for locations with single on-demand water heater
G3	$0.931/Ccf	650 to 3,000 cfh, up to 3,190 cfh for locations with single on-demand water heater
G4	$.903/Ccf	> 3,000 cfh

Table 2.1 ENSTAR natural gas rates, as of July 1, 2022

General Service rates for Chugach are current as of July 1, 2022. The retail rate is inclusive of the energy charge, fuel charge, purchased power charge, Fire Island wind adjustment, BRU contributed capital surcharge and rebate, regulatory cost charge, and gross revenue tax. This analysis does not include the restricted rate reduction as it is anticipated this will end in 2023.

	Retail rate ($/kWh)	Energy charge ($/kWh)
N. Residential	$0.1774	$0.1527
N. Small General Service (SGS)	$0.1435	$0.1188
S. Residential	$0.1991	$0.1351
S. SGS	$0.1607	$0.0967

Table 2.2 Chugach retail electricity rates, as of July 1, 2022

	Average gas (Ccf/mo)	Gas with HP (Ccf/mo)	Average electric (kWh/mo)	Electric with HP (kWh/mo)
Residential	110	22	600	1,390
SGS	295	30	1,250	3,560

Table 2.3 Comparison of average monthly natural gas and electricity consumption with and without a heat pump

	Average net utility cost ($/month)	Net utility cost with heat pump ($/month)	Percent difference
N. Residential	$215	$257	+19%
S. Residential	$228	$285	+25%
N. SGS	$447	$520	+16%
S. SGS	$469	$579	+24%

Table 2.4 Comparison of modeled average net monthly utility cost (natural gas + electric) with and without heat pump system for members in North and South districts at current rates compared to natural gas heat

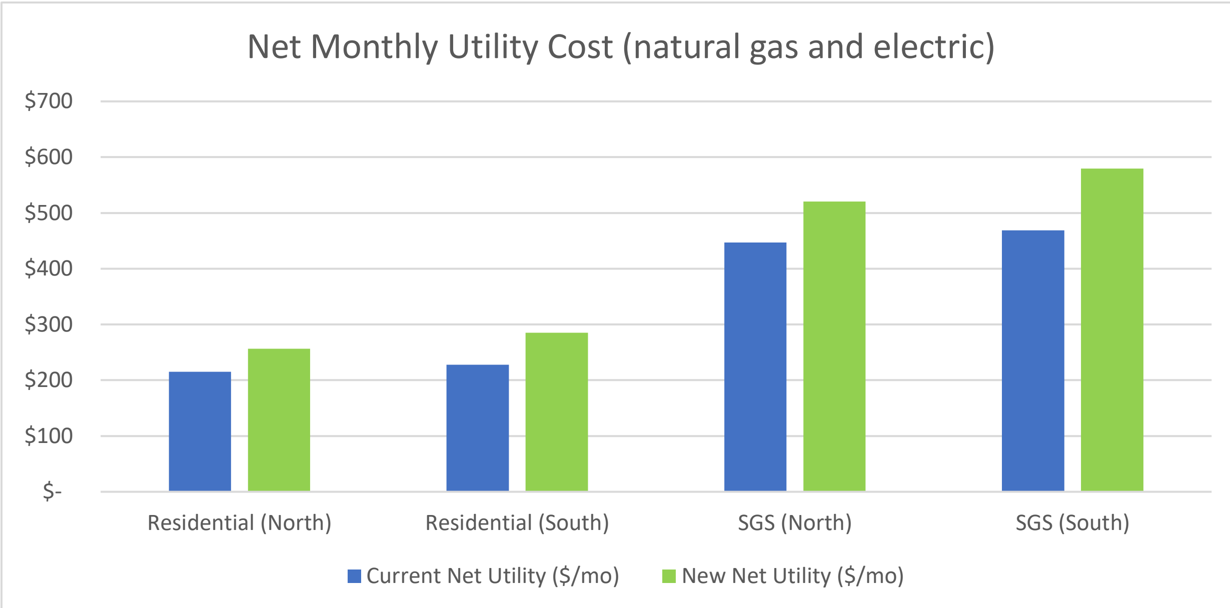


Figure 2.5 Comparison of modeled average net monthly utility cost (natural gas and electric) with and without heat pump system for members in North and South districts at current rates using natural gas

Cost parity for the average residential and SGS members is not obtained until the price of electricity is equal to or less than $0.11/kWh and $0.12/kWh, respectively. A reduction of the energy charge by more than 30 percent would be required for Chugach to provide a special residential heat pump rate at cost parity with natural gas heat. For SGS members, a reduction of between 5-40 percent would be necessary to reach cost parity with natural gas. SGS members in the North District are currently the closest to cost parity with natural gas, and a 5 percent reduction of the energy charge on delivered electricity resulting in a retail rate of approximately $0.1225. The low cost of natural gas available to most of the Chugach service area does not indicate that heat pumps are currently cost-effective for most members, and a rate adjustment to reach cost parity with natural gas would require significant reductions in the energy charge.

	Current retail rate ($/kWh)	Retail Cost Parity ($/kWh)	Current Energy charge ($/kWh)	Equiv. Energy Charge at cost parity ($/kWh)	Energy Charge decrease %
N. Residential	$0.1774	$0.1199	$0.1527	**$0.0952**	-38%
N. SGS	$0.1435	$0.1226	$0.1188	**$0.0979**	-18%
S. Residential	$0.1991	$0.1199	$0.1351	**$0.0559**	-59%
S. SGS	$0.1607	$0.1226	$0.0967	**$0.0586**	-39%

Table 2.5 Heat pump vs. natural gas cost parity and equivalent energy charge compared to actual energy charge.

Cost Comparison – Fuel Oil Heat

Approximately 2.5 percent of Chugach members are located outside ENSTAR's certificated service area. These members do not have the option of natural gas fuel for space heating and may benefit from a heat pump at near cost parity, compared to either fuel oil or biomass source. Approximately 900 Chugach residential meters and 200 SGS meters within the Chugach service area do not have access to natural gas service. An additional 500 Residential and 300 SGS members within the Municipality of Anchorage do not have natural gas service. In total, Chugach members without natural gas service represent approximately 1 percent of residential and 1.5 percent of SGS members.

	Residential	SGS	Total members
Cooper Landing (99572)	389	68	457
Hope (99605)	211	35	245
Moose Pass (99631)	159	30	189
Tyonek (99682)	130	34	164
Municipality of Anchorage	536	163	699
Total without gas service	**1,425**	**330**	**1,754**
Total Chugach System	96,706	13,817	110,523

Table 3.1 Extended service area residential and small commercial members by service location. Source: DataDawg Total Active Residential and SGS Members as of 8/15/2022

Heat pumps are significantly more cost-competitive for members that rely on fuel oil for their primary heat source, as the cost of fuel oil is higher compared to natural gas. Since the cost of heating oil is also heavily influenced by global markets in comparison to Cook Inlet natural gas or electricity, a member heating their home or business with fuel oil has significantly more exposure to price volatility than they would with an electric heat pump. Continued price volatility and the high cost of purchasing bulk fuel oil could encourage a member to adopt an electric heat pump more readily than a member with natural gas heat.

	Average fuel oil (gal/mo)	Fuel oil with HP (gal/mo)	Average electric (kWh/mo)	Electric consumption with HP (kWh/mo)
Residential	42	13	600	1,200
SGS	120	32	1,250	2,880

Table 3.2 Comparison of average fuel oil consumption with and without a heat pump system

	Average net utility cost ($/month)	Net utility cost with heat pump ($/month)	Percent difference
Residential	$293	$222	-24%
SGS	$677	$635	-6%

Table 3.3 Comparison of average net monthly heating cost with and without heat pump system for representative South district member at current rates using fuel oil at retail price of $4.25 residential and $4.00 commercial

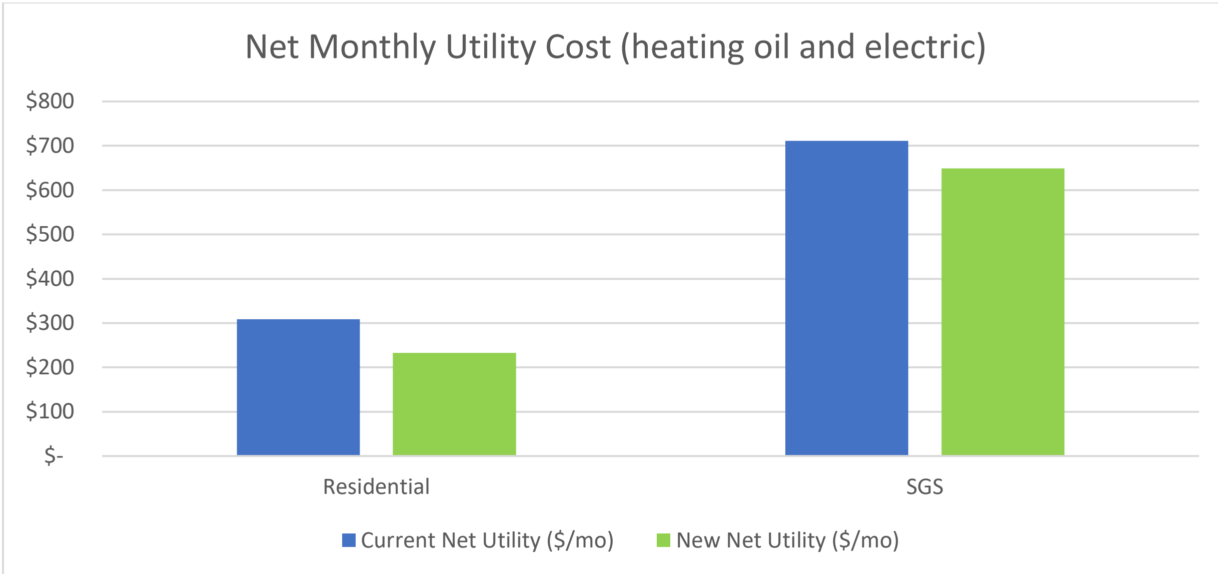


Figure 3.1 Comparison of average net monthly heating cost with and without heat pump system for representative South district member at current rates using fuel oil at a retail price of $4.25 residential and $4.00 commercial

At current retail rates, cost parity for residential members in the extended service area may be as low as $2.25/gal for fuel oil (#1 heating fuel), and approximately $3.65/gal for SGS members. A heat pump is assumed to displace 80 percent of fuel oil consumption for residential members and 90 percent for SGS members.

Emissions and Natural Gas Consumption

Carbon Comparison

Heat pumps allow for increased electrification of a residential or commercial structure and shift carbon emissions from decentralized natural gas and oil furnaces to combined cycle gas turbine generators in the Chugach system. The high efficiency of an electric heat pump provides a meaningful reduction in carbon emissions compared to both natural gas and fuel oil space heating. Existing natural gas heating has a lower emission intensity than fuel oil, and as a result an electric heat pump provides a reduction of approximately 30 percent less carbon emissions compared to natural gas and over 40 percent reduction for fuel oil. This analysis assumes a system mix of approximately 12.5 percent renewables on the grid during heating months, but this could be higher for members with distributed generation and net metering.

	Average CO2 emissions (lbs/year)	CO2 with HP (lbs/year)	Percent difference
Residential gas	21,363	16,241	-24%
SGS gas	53,721	38,270	-28%
Residential oil	17,285	9,931	-43%
SGS oil	44,769	27,802	-38%

Table 3.1 Comparison of average annual CO2 emissions with and without heat pump

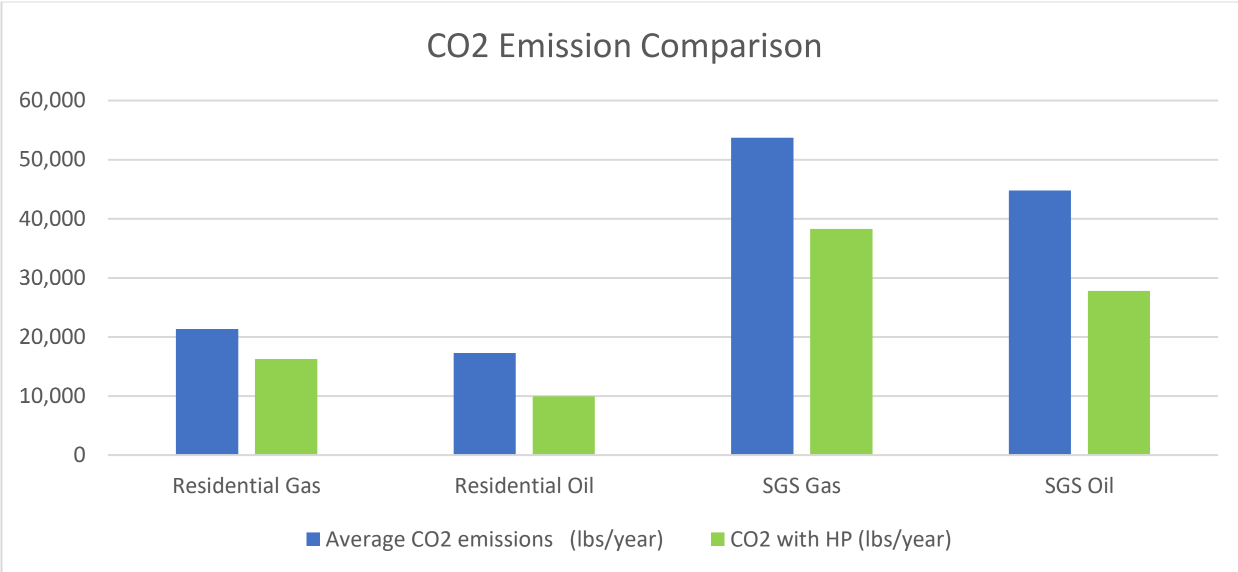


Figure 3.1 Average annual CO2 with and without heat pump

In addition to electric heat pumps, natural gas-powered heat pumps are also an option that is commercially available. The most common configuration is an absorption heat pump, which works similarly to an electric heat pump but uses a natural gas combustion chamber to provide a concentrated source of heat. Most available units are sized for larger commercial structures or homes over 2,500 sq feet. Less data is available on absorption heat pumps in Alaska, but national data indicates a COP of most units between 0.9 - 1.4. This could provide emission reductions of 10-30 percent for members with natural gas but would not significantly impact electric use.

Natural Gas Consumption

An average Chugach residential and SGS member is used to model emission intensity and gas consumption for this analysis. Net consumption in a base case represents the primary energy consumed from Cook Inlet natural gas fuel delivered to customers by ENSTAR, in addition to the natural gas consumed by Chugach for power. On average, a modeled residential member could represent approximately a 25 percent reduction in primary energy consumed by switching to an electric heat pump, and an SGS member would represent approximately a 30 percent reduction, assuming an average generation mix of 12.5 percent renewables. Although this reduction in total natural gas consumption per member would reduce the net natural gas consumed from Cook Inlet, it would increase the proportion of the total gas consumed from the BRU field. As the percent of renewable generation increases, the amount of Cook Inlet gas avoided would similarly increase. A gas-powered absorption heat pump could provide a similar reduction of natural gas consumption by 20-30 percent but would not benefit from increases in renewable energy.

System impacts

The overall impact on the Chugach system will depend on both the rate of electric heat pump adoption by residential and SGS members, as well as the efficiency and configuration of the individual heat pump systems. Prioritizing electric heat pumps with higher seasonal efficiency will maximize the emission reduction and natural gas avoided but will also increase peak load during the coldest hours of the day as members rely less on the auxiliary heating system. For this analysis, peak load assumes an electric load per heat pump system of 2.2 kW for residential systems and 4.5 kW for SGS systems. The total gas avoided is inclusive of natural gas for space heat that is displaced by an electric heat pump system, minus the additional natural gas Chugach would consume to generate the power.

Low adoption and high adoption scenarios are provided for general comparison. A low adoption scenario assumes a linear rate of adoption of 0.15 percent annually for 10 years for residential and 0.20 percent for SGS member categories, and assuming no growth of the total member base. A high adoption scenario assumes a base adoption rate of 0.25 percent annually with an inflection point increasing to 0.75 percent for residential and 1 percent for SGS members after the 5th year (2027). The High adoption scenario also assumes a consistent 2.5 percent annual adoption rate for residential and 3.0 percent for SGS members in the extended service area currently without access to natural gas.

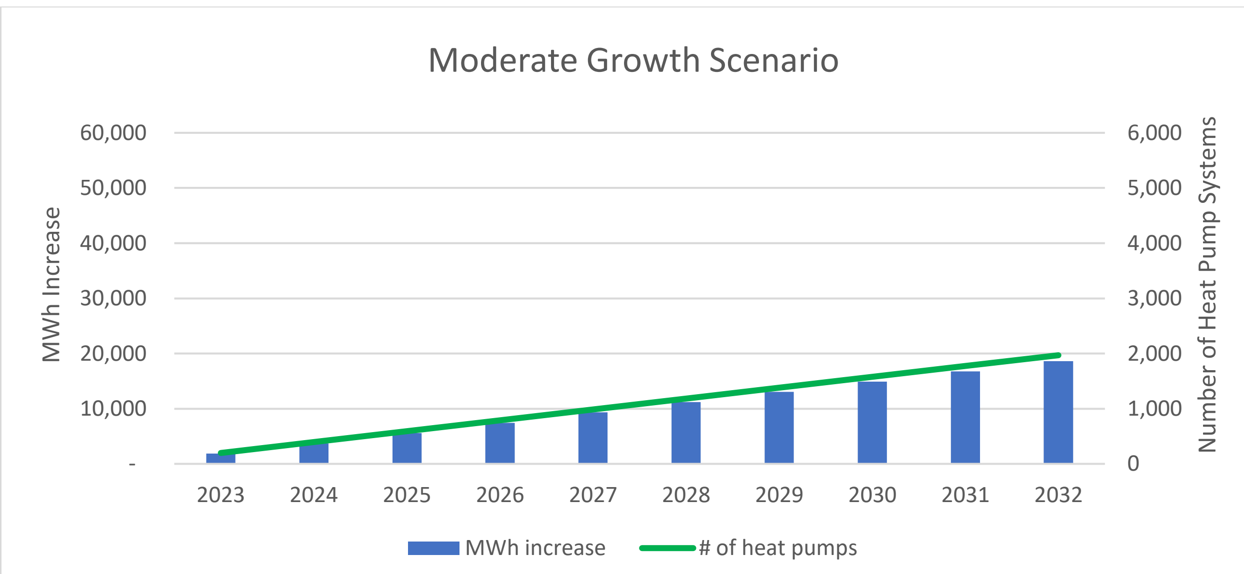


Table 4.1 Moderate heat pump adoption scenario (0.15% annual residential and 0.20% SGS adoption)

	Residential (HP systems)	SGS (HP systems)	Total increase (MWh/year)	Total Residential + SGS % increase (MWh)	Peak load increase (MW)	Gas avoided (Mcf/yr)
5-year increase	823	161	9,313	1.2%	2.5	543,699
10-year increase	1,646	323	16,247	2.1%	5.1	1,087,398

Table 4.1 Moderate heat pump adoption scenario (0.15% annual residential and 0.20% SGS adoption)

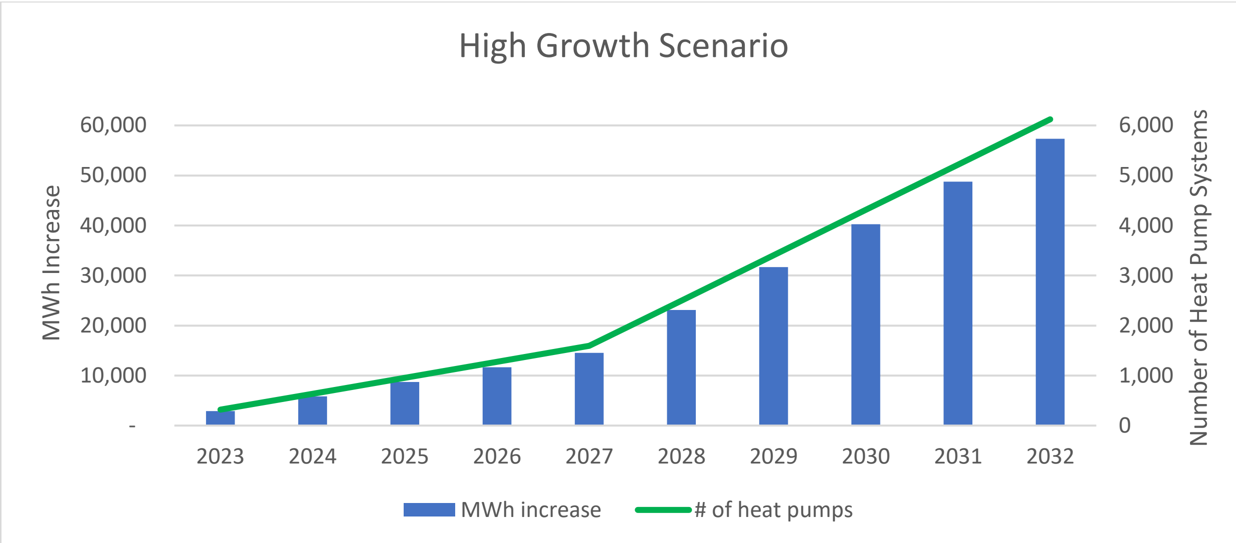


Figure 4.2 High heat pump adoption scenario (0.25% annual adoption increasing to 0.75% for residential and 1.0% for SGS members after year five)

	Residential (HP systems)	SGS (HP systems)	Total increase (MWh/year)	Total Residential + SGS % increase (MWh)	Peak load increase (MW)	Mcf gas avoided
5-year increase	1,371	222	14,532	2.5%	4.0	847,101
10-year increase	5,160	962	52,949	9.9%	15.7	3,345,789

Table 4.2 High heat pump adoption scenario (0.25% annual adoption increasing to 0.75% for residential and 1.0% for SGS members after year five)

Financial Considerations

Cost to Members

Data is limited on actual installation costs of either ASHP or GSHP systems within the Chugach service area. Total installed costs for heat pumps vary greatly depending on the size of the system and the type of retrofit or new construction. A single mini split heat pump unit for a small structure or single room is significantly less expensive than a multi-head unit for large structure.

Installed costs for an ASHP retrofit into an existing structure varies widely, with an average cost of $4,000-8,000 for a single mini-split depending on the system, installer, and necessary electrical upgrades. Larger multi-head systems may run upwards of $10,000-$15,000 (Alaska HeatSmart, 2022). Older homes and commercial buildings will require more significant electrical upgrades to support the increased load of a heat pump system, although most of the structures in the Anchorage area are sufficiently modern to avoid major retrofit costs. The capital investment is a significant deterrent to heat pump adoption in Alaska and efforts have been made to reduce this barrier through various state and local incentives for heat pump systems.

Beginning in 2023, federal incentives for improved efficiency and electrification will provide rebates and tax credits for residential and commercial members to make improvements to their homes and businesses with a goal of increasing electrification and energy efficiency. The High-Efficiency Electric Home Rebate Program establishes efficiency categories and corresponding rebate amounts, and limit rebates to up to 50 percent of project cost for median-income households, and up to 100 percent of project for low-income households. A rebate from Chugach would not be limited by household income.

Federal Rebate	Low Income Household	Median Income Household
Heat Pump System	Up to $8,000	Up to $4,000
Electric Load Service Center	Up to $4,000	Up to $2,000
Insulation, sealing, ventilation	Up to $1,600	Up to $800
Electric Wiring	Up to $2,500	Up to $1,250
Total combined amount	Up to $14,000	Up to $7,000

Table 5.1 Federal High-Efficiency Electric Home Rebate Program

For example, a median income household that installs a heat pump system and related upgrades for a total cost of $6,000 could be eligible for up to $3,000 in Federal rebates for a 50 percent reduction of total project cost. Alternatively, the Energy Efficient Home Improvement tax credit program will allow the option for households to deduct up to 30 percent of the installed costs for a heat pump system and related upgrades up to $2,000. In the example above, a household would be eligible for an $1,800 tax credit for a 30 percent reduction of total project cost.

Comparable Incentives and Programs

Several types of incentive programs exist for promoting heat pump adoption and reducing the barrier to entry, including special rates and rebate programs within Alaska. Alaska Electric Light & Power in the Juneau area offers a heat pump-specific electric rate, although this is primarily a relic of older rate schedules with a demand charge and is not typically used by current members. The most common incentive is a one-time rebate to defray up-front installed costs. One current example is Alaska Power & Telephone, which offers a $500 one-time rebate on the total installed cost of a heat pump system. SeaAlaska supports this program within their region and provides a matching $500 for SeaAlaska shareholders. Although installed costs vary significantly, a $500 rebate typically covers about 5-10 percent of total installed cost for a mini-split unit. A more complex but very successful program is offered in Maine through Efficiency Maine, the non-profit trust administrator for state efficiency programs. This heat pump rebate program provides a tiered structure, offering a larger rebate for a more efficient heat pump models. The incentive applies toward up to two heat pumps, with the second unit receiving 50 percent the amount of the first. The program offers up to $1200 combined for top-rated heat pumps, typically covering over 10 percent of installed cost.

Within Alaska, a 501(c)(3) non-profit called Alaska Heat Smart was recently established in the Southeast region specifically to promote heat pump adoption. This organization is supported in partnership with AEL&P, AHFC, the City and Borough of Juneau, and others. Alaska Heat Smart provides resources for residents considering heat pumps and serves as an intermediary between residents and local installers, as well as providing home energy assessments and heat pump recommendations. Coordination from Alaska Heat Smart reduces the burden on the utility to coordinate aspects of education, incentives, and home assessments. This has proven to be a successful business model, and the program could be expanded to support residential members in the Chugach service area.

Potential Chugach Program

Since the up-front installation cost is the primary impediment to heat pump adoption, a moderate Chugach rebate to help defray total installed costs could encourage a small pilot program of early adopters to deploy electric heat pumps. A small pilot program of approximately 100 residential and 20 SGS participants per year would represent less than 1 percent of total members. An incentive program of a one-time rebate of $900 for residential and $1,500 for SGS members towards total installed cost would be comparable in magnitude to current incentive programs for EV chargers and may provide encourage early adopters who are primarily interested in reducing carbon emissions and exposure to heating fuel price volatility. A total pilot program target of 100 residential and 20 SGS members could reach the intended goal of 1,000 MWh of additional sales by the end of year three if fully subscribed. It is anticipated that the first year of the program would likely be around 25 percent subscribed, and additional members could be added in year two or three to meet the goal for total number of participants.

	Program participants	Incentive cost	Annual load increase (MWh)	Annual sales increase (gross)
Residential	100	$90,000	360 - 792	$48,636 - $107,000
SGS	20	$30,000	210 - 462	$20,308 - $44,676
Program Total	**120**	**$120,000**	**570 – 1,254**	**$68,950 – 151,676**

Table 5.2 Conceptual incentive pilot program cost and potential rage of sales increase if fully subscribed

	Total participants	Total Incentive cost	Total increase (MWh)	Fixed-cost contribution (net)
If 100% subscribed	120	$120,000	570 - 1,254	$1,301 - 183,349
If 50% subscribed	60	$60,000	143 - 627	$605 - 91,675

Table 5.3 Conceptual incentive pilot program cost and potential range of fixed-cost contribution at end of year 3

The increase in sales is determined by the number of project participants multiplied by the average annual increase in consumption (5.4 MWh for Residential, and 17.0 MWh for SGS). The fixed-cost contribution is represented by subtracting the incentive cost from the increased sales.

Requiring performance standards for a heat pump system eligible for a rebate incentive through a pilot program would increase the predictability of performance and ensure consistency with federal incentives. Heat pump models with a HSPF of 10 or greater are currently offered by more than seven different manufacturers in the United States, five of which have certified local installers in the Anchorage/Mat-Su region. Trained service technicians are currently limited but are anticipated to increase with accelerated deployment of electric heat pumps around the country.

The substantial investment required to retrofit homes and businesses with electric heat pumps will remain a challenge to adoption in the Chugach service area. A pilot program with a rebate incentive could encourage heat pump adoption and attract members who may be good candidates for electrified heating. A pilot program would provide meaningful data from a defined sample set of members which would inform economic analysis, future incentive programs, and infrastructure planning. This data would allow Chugach to better understand demand the threshold for SGS members and refine load forecasting models. The Department of Energy is currently supporting a cold climate heat pump challenge which will provide valuable analysis of heat pump performance in cold climates and should release findings in 2025 that could compliment a Chugach pilot program from 2023 to 2025.

Chugach Electric Association, Inc.

2022 Heat Pump Feasibility Study and Heat Pump Pilot Program Recommendation

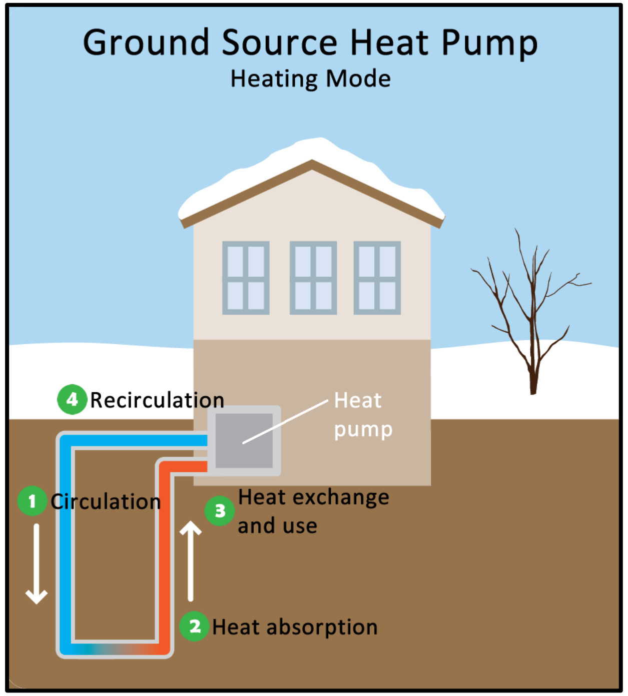
Mark Henspeter
Business Development
Operations Committee Meeting
October 19, 2022

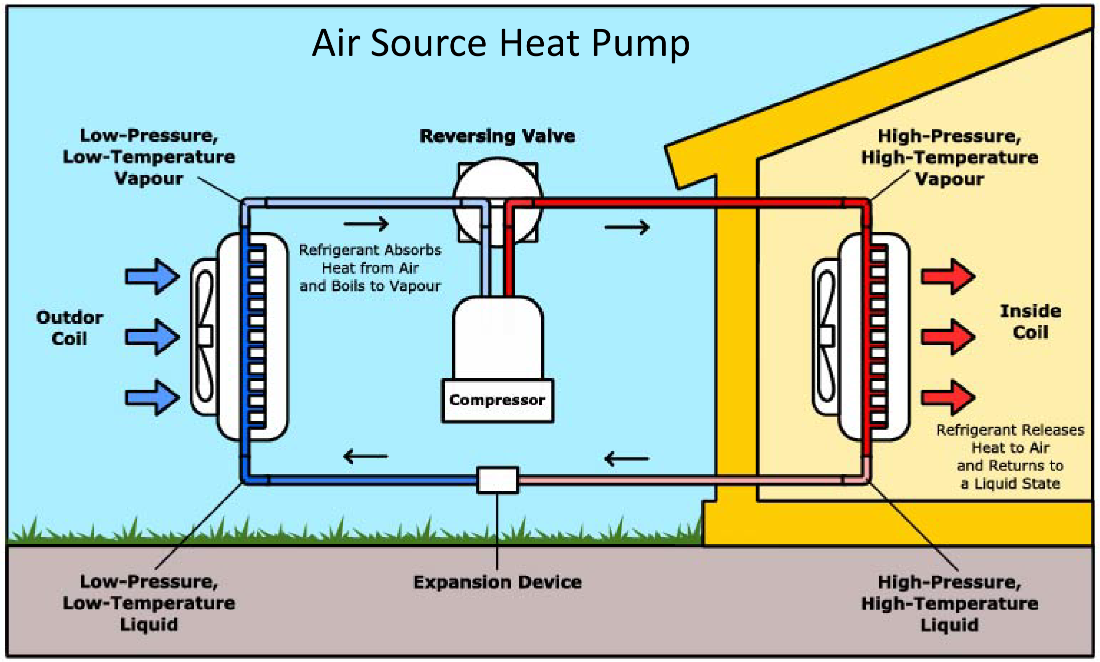
Why consider heat pumps?

- Heat pumps are a proven technology and can support beneficial electrification
- Heat pumps can help Chugach members lower the cost of heating their homes and businesses
- Heat pumps can help Chugach members reduce carbon emissions
- Heat pumps are a business development opportunity for Chugach to increase load and boost annual sales
- Chugach conducted a heat pump feasibility study in 2022 and plans to implement a pilot program in 2023

What is a heat pump?

- Two main categories of heat pump systems are Air-Source (ASHP) and Ground-Source (GSHP)
- Both types of heat pump systems are currently operating within the Chugach service area
- GSHPs are feasible but are highly site-specific and require significant dirt work
- ASHPs are feasible for retrofits or new construction and are available off-the-shelf
- Feasibility study evaluated ASHPs for Residential and Small General Service (SGS) members





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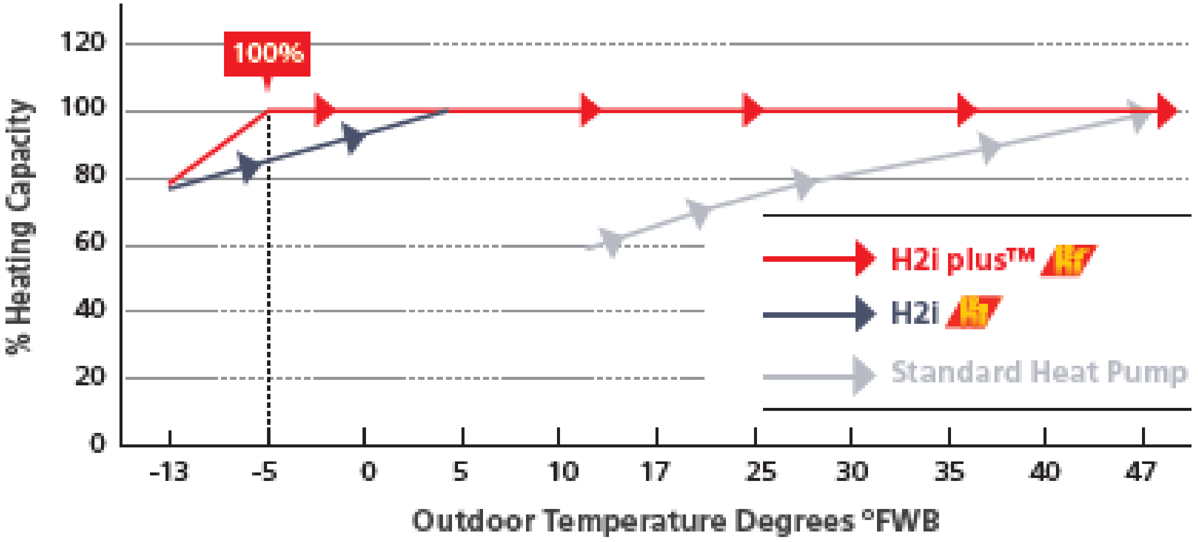
Air-Source Heat Pumps in the Chugach Service Area

- Approximately 85% of the annual heating season is above 5°F
- ASHPs that maintain 100% rated heating capacity at 5°F are available from multiple manufacturers
- For optimal performance, an ASHP could be installed as part of a hybrid heat system as the primary heat source when the temperature is about 5°F or above. An auxiliary heat source (natural gas, fuel oil, or biomass) would provide heat when the temperature is below 5°F
- A hybrid heat system is more cost-effective for members and would not significantly increase Chugach's winter peak loads



Mitsubishi HVAC promotional material: Hyper Heat (H2i) low-temperature heat pumps compared to standard heat pump

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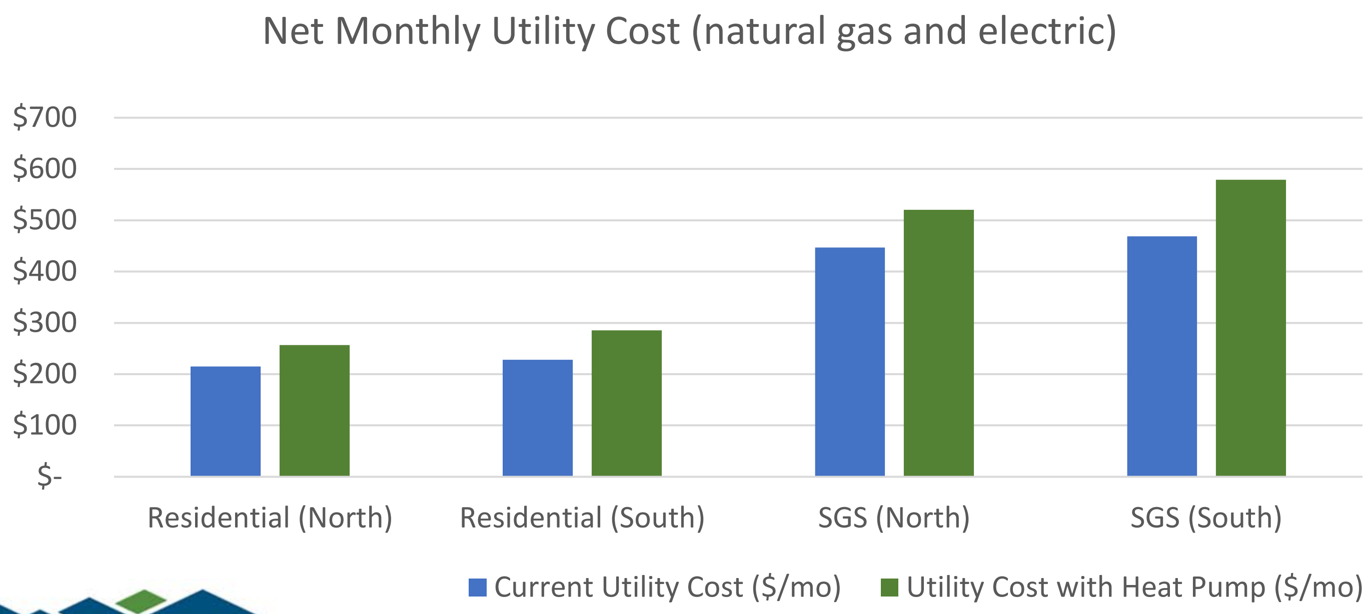
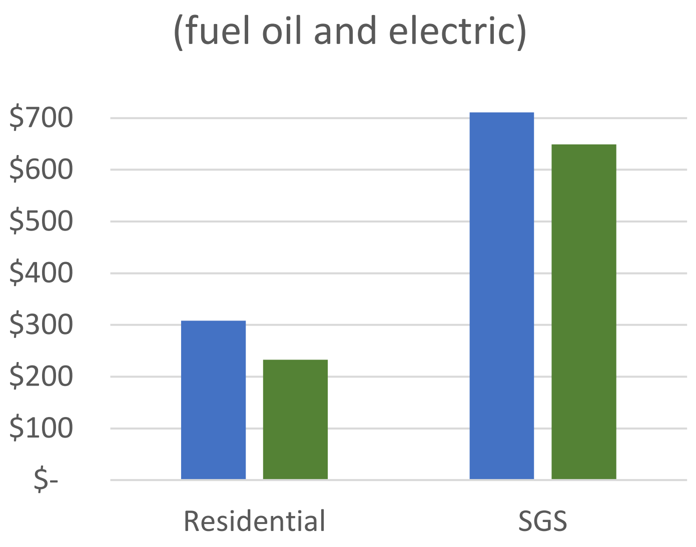
Air-Source Heat Pump Feasibility

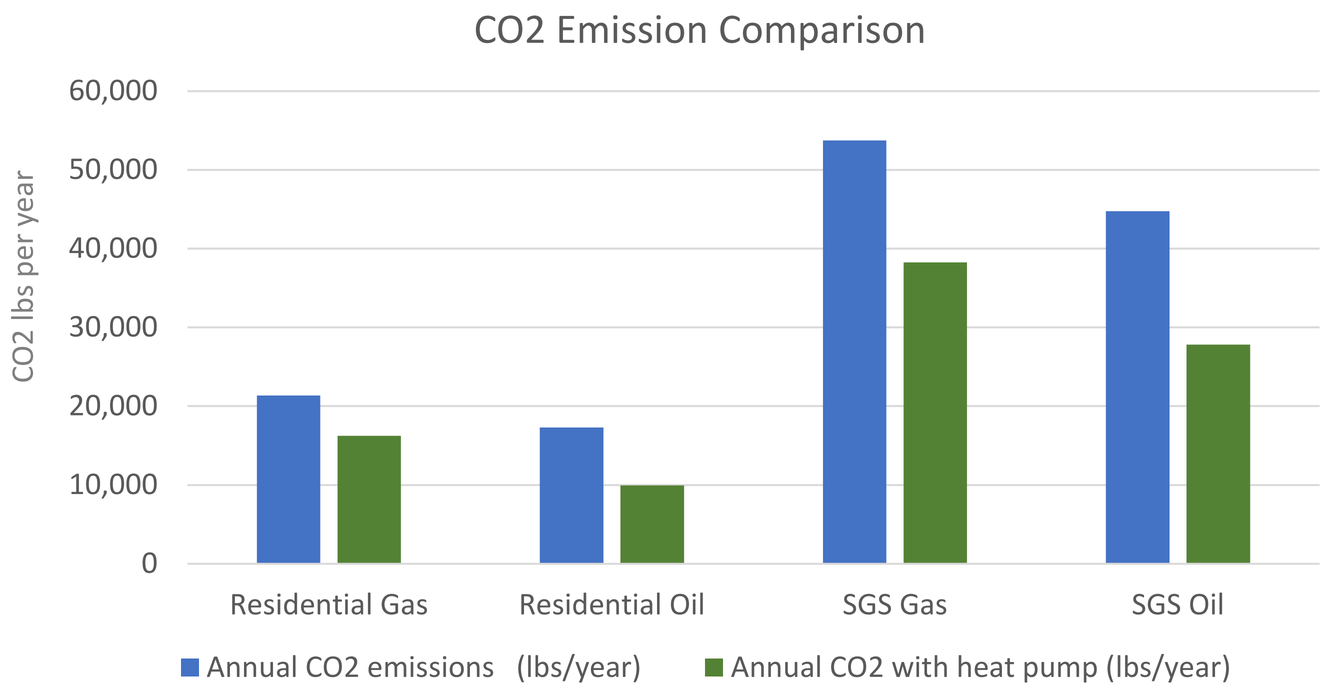
- Feasibility study evaluated ASHP potential for Residential and SGS members
- Results indicate that ASHPs could reduce net energy consumption and support approximately 80% of annual space heating
- ASHPs are not yet cost-competitive with natural gas heat but could reduce heating cost by 10-25% for members who use fuel oil
- Approximately 1,400 Residential and 300 SGS members do not have access to natural gas





Heat Pump Emission Reductions

- ASHPs could reduce net carbon emissions for residential and SGS members by 20-30% compared to natural gas heating and 35-45% compared to fuel oil heating



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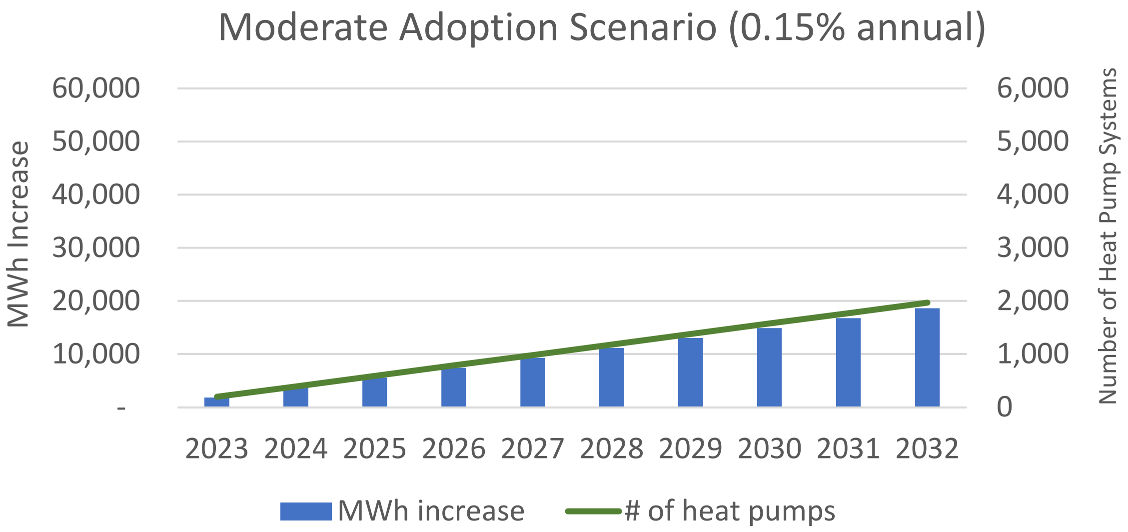
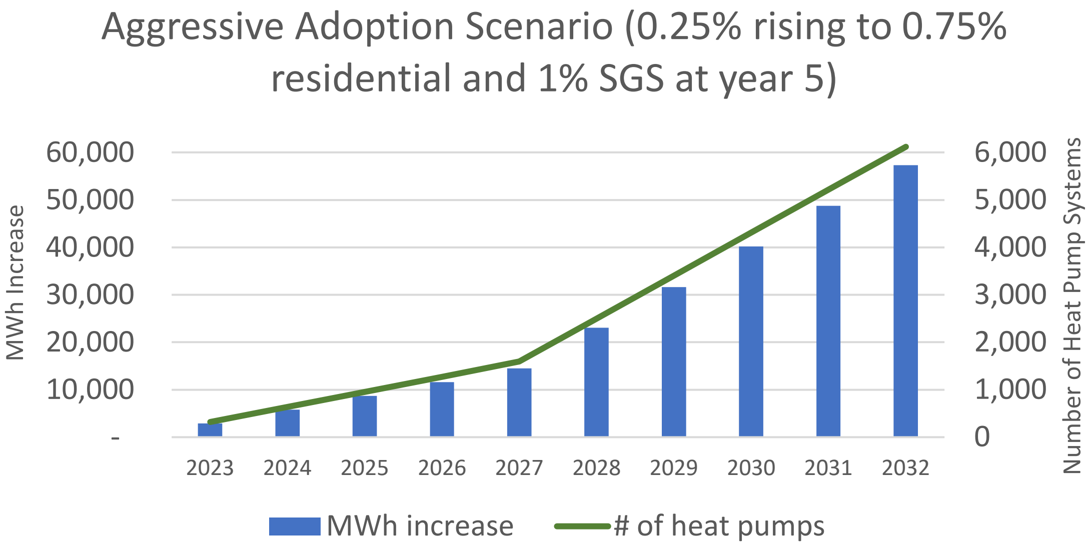
Heat Pump Rate of Adoption

- Adoption rate for ASHPs is expected to increase as cold climate performance continues to improve
- Based on the 2022 feasibility study, members who currently use fuel oil will be more likely to install a heat pump since it is cost-competitive
- Modeled scenarios show significant potential for increased sales but less significant increase to peak loads





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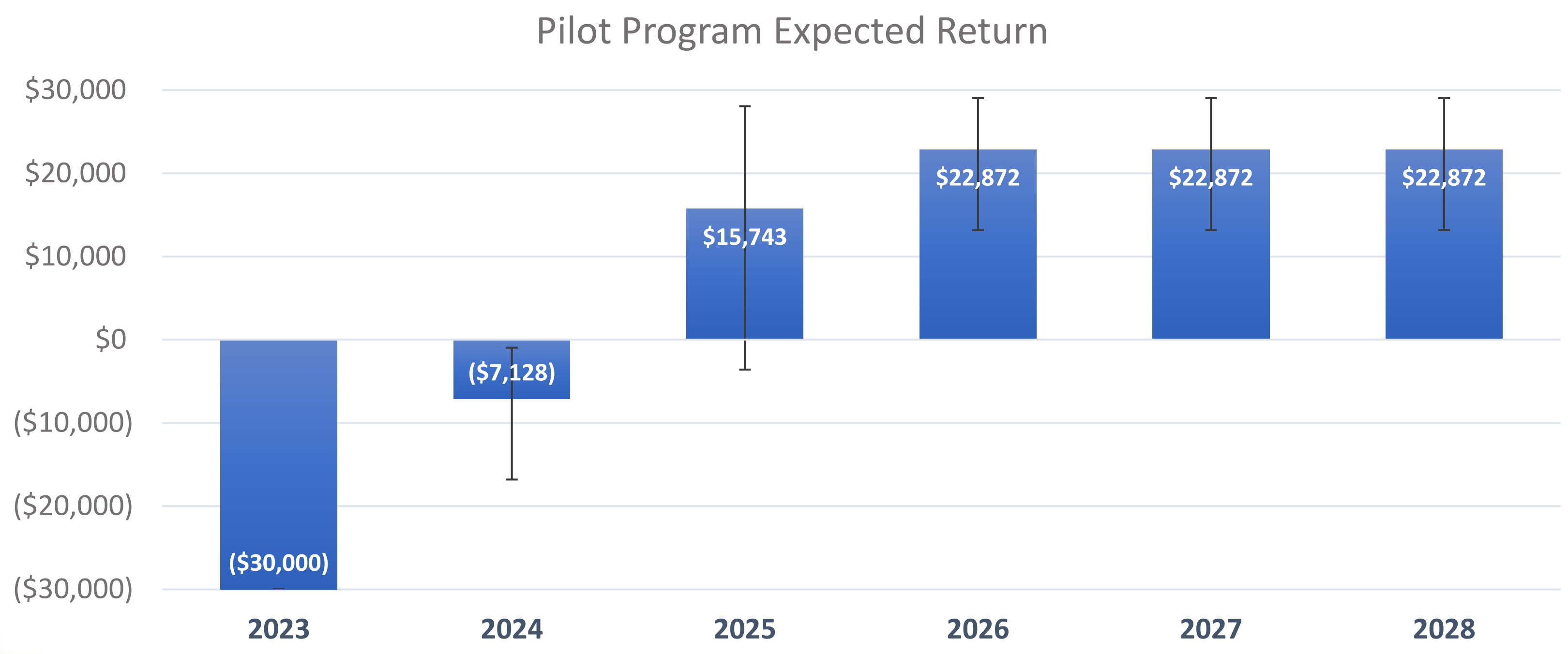
Heat Pump Pilot Program

- Year one of a pilot program would target 25 residential and 5 SGS members
- Provide a rebate incentive up to 15 percent of the total installed cost of a heat pump system with a limit of $900 per residential member and $1,500 per SGS member



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Heat Pump Pilot Program

- Use social media and targeted email to focused marketing of pilot program to members without natural gas service
- Expand targeted marketing to Residential and SGS members specifically interested in reducing carbon emissions
- Work with local distributors and installers to raise awareness for pilot program and federal heat pump incentives

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Heat Pump Pilot Program

- A pilot program would provide insight on real-world performance of ASHPs in the Chugach service area and inform continued analysis of economics and infrastructure impacts.

- A pilot program incentive would require a heat pump system be installed by a manufacturer-certified installer. The heat pump system would be required to have minimum performance standards consistent with Federal criteria for heat pump incentives and efficiency tax.

- If successful, a pilot program could be expanded in subsequent years. A pilot program of 100 residential and 20 SGS members could provide an increase of more than 1,000 MWh of annual sales and could deliver a positive return on investment within three years.

Next Steps

- Implement Pilot Program for ASHP starting Q1 2023 with an expected duration of three years
- Continue to evaluate opportunities for Large General Service members including both ASHPs and GSHPs in a potential phase two pilot program
- Engage with existing efficiency non-profits such as Alaska Heat Smart and investigate potential expansion into Chugach service area
- Engage with ongoing DOE cold-climate heat pump challenge

Questions?

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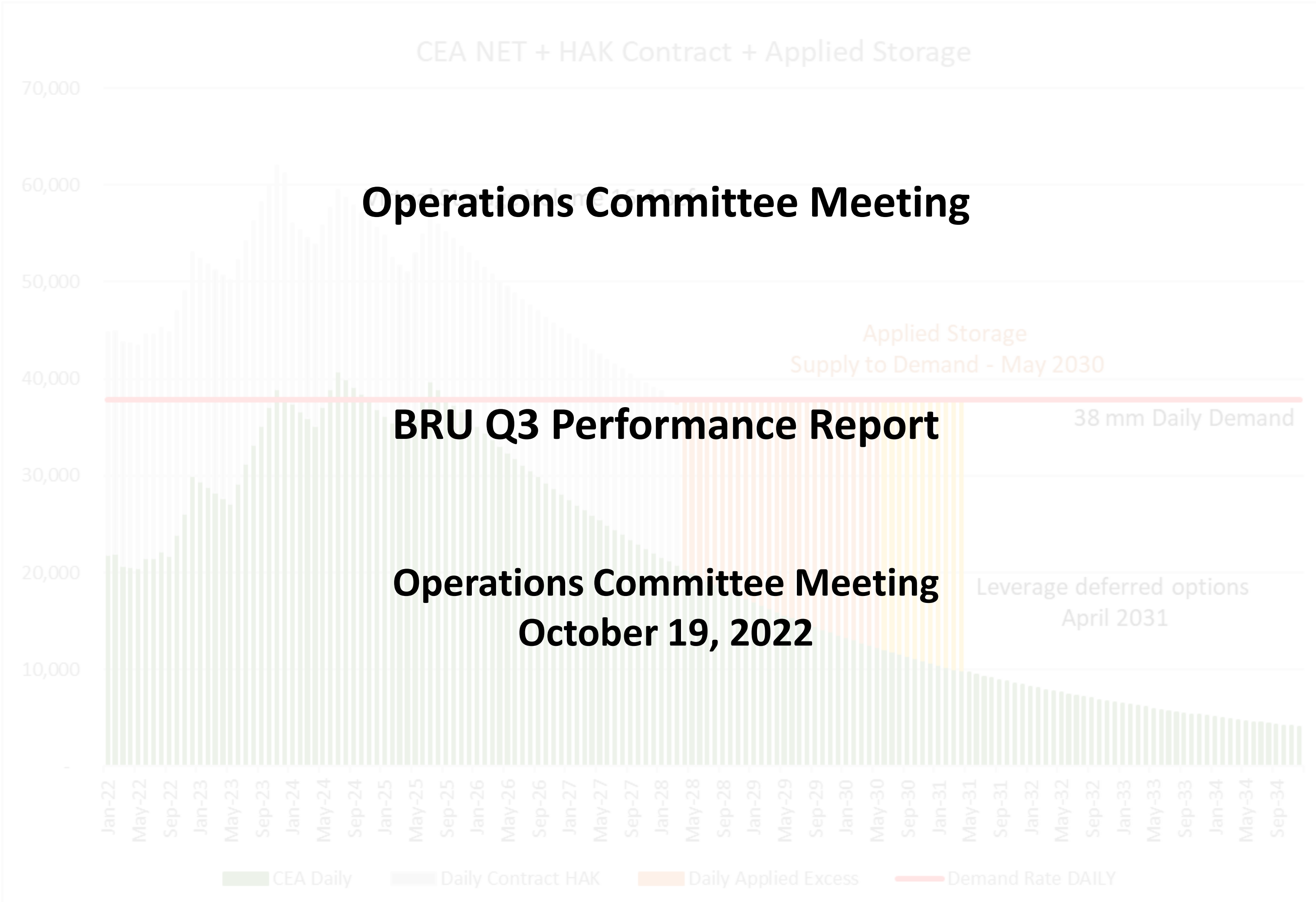
Operations Committee Meeting

BRU Q3 Performance Report

Operations Committee Meeting
October 19, 2022



BRU Q3 2022 Performance Report

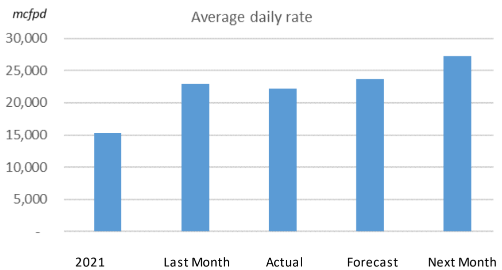
EFFECTIVE YTD SEPTEMBER SAVINGS @ $ 3.97 NET / mcf $ 23,661,533

September 2022

Production - NET to Chugach

September 2022 Production *(mcf)*

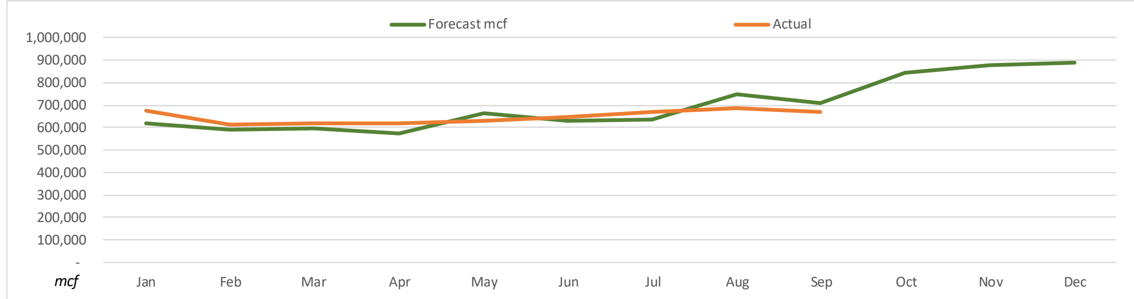
	Sep-21	Aug-22	September 2022 Actual	September 2022 Forecast	Oct-22 Forecast
NET Production	475,817	687,957	666,924	709,254	843,798
Average daily rate	15,349	22,932	22,231	23,642	27,219
Acitve wells	12		15		17



Production Forecast to Actual - NET to Chugach

NET YTD Production (mcf) 5,830,031

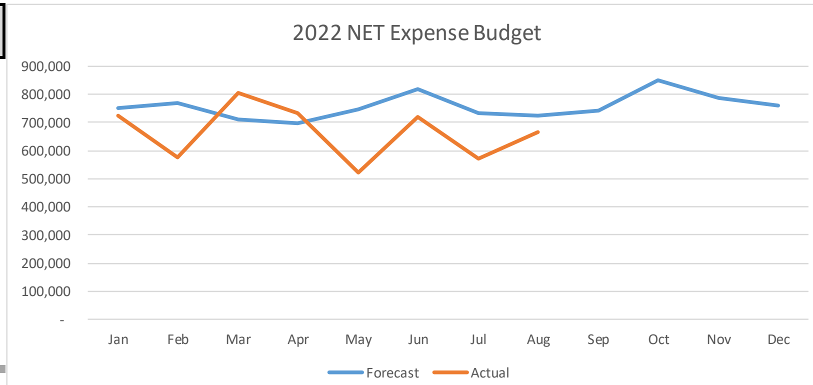
NET to CEA	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Forecast	616,698	593,363	596,839	572,669	663,943	629,763	637,831	747,748	709,254	843,798	877,023	888,259
Actual	676,274	613,636	620,834	618,365	632,886	645,458	667,697	687,957	666,924			
Month Variance	10%	3%	4%	8%	-5%	2%	5%	-8%	-6%			
Actual YTD	676,274	1,289,910	1,910,744	2,529,109	3,161,995	3,807,453	4,475,150	5,163,107	5,830,031			
YTD Variance	10%	7%	6%	6%	4%	4%	4%	2%	1%			



Budget Performance

BRU OPEX (Net CEA)

	Forecast	Actual	YTD Cum Delta	Variance
Jan	751,233	725,585	(25,648)	-3%
Feb	769,574	577,401	(217,821)	-14%
Mar	711,365	805,069	(124,117)	-6%
Apr	695,689	735,286	(84,520)	-3%
May	745,233	522,688	(307,065)	-8%
Jun	820,256	720,582	(406,739)	-9%
Jul	735,355	573,567	(568,527)	-11%
Aug	724,369	663,695	(629,201)	-11%
Sep	741,963	-	-	
Oct	852,147	-		
Nov	789,321	-		
Dec	761,349	-		
	9,097,854	5,323,873		



CAPEX Commitment

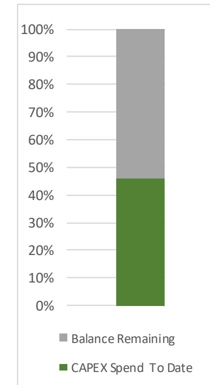
NET to Chugach

Total CAPEX Budget	$ 26,536,588
CAPEX Spend to Date	$ 12,231,734
Balance Remaining	$ 14,304,854

BRU - Gas Transfer Price

Field Ops	2.57
ARO Surcharge	0.52
Capital Recovery	1.41
GTP / mcf $	4.50

effective 10/1/22



Activity Highlights

- Continue gravel installation for pad expansions at H, J and K pads
- Drafting Joint Ballot Agreement for equipment & services
- F-pad flowline installation planned completion in October (2 wells)
- Completed drilling operations BRU 244-27, 222-34 F-pad
- Completed drilling operations 233-23 K-pad
- Drilling operations in progress BRU 214-13 K-pad
- 2022 Reserve Report Update approved by RCA
- 2022 ARO Study approved by RCA
- RCA approved GTP $ 4.50/Mcf effective October 1, 2022
- Chugach BRU Management Plan approved by RCA

CHUGACH ELECTRIC ASSOCIATION, INC.
Anchorage, Alaska

OPERATIONS COMMITTEE MEETING
AGENDA ITEM SUMMARY

October 19, 2022

ACTION REQUIRED **AGENDA ITEM NO. V.C.**

____ Information Only
_X__ Motion
_X__ Resolution
____ Executive Session
____ Other

TOPIC

Project Authorization – Quartz Creek Transmission Line Rebuild: Girdwood to Indian

DISCUSSION

The Quartz Creek Transmission Line is operated at 115 kV between the University Substation in Anchorage and the Quartz Creek Substation in Cooper Landing (Kenai Peninsula). The 90-mile line was originally installed in 1962 to export energy from the Cooper Lake Hydroelectric Project on the Kenai Peninsula to the Anchorage area. Sections of the line are over 50 years old and are nearing the end of their useful life.

Chugach Electric Association, Inc. (Chugach) has been rebuilding this transmission line since 2012 through which it has developed a consistent Basis of Design for the line. To date, approximately 36 miles of the line have been rebuilt. Below is the current status and the remaining schedule for the transmission line rebuild:

Transmission Line Segment	*Approx. Miles*	*Year*	*Status*
Completed Rebuilds			
Ingram to Silvertip	15	2012	Completed
Powerline Pass	6	2016	Completed
Silvertip to Hope	4	2017	Completed
Hope to Summit	10	2018	Completed
Placer River	1	2020	Completed
Completed Subtotal	***36***		
Planned Rebuilds			
Girdwood to Indian	11	2024	Planned
Summit Lake to Daves Creek	10	2026	Planned
Daves to Quartz	7	2029	Planned
Girdwood to Ingram	15	2031	Planned
Tudor Junction to Powerline Pass	11	2032	Planned
Planned Subtotal	***54***		
Total	***90***		

The Girdwood to Indian Substation transmission line segment, which spans approximately 11 miles, has been impacted by avalanches and equipment failures. Field inspections have revealed significant deterioration in structure foundations due to corrosion and ice damage. The rebuild will replace aging infrastructure with a more modern robust design addressing known operational challenges including mitigating impacts of avalanche slide areas, minimizing corrosion and ice damage of structures adjacent to Turnagain Arm, and reducing equipment failures by increasing the strength ratings. Consistent with past rebuilds of this transmission line, this section of line will be insulated to 230 kV standards for the added benefit of additional phase and ground clearances which has proved beneficial in operation of the rebuilt line sections; it increases reliability of the line by mitigating impacts of vegetation as well as snow and ice loading. Increasing conductor size and insulating to 230 kV also allows for future 230 kV operation with decreased losses and increased capacity of the line. The project also includes the increasing the size of the conductor and the addition of fiber optic cable between Indian and Girdwood Substations which will allow for retirement of an existing Power Line Carrier system and greater communication capacity.

This rebuild provides for double circuit construction between Tidewater Slough to the Girdwood Substation, which allows for future substation upgrades to support two transmission line terminals and an advanced bus design to reduce the impacts of outages during contingencies. It will enhance reliability for communities served by this transmission line.

The project is included in Chugach's 2022-2026 Capital Improvements Program and, if approved, will be included in the 2023 budget. The total project cost is estimated at $21,200,000.

MOTION

Move that the Operations Committee recommend the Chugach Electric Association, Inc. Board of Directors approve the attached resolution authorizing the Chief Executive Officer to approve project expenditures for the transmission line rebuild between the Girdwood Substation and the Indian Substation at an estimated total cost of $21,200,000 and with an estimated completion date of December 2024.

RESOLUTION

Quartz Creek Transmission Line Rebuild:
Girdwood to Indian Substation Project Authorization

WHEREAS, Chugach Electric Association, Inc.'s (Chugach) 90-mile transmission line that extends from the Quartz Creek Substation (Quartz Creek) in Cooper Landing to the University Substation (University) in Anchorage was installed in 1962 to export energy from the Cooper Lake Hydroelectric Project on the Kenai Peninsula to the Anchorage area;

WHEREAS, the Quartz Creek to University transmission line is essential for the delivery of energy and capacity to retail and wholesale members throughout Chugach's system;

WHEREAS, Chugach has rebuilt 36 of the 90-mile Quartz Creek to University transmission line to 230 kV, comprised of the Ingram to Silvertip segment in 2012, the Powerline Pass segment in 2016, the Silver to Hope segment in 2017, the Hope the Summit segment in 2018, and the Placer River segment in 2020;

WHEREAS, Chugach has identified the need to rebuild 11 miles of the transmission line extending between the Girdwood Substation and the Indian Substation to increase reliability and to mitigate deterioration of structure foundations;

WHEREAS, the Girdwood to Indian Substation transmission line segment is nearing the end of its useful life and the rebuild of this segment will address known operational challenges associated with avalanche slides, corrosion, clearance, and communication issues;

WHEREAS, the rebuild of the Girdwood to Indian Substation transmission line will be constructed to current standards and robust design requirements;

WHEREAS, the project will include double circuit construction from Tidewater Slough to the Girdwood Substation which will allow for future substation upgrades to support an additional transmission line terminal which in coordination with an advanced bus design will significantly increase reliability to communities in Chugach's service territory served by the Quartz Creek Transmission Line,

WHEREAS, the 230 kV construction standards provide additional clearances adding increased reliability and future operation consistent with the 2010 Railbelt Integrated Resource Plan;

WHEREAS, the conversion of the 115 kV line to 230 kV transmission line will result in a reduction in line losses from the Kenai Peninsula to Anchorage;

WHEREAS, the rebuild of the Quartz Creek to University transmission line is included in Chugach's 2022 – 2026 Capital Improvement Plan;

WHEREAS, Chugach has estimated the total cost of the project at $21,200,000.

NOW, THEREFORE, BE IT RESOLVED, that the Chugach Electric Association, Inc. Board of Directors authorizes the Chief Executive Officer to approve project expenditures for the rebuild of the Quartz Creek Transmission Line between the Girdwood Substation and the Indian Substation at an estimated amount of $21,200,000, with an estimated completion date of December 31, 2024.

CERTIFICATION

I, Samuel Cason, do hereby certify that I am the Secretary of Chugach Electric Association, Inc., an electric non-profit cooperative membership corporation organized and existing under the laws of the State of Alaska: that the foregoing is a complete and correct copy of a resolution adopted at a meeting of the Board of Directors of this corporation, duly and properly called and held on the 26th day of October, 2022; that a quorum was present at the meeting; that the resolution is set forth in the minutes of the meeting and has not been rescinded or modified.

IN WITNESS WHEREOF, I have hereunto subscribed my name and affixed the seal of this corporation the 26th day of October, 2022.

____

Secretary

Quartz Creek Transmission Line Rebuild: Girdwood to Indian

Operations Committee Meeting
October 19, 2022

CHUGACH
POWERING ALASKA'S FUTURE

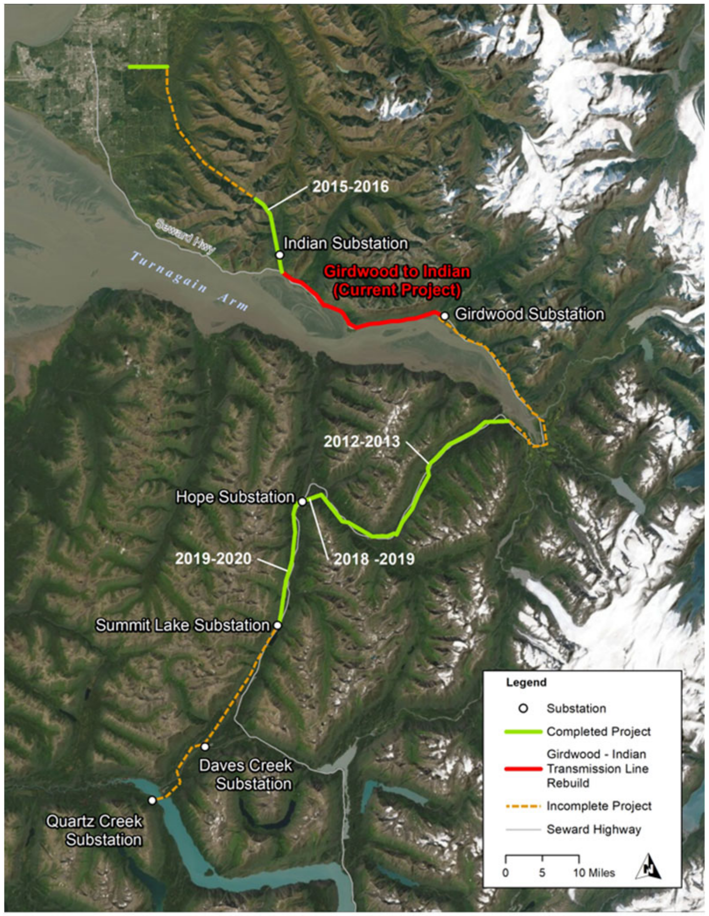
Quartz Creek Rebuild: Girdwood - Indian

<u>Introduction:</u>

- *Requesting an approved Motion for Project Authorization.*

<u>Description of Quartz Creek Transmission Line:</u>

- *Constructed in 1962 for Cooper Lake Hydroelectric Plant*
- *Transmission path for Bradley Lake energy (increased use)*
- *Serves communities in Chugach's territory*
- *Programmatic rebuild starting in 2012*
- *36 of 90 miles rebuilt to date*



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Quartz Creek Rebuild: Girdwood - Indian

Programmatic Upgrade Benefits:

- *Replacing assets nearing the end of useful life (original line const. 1962)*
- *Identified in an RIRP performed by B&V, February 2010*
- *Consistent Basis of Design and practices:*
  - *Insulating to 230 kV standards: raising clearances and preparing for future operation*
  - *Larger conductor: increasing strength, standardizing and lowering losses*
  - *Designed for Fiber Optic cable*
  - *50-year life robust design addressing known avalanche, strength, wind, icing and vegetation issues.*

Quartz Creek Rebuild: Girdwood - Indian

Proposed Rebuild Schedule

Completed Rebuilds	Approx. Miles	Year	Status
Ingram to Silvertip	15	2012	Complete
Powerline Pass	6	2016	Complete
Silvertip to Hope Sub.	4	2017	Complete
Hope Sub. to Summit Sub.	10	2018	Complete
Placer River	1	2020	Complete
Completed Subtotal	**36 miles**		
Planned Rebuilds			
Girdwood Sub. to Indian	11	2024	Planned
Summit Lake to Daves Creek Subs.	10	2026	Planned
Daves Creek to Quartz Creek Subs.	7	2029	Planned
Girdwood Sub. to Ingram Creek	15	2031	Planned
Tudor Junction to Powerline Pass	11	2032	Planned
Planned Subtotal	**54 miles**		
Total	**90 miles**		

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Quartz Creek Rebuild: Girdwood - Indian

Girdwood to Indian Project Justification:

- *Foundation/anchor corrosion and other damage*
- *Safety concerns*
- *Double circuit construction from Tidewater Slough into GWSS*
- *Programmatic benefits*

Girdwood to Indian Scope of Work:

- *11 miles of transmission line 12 miles of Fiber optic cable*
- *Retire existing transmission line*
- *Install new: conductor, fiber optic cable, structures, guys, anchors and foundations*
  - *Wood, galvanized and weathered steel construction*

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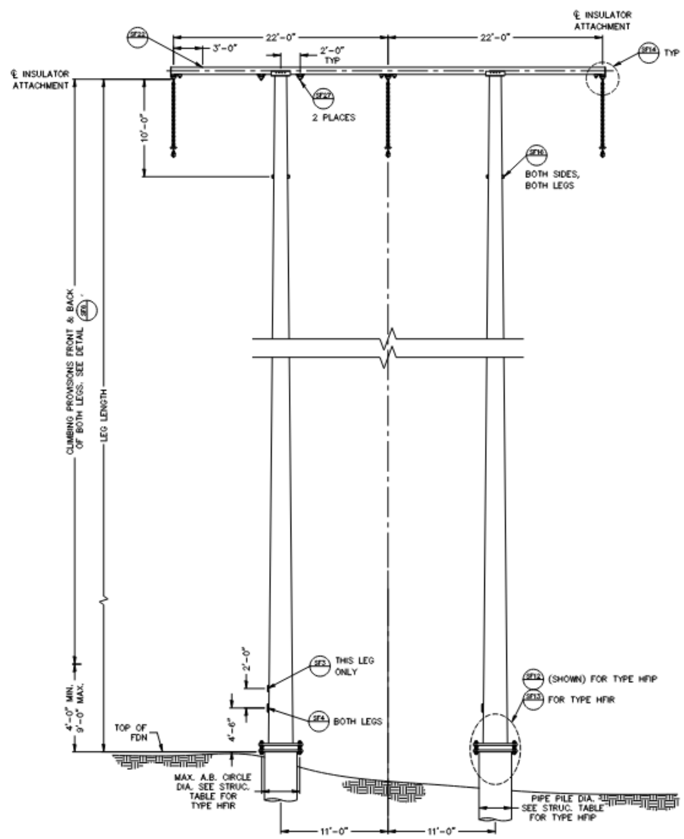
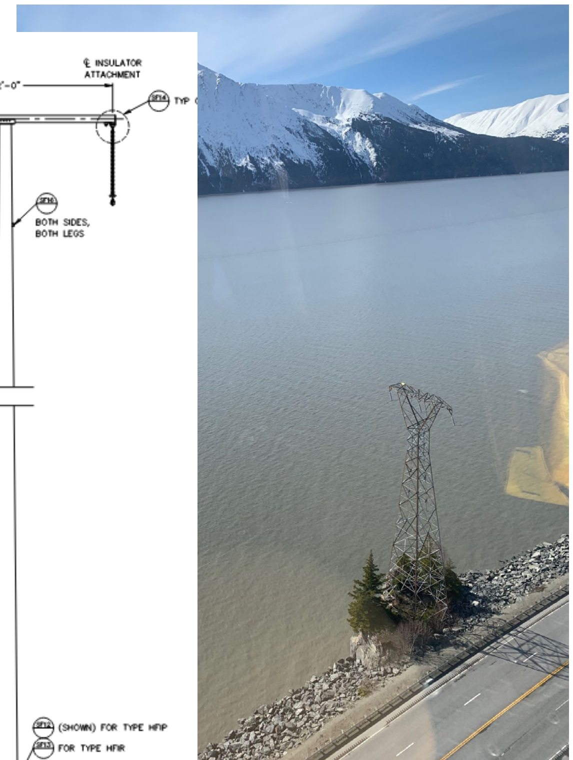
Quartz Creek Rebuild: Girdwood - Indian

Risks and Constraints

- *Commodity pricing, inflation and supply chain issues*
- *Labor resources*
- *Outage duration on this transmission line*
  - *Constrained by Bradley Lake Participants and other factors*
- *Construction*
  - *Location and complexity*
- *Engagement with external entities*





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Quartz Creek Rebuild: Girdwood - Indian

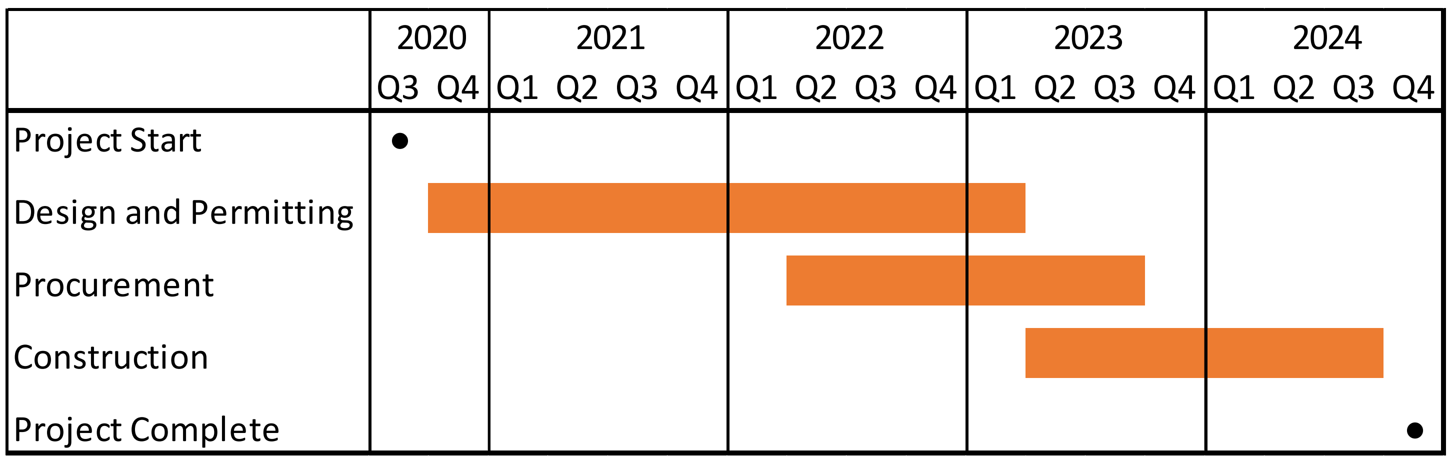
Project Estimate and Authorization: $21.2 M

- *Total Installed Cost Estimate*
- *Included in the 2022-2026 CIP*

Category	Estimate
Labor	$0.65 M
Professional Services	$1.3 M
Materials	$7.3 M
Construction	$11.9 M
Total Installed Cost Estimate	***$21.2 M***

Project Schedule:

- *Design in progress*
- *Permitting in progress*



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