

Yakutat Tlingit Tribe

606 Forest Hwy. 10 * P.O. Box 418 * Yakutat, Alaska 99689
Phone (907) 784-3238 * Fax (907) 784-3595 * www.yttribe.org



REQUEST FOR QUOTE

Title: ANB/ANS Energy Efficiency Measures

Project No: 2020-01 Start Phase 2

Location: Yakutat, Alaska

RFQ Release Date: February 21, 2020

RFO Mandatory Pre-Bid: February 27, 2020, 12:00PM
ANB/ANS Hall

Request for Information: March 10, 2020, 2:00PM by Email

RFQ DUE DATE: March 13, 2020, 2:00PM (SEALED QUOTE)

Deliver or Mail to: Yakutat Tlingit Tribe

MISSION: To preserve, maintain and protect the unique culture, land & resources of Yakutat Tlingit people;
to maximize our social, health & well-being while creating economic development benefits to all tribal members.



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Appendix A: ANTHC Yakutat Alaska Native Brotherhood Hall Energy Audit Report

1. Project Directory

Point of Contact: (Bidding Phase)	Nathan Moulton, Executive Director Yakutat Tlingit Tribe P.O. Box 418 Yakutat, Alaska 99689	P: (907) 784-3238 ext. 102 F: (907) 784-3595 nmoulton@ytttribe.org
Project Manager: (Bidding Phase)	Ralph Wolfe, Community Catalyst Yak-Tat Kwaan, Inc. P.O. Box 418 Yakutat, AK 99689	P: (907) 784-3238 ext. 108 F: (907) 784-3595 rwolfe@ytttribe.org
Project Locations:	<u>ANB/ANS Hall</u> Yakutat, AK 99689	
Building(s) Owner:	Property Manager, Cynthia Peterson (Acting) P.O. Box 418 Yakutat, AK 99689	P: (907) 784 3238 ext. 101 F: (907) 784-3595 cpetersen@ytttribe.org
Energy Consultant:	ANTHC-Energy Projects Group Kelli Whelan 4500 Diplomacy Drive Anchorage, AK 99508	P: (907) 729-3723 kmwhelan@anthc.org

2. List of Documents

Type	Author	Notes
Yakutat Alaska Native Brotherhood Hall Energy Audit Report	Kelli Whelan, Energy Auditor	Appendix A

3. Invitation for Quote

Quote documents will be received in accordance with the time schedule shown below by the:

Yakutat Tlingit Tribe
P.O. Box 418
Yakutat, Alaska 99689
Attention: Nathan Moulton

The outside of the envelope containing the documents will clearly state the words:

**“Enclosed Vendor Quote for ANB Energy
Energy Efficiency Measures”**

Pre-Bid Job Walk and Requests for Information:

As no formal plans exist for this facility, we will hold a mandatory pre-bid job walk on February 27, 2020 at 12:00 PM or by appointment on the 24th-26th, to allow contractors an opportunity to physically inspect the premises where work will occur. Contractors not present or excused by appointment on the 24th-26th, will be excluded from the RFQ process. Contractors will be required to complete sign in sheet verifying attendance.

Requests from bidders for interpretation or clarification of the bidding documents shall be made in writing to Nathan Moulton by email at nmoulton@ytttribe.org no later than seven (3) days prior to the date for opening bids (March 10, 2020 at 2:00 PM).

Bid opens at: 2:00 P.M local time, (March 13, 2020)

At the above time and date the bids will be opened privately and read. Bids must be received by YTT prior to the time fixed for opening of the bids to be considered. Time receipt will be determined by the time stamp in the YTT Office.

YTT reserves the right to reject any and all bids and to waive any information in the bids. No bidder may withdraw their bid after the hour set for bid opening, or before the award of contract unless said award is delayed for a period exceeding sixty (60) days from time of the opening.

YTT shall not be responsible for bid preparation costs, nor for costs, including attorney fees, associated with any challenge to the determination of the lowest responsive and responsible bidder and or award of contract, and or rejection of bids. By submitting a bid each bidder agrees to be bound in this respect and waives all claims to such costs and fees.

YTT assumes no responsibility for any interpretations or presentations made by any of its officers or agents unless interpretations or presentations are made by written addendum to this RFQ.

4. Bidder Checklists

All Bidders shall include the following documentation within their submittal package;

Required Documents

- I. Written Bid Proposal consisting of detailed approach, and schedule/timeline to complete all scope of works here-in
- II. Contractor Cost Detail Sheet (to be completed per Scope of Work outlined pages 7-11)
- III. Certificate of insurance
- IV. Certificate of Compliance
- V. Contract

5. Bid Proposal

Date Submitted: _____

To: Yakutat Tlingit Tribe
P.O. Box 418
Yakutat, Alaska 99689
Attention: Nathan Moulton

Subject: Request for Quote 2020-01 Start Phase 2

Project Title: ANB/ANS Energy Efficiency Measures

Pursuant to and in compliance with subject Request for Proposal, and other bid documents relating thereto, the bidder hereby proposes to supply/furnish labor and materials and to perform all work for the completion of the above project in the strictest accordance with the bid documentation for the sum of:

Lump Sum \$ _____

Contractor Cost Detail Attachment

Price and List Each Task Item individually so owner may easily verify and decide if any value engineering is required on the project.

Time line:

The bidder agrees, if awarded the contract, to commence and complete the work by May 31, 2020.

Type of Business _____

The awarded bidder represents that it operates as;

- a) A corporation
- b) An individual
- c) An LLC
- d) A non-profit organization
- e) A JV

Company Name: _____

Date: _____

AK Contractor's License Number: _____

Employer's Tax Identification Number: _____

Contractor's Duns Number (If applicable): _____

Authorized Representative Signature: _____

Printed name and title: _____

Mailing Address: _____

Company phone and fax: _____

Company email:

6. Project Details

a) **Summary**

The Yakutat Tlingit Tribe is soliciting sealed quotes from qualified Contractors to complete energy efficiency measures and conservation upgrades on the following buildings:

ANB/ANS Hall, Yakutat Alaska 99689

b) **Background**

This facility provides critical programs for community events. Reducing the cost of heat and power to these buildings will increase the funds available to provide additional and critical services to community residents, tribal members and visitors.

c) **Objectives**

The goal of this project is to reduce energy costs and upgrade aging HVAC systems in the ANB/ANS Hall.

d) **Approach**

The Yakutat Tlingit Tribe will seek quotes from authorized contractors within the State of Alaska to provide the Energy Efficiency Measures recommended by the Energy Audit Report. All quotes should include costs for materials purchase, transport, and installation.

8. Scope of Work

ANB/ANS HALL

*(Note: Refer to Appendix A: Energy Audit Report-
TABLE 2 Priority List pages 4-5 and all other included pages)
Tasks are identified in the audit by Rank numbers as listed below)*

Task 1.0 Lighting Measures (Rank 1)

Replace fluorescent and incandescent lighting with new LED equivalent.

Task 2.0 Insulation Measures (Rank 2)

Insulate under floor (IF UNINSULATED) with R-21 Faced Fiberglass Batting and associated vapor barrier as required per code.

Add additional blown in cellulose insulation to attic spaces to a minimum of 12 inches.

Install R20 rigid foam board insulation to interior or exterior side of wall.

Task 3.0 Occupancy Sensors (Rank 4)

Install Occupancy Sensors in bathrooms and kitchen

Task 4.0 Exterior Doors and Windows (Rank 5)

Replace exterior doors with energy efficient half-lite metal security doors with insulated foam cores with U Factor at or below .3

Replace Exterior Windows with energy rated at or below U Factor of .3

Task 5.0 Replace Current Oil Fired Boiler (Rank 6)

Replace current oil fired boiler with a new Olsen BCL190.

Task 6.0 Building Sealing Measures (Rank 7)

Inspect and ensure all building sealing measures are completed. Pressure Test building to ensure Task is complete.

Task 7.0 Heat Pump (Rank 8)

Design and Install Heat Pump adequate to ensure secondary heat source and cooling measures for main dining area.

9. Contract

Contract will be drafted upon successful review of costs and notification of quote that is in the best interest of the Yakutat Tlingit Tribe.

10. Contract Performance

Work shall not commence until April 1, 2020 and shall be complete no later than May 31, 2020.

11. Certificate of Liability Insurance

Minimum of \$1,000,000 General Liability Per Occurrence

Minimum of \$500,000 Automobile Liability Per Occurrence

Workman Compensation Coverage At State Minimum or higher.

Named Insured Shall Be:

**Yakutat Tlingit Tribe
PO BOX 418
Yakutat AK 99689**

12. Certificate of Compliance

I (WE) HEREBY CERTIFY THAT ALL WORK HAS BEEN PERFORMED AND MATERIALS SUPPLIED IN ACCORDANCE WITH THE PLANS, SPECIFICATIONS AND CONTRACT FOR THE ABOVE WORK, AND THAT:

A. Not less than the prevailing rates of wages as ascertained by the governing body of the contracting agency has been paid to laborers, workmen, and mechanics employed on this work:

B. There have been no unauthorized substitutions of subcontractors' nor have any subcontractors been entered into without the names of the subcontractors have been submitted to engineer prior to the start of such subcontracted work;

C. No subcontract was assigned or transferred or performed by any subcontractor other than the original subcontractor, without prior notice having been submitted to the engineer together with the names of all subcontractors;

D. All claims for material and labor and other service performed in connection with these specifications have been paid.

E. All monies due the State Industrial Accident Fund, the State Unemployment Compensation Trust Fund, the State Tax Commission, hospital associations and/or others have been paid.

Dated this ____ day of _____, _____, _____
(Signature of Contractor)

Notary Block

[To be completed by Notary Republic]

STATE OF _____)
) ss.
_____))
(Judicial District or County)

I certify that on the ____ day of _____, _____, before me, the undersigned authority personally appeared known to be the person whose name appears above as the Owner and to be the person who signed the foregoing instrument and acknowledge to me that it was freely and voluntarily signed for uses therein described.

WITNESS my hand and official seal the day and year first above written.

Notary Public in and for

SEAL

the State of _____

My Commission Expires: _____



Investigative Energy Audit For

Yakutat Alaska Native Brotherhood Hall



Prepared For
Yakutat Tlingit Tribe

Prepared By
Kelli Whelan, Kevin Ulrich, and Cody Uhlig

March 6, 2018

ANTHC-DEHE
4500 Diplomacy Dr.
Anchorage, AK 99508

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PREFACE

The purpose of this report is to provide guidance in reducing facility operating costs and enhance the sustainability of this community. The report assesses the current energy usage of the facility, provide options for reducing the amount of energy used, and evaluate the cost vs. benefit of each option.

Discussions of site specific concerns, financing options, general facility information, and an Energy Efficiency Action Plan are also included in this report.

ACKNOWLEDGMENTS

The Energy Projects Group gratefully acknowledges the assistance of the Yakutat Tlingit Tribe and the Tribal Transportation Director, Community Catalyst, and Yakutat Mayor, Ralph Wolfe.

OVERVIEW

This report was prepared for the Yakutat Tlingit Tribe. The scope of the audit focused on Alaska Native Brotherhood Hall and includes an analysis of building occupancy schedules, building shell, heating systems, heating and ventilations systems, domestic hot water, lighting, and other electrical loads. The Alaska Native Brotherhood Hall was constructed in 1923 and remodeled in 2011. The Hall is approximately 2430 square feet, and has an open floor plan featuring a large seating area, a kitchen, restrooms, and a stage. Behind the stage is an unheated arctic entry that is used for storage. Data was based on a site survey and interviews with members of the Yakutat Tlingit Tribe.

ENERGY BASELINE

Based on unsubsidized electricity and fuel oil prices in effect at the time of the audit, the total predicted energy costs are \$4,329 per year. This includes \$1,262 for unsubsidized electricity and a calculated cost of \$3,067 for #2 fuel oil.

The State of Alaska Power Cost Equalization (PCE) program provides a subsidy to rural communities across the state to lower electricity costs and make energy affordable in rural Alaska. The Alaska Native Brotherhood Hall does not receive a PCE subsidy.

Table 1 lists the predicted annual energy usage before and after the proposed retrofits for the Alaska Native Brotherhood Hall.

Annual Energy Costs by Fuel Type

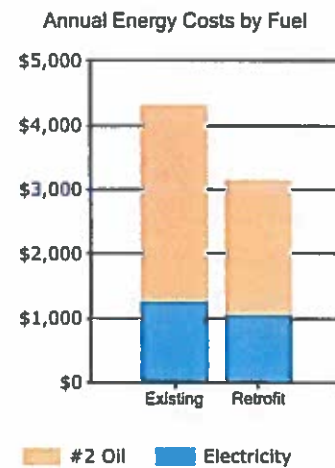


Table 1: Predicted Annual Energy Use for the Alaska Native Brotherhood Hall

Predicted Annual Energy Use			
Fuel Use	Existing Building	With Proposed Retrofits	Total Energy Savings
Electricity	3,237 kWh	2,722 kWh	515 kWh
#2 Oil	826 gallons	567 gallons	259 gallons

PROPOSED ENERGY EFFICIENCY MEASURES (EEM)

Table 2 below summarizes the energy efficiency measures analyzed for the Alaska Native Brotherhood Hall. Listed are the estimates of the annual savings, installed costs, and two different financial measures of investment return: the Savings Investment Ratio (SIR) and the retrofits' Simple Payback. The results of an alternative heating system (air-source heat pump) feasibility study may be found in Appendix G.

Table 2: Priority List – Energy Efficiency Measures

Priority	Feature	Improvement Description	Annual Energy Savings ¹	Installed Cost	Savings to Investment Ratio, SIR ²	Simple Payback (Years) ³
High	Lighting: Storage area	Replace incandescent bulbs with new LED equivalent lighting.	Maint. Savings		15.09	1.2
High	Lighting: Entryway Light	Replace incandescent bulb with new LED equivalent lighting.	Maint. Savings		13.14	1.5
High	Lighting: Women's Bathroom	Replace incandescent bulbs with new LED equivalent lighting.	Maint. Savings		10.50	1.7
High	Lighting: Boiler Room	Replace incandescent bulb with new LED equivalent lighting.	Maint. Savings		9.32	1.9
High	Lighting: Stage	Replace incandescent bulbs with new LED equivalent lighting.	Maint. Savings		8.19	2.3
High	Lighting: Men's Bathroom	Replace incandescent bulbs with new LED equivalent lighting.	Maint. Savings		7.46	2.5
High	Lighting: Main Seating Area	Replace exposed fluorescent with new LED equivalent lighting.	Maint. Savings		4.37	4.5
Medium	Exposed Floor: Main Seating Area (if uninsulated)	Insulate under floor with R-21 faced fiberglass batting.			1.20	19.6
Low	Insulation: Attic	Add additional blown cellulose insulation to attic spaces.			0.93	25.4
Low	Below-Grade Wall: Crawlspace Cover (if uninsulated)	Install R-20 rigid foam board to interior or exterior side of wall (does not include cost of coverings).			0.81	29.1
Low	Controls: Men's Bathroom	Occupancy sensor in men's bathroom would limit exhaust fan use.			0.69	18.7
Low	Exterior Door: Main Entrance	Remove existing door with a better insulated model.			0.66	35.8
Low	HVAC and DHW	Replace current oil fired boiler with a new Olsen BCL190.			0.51	34.0
Low	Lighting: Main Seating Area	Replace covered fluorescent lights with new, direct-wire LED equivalent lighting.	Maint. Savings		0.42	46.0
Low	Lighting: Men's Bathroom	Replace covered fluorescent lights with new, direct-wire LED equivalent lighting.	Maint. Savings		0.28	65.8
Low	Lighting: Women's Bathroom	Replace covered fluorescent lights with new, direct-wire LED equivalent lighting.	Maint. Savings		0.28	65.8

Priority	Feature	Improvement Description	Annual Energy Savings ¹	Installed Cost	Savings to Investment Ratio, SIR ²	Simple Payback (Years) ³
Low	Lighting: Kitchen	Replace covered fluorescent lights with new, direct-wire LED equivalent lighting.	Maint. Savings		0.22	42.3
Low	Air Tightening	Seal the air drafts from the electrical outlets.			0.22	42.3
TOTAL for all measures			Maint. Savings			
Total for High and Medium Priorities			Maint. Savings			

Table Notes:

¹ Maintenance savings were calculated by determining the approximate number and cost of fluorescent bulbs that would need to be replaced over the lifetime of an equivalent LED bulb, and then adding that subtotal to the cost of labor for changing each bulb. The total was divided over the lifespan of the LED equivalent bulb. Note: the LED lifespan is capped at 30 years.

A value of \$25 per hour was estimated for local labor. The length of time for changing each bulb was varied based on the location of the fixture (i.e. the T-12 bulbs in the ANB Hall were estimated at 30 minutes each, rather than a typical 15 minutes per bulb installation).

² Savings to Investment Ratio (SIR) is the total savings over the life of a project (for example: changing a light bulb) divided by its investment costs (materials, labor, shipping, etc.). The SIR shows how profitable a project will be; the higher the SIR, the more profitable the project. An SIR greater than 1.0 indicates a cost-effective project (i.e. more savings than cost). Note: the project's SIR is related to the rest of the Energy Efficiency Measures (EEM) above and the calculation assumes that projects are completed in the same order as in the table.

³ Simple Payback (SP) is the estimated length of time needed to recoup the initial investment cost of the project. Note: this does not account for accrued interest from loans or any future changes in energy prices.

Due to the age of the building, the Yakutat ANB Hall is likely considered a cultural resource by the State of Alaska. Before any invasive construction takes place, proper vetting and approvals should be obtained.

Additional Recommendations (not included in Table 2)

See Appendix E for a list of materials and a labor cost estimate. See Appendix F for material specifications.

Boiler maintenance: A boiler tune-up is recommended. Clean out burn chamber, replace fuel nozzle if needed, and adjust nozzle location.

Window film: Applying shrink wrap film may reduce air/heat loss through the windows.

Thermal curtains: Installing thermally insulating or heavy curtains may reduce air/heat loss through the windows.

FACILITY DESCRIPTION

Building Occupancy Schedules

The building is used irregularly for meetings, rehearsals, memorial services, and potlaches.

Building Shell

The exterior walls are 2x6 wood-framed panel construction.

The roof of the building is 2x6 wood-framed panel construction.

The building is constructed on pilings. This space is protected by a crawlspace wall.

There are 17 total windows in the building. Three energy efficient storm windows line both sides of the main seating area (six windows total). The remaining 11 are south-facing and are located at the back wall.

There are two entrances in the main part of the building, and one side door to the front storage area. All doors are insulated metal with the main entrance having a two quarter-lite window, and the back door has a full-lite window. The storage area side entrance door is windowless.

Heating Systems

The heating systems used in the building are:

Forced Air Unit- Olson BCL-190

Fuel Type:	#2 Oil
Input Rating:	231,000 BTU/hr
Steady State Efficiency:	76 %
Idle Loss:	1.5 %
Heat Distribution Type:	Air

Toyotomi Water Heater

Fuel Type:	#2 Oil
Input Rating:	148,000 BTU/hr
Steady State Efficiency:	88 %
Idle Loss:	0 %
Heat Distribution Type:	Water

Space Heating Distribution Systems

The building is heated by a forced air boiler that is turned on as needed. Five vents, one through the boiler room and four in the cathedral ceiling, distribute heat into the main seating area. The boiler is controlled by a single thermostat located in the main seating area. The thermostat is set to 75°F, with a setback temperature of 48°F.

Building Ventilation Systems

The kitchen has a Captive-Aire 4224 ND exhaust hood above the flat top grill and ovens. The hood is used as needed. The men's bathroom has a small exhaust fan that runs whenever the bathroom lights are turned on.

Domestic Hot Water System

There is a Toyotomi OM-122 on-demand hot water heater that is used in the kitchen.

Lighting

There are a total of 45 light fixtures in the building. The lights use an estimated 885 kWh annually.

Table 3: Major Appliances and Equipment in the Alaska Native Brotherhood Hall

Lighting	Number of Bulbs	Fixture Type	Location(s)
4' Fluorescent T-12	19	Strip lights	Main seating area
4' Fluorescent T-8	24	2- to 4-bulb covered ceiling fixtures	Main seating area, men's bathroom, women's bathroom, kitchen
Incandescent, 100W	12	Spot lights, ceiling fixtures	Entryway, exhaust hood, stage, storage area, boiler room
Incandescent, 40-60W	6	Vanity	Men's bathroom, women's bathroom
CFL, spiral	1	Ceiling fixture	Stage entrance/side closet
Other	2	Spot lights	Main seating area

Other Electrical Loads

There is a variety of kitchen appliances and sound equipment that are used as needed.

Major Equipment

Table 4: Major Appliances and Equipment in the Alaska Native Brotherhood Hall

Equipment	Rating (Watts)	Annual Usage (kWh)
Vulcan Electric Range and Double Ovens	2000 – 36,000 ^a	629.6
Maytag Plus Refrigerator/Freezer	828 (maximum)	402
Microwave	1,620	295.2
Bunn Pour-Omatic Coffee Maker	1,600	291.5
Aroma Commercial Rice Cooker	1,650	207.8
Peavey Loud Speakers	200 (each)	50.4
Peavey Sound Mixer	250	31.5

^a Each of the four burners are rated at 2 kW, the ovens are 5kW each, and the flat top was assumed to be equivalent to 4 burners. An average of 5 kW was used to model the unit in AkWarm.

PROJECT FINANCING

The total estimated cost of the recommended EEM's is \$14,031. The payback for the implemented EEM's is approximately 15.7 years. ANTHC is willing to assist the community with acquiring funds to complete the scope of work recommended in this energy audit.

There are several options for financing energy efficiency projects within the State of Alaska. These include the use of grants, loans, and other funding opportunities. Below is some information on potential funding opportunities.

Energy Efficiency Revolving Loan Program – This is a loan administered by the Alaska Housing Finance Corporation (AHFC) for use by any applicant who is also the owner of the building where the work will take place. It provides a loan for permanent energy-efficiency projects with a completion window of one year.

Sustainable Energy Transmission and Supply Program – This is a loan administered by the Alaska Energy Authority (AEA) for a government, business, or other organized body of people. It provides a loan for energy-efficiency or power transmission or distribution projects.

USDA-RD Communities Facilities Direct Loan & Grant Program - This is a loan or grant provided by the US Department of Agriculture – Rural Development (USDA-RD) for any essential community facility in a rural area. It provides a loan or grant to develop essential community facilities with upgrades or equipment for improvement.

MEASUREMENT AND VERIFICATION

The actual results of these recommendations can be measured by collecting and monitoring energy use. This information is available on the monthly bills provided by the local electric utility and the local fuel oil supplier. Collecting data and performing a historical comparison is the simplest method of validating the energy and cost savings seen by the measures. Additionally, active remote monitoring systems are available that can collect and store data regarding energy and fuel usage. These systems allow the user to track the usage in real time and can be shared more easily with partners across the state.

APPENDICES

Appendix A – Energy Billing Data

1. Electricity Billing Data

Electric Utility: AVEC (formerly Yakutat Power Inc.)

Date	Reading	Usage	Charge
January 2016	5918	416	\$122.18
February 2016	6448	530	\$155.66
March 2016	6617	169	\$49.64
April 2016	6811	194	\$56.98
May 2016	7124	313	\$91.93
June 2016	7374	250	\$73.43
July 2016	7619	245	\$71.96
August 2016	7923	304	\$89.28
September 2016	7985, 348 ^a	410	\$120.42
October 2016	641	293	\$86.05
November 2016	767	126	\$37.01
December 2016	949	182	\$53.45

^a Two readings were taken during September. The meter was also reset to zero mid-month.

2. #2 Fuel Oil Billing Data

Fuel Company: Delta Western Inc.

Date	Gallons	Price per Gallon	Total
August 2016	100	\$3.268	\$326.80
October 2016	124.7	\$3.268	\$407.52
October 2016	30.5	\$3.268	\$99.67
December 2016	50.0	\$3.268	\$163.40
April 2017	100	\$3.712	\$372.20

Note: Regular fuel oil delivery invoices were unable to be obtained. The building heating schedule was created using input from Tlingit tribal members. Similar buildings from past ANTHC audits use approximately 700-800 gallons of fuel oil annually. The annual usage for the ANB Hall is estimated to be approximately 869 gallons.

Appendix B – Energy Audit Report – Project Summary

ENERGY AUDIT REPORT – PROJECT SUMMARY	
General Project Information	
PROJECT INFORMATION	AUDITOR INFORMATION
Building: Alaska Native Brotherhood Hall	Auditor Company: Alaska Native Tribal Health Consortium
Address: 342 Max Italo Dr.	Auditor Name: Kelli Whelan
City: Yakutat	Auditor Address: 4500 Diplomacy Drive Anchorage, AK 99508
Client Name: Ralph Wolfe	Auditor Phone: (907) 729-3723
Client Address: P.O. Box 418 606 Forest Hwy. 10 Yakutat, AK 99689	Auditor FAX: (907) 729-4047
Client Phone: (907) 784-3238	Auditor Comment:
Client FAX: (907) 784-3595	
Design Data	
Building Area: 2,428 square feet	Design Space Heating Load: Design Loss at Space: 69,271 Btu/hour with Distribution Losses: 69,271 Btu/hour Plant Input Rating assuming 82.0% Plant Efficiency and 25% Safety Margin: 105,596 Btu/hour Note: Additional Capacity should be added for DHW and other plant loads, if served.
Typical Occupancy: 65 people	Design Indoor Temperature: 75° F (building average)
Actual City: Yakutat	Design Outdoor Temperature: 2.1° F
Weather/Fuel City: Yakutat	Heating Degree Days: 9,084° F-days
Utility Information	
Electric Utility: AVEC (formerly City of Yakutat – Yakutat Power Inc.)	Average Annual Cost/kWh: \$0.390/kWh

Annual Energy Cost Estimate							
Description	Space Heating	Water Heating	Ventilation Fans	Lighting	Refrigeration	Other Electrical	Total Cost
Existing Building	\$3,120	\$27	\$91	\$345	\$157	\$589	\$4,329
With Proposed Retrofits	\$2,125	\$27	\$89	\$181	\$157	\$589	\$3,168
Savings	\$995	\$0	\$2	\$164	\$0	\$0	\$1,161

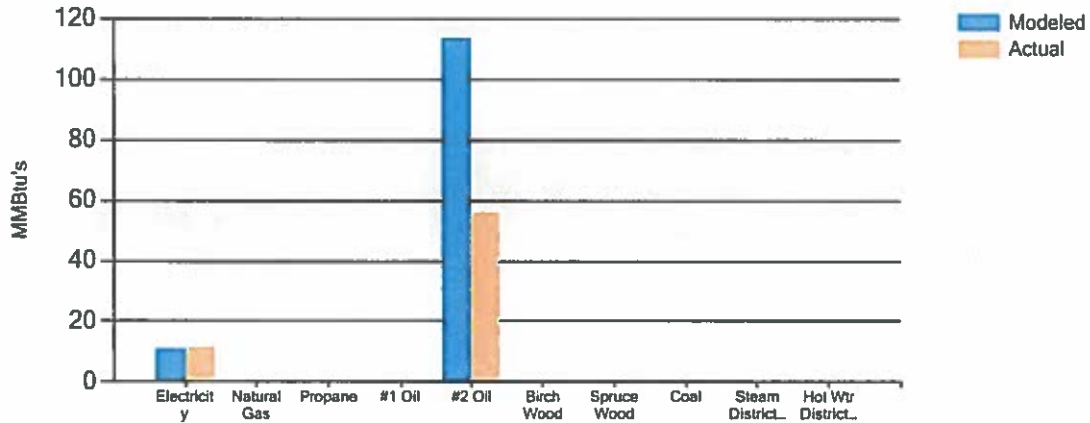
Building Benchmarks			
Description	EUI (kBtu/Sq.Ft.)	EUI/HDD (Btu/Sq.Ft./HDD)	ECI (\$/Sq.Ft.)
Existing Building	51.5	5.67	\$1.78
With Proposed Retrofits	36.1	3.97	\$1.30

EUI: Energy Use Intensity - The annual site energy consumption divided by the structure's conditioned area.
 EUI/HDD: Energy Use Intensity per Heating Degree Day.
 ECI: Energy Cost Index - The total annual cost of energy divided by the square footage of the conditioned space in the building.

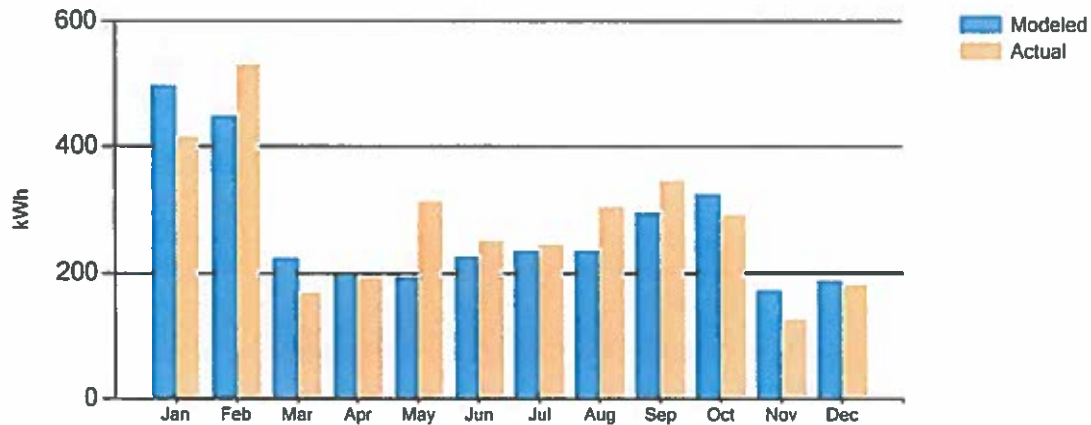
Appendix C – Actual Fuel Use versus Modeled Fuel Use

The graphs below show the modeled energy usage results of the energy audit process compared to the actual energy usage report data. The model was completed using AkWarm modeling software. The orange bars show actual fuel use, and the blue bars are AkWarm’s prediction of fuel use.

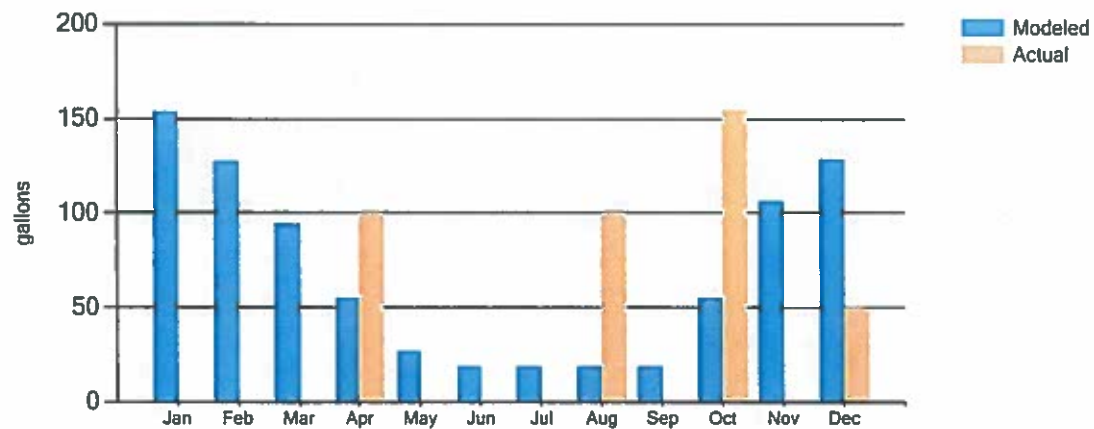
Annual Energy Use



Electricity Use



#2 Fuel Oil Use



Note: Actual fuel quantities above are known deliveries, and are not representative of the usage.

Appendix D - EUI Calculation Details

The Alaska Village Electric Cooperative (AVEC) currently provides electricity to the residents of Yakutat as well as to all commercial and public facilities. Delta Western Inc. is the local fuel distributor.

The average cost for each type of fuel used in this building is shown in Table D-1 below. This figure includes all surcharges, subsidies, and utility customer charges:

Table D-1: Energy Cost Rates for each Fuel Type

Average Energy Cost (2017)	
Description	Average Energy Cost
Electricity	\$ 0.39/kWh
#2 Oil	\$ 3.71/gallons

Table D-2 shows the calculated results for the building Energy Use Index (EUI), which determines the total energy usage for a type of building for comparison with other buildings of the same type. This allows the user to determine the relative energy use of a building in relation to others of the same type or use.

Table D-2: EUI Building Calculations for the Alaska Native Brotherhood Hall

Energy Type	Building Fuel Use per Year	Site Energy Use per Year, kBTU	Source/Site Ratio	Source Energy Use per Year, kBTU
Electricity	3,237 kWh	11,048	3.340	36,900
#2 Oil	826 gallons	114,005	1.010	115,145
Total		125,053		152,044
BUILDING AREA		2,428 Square Feet		
BUILDING SITE EUI		51 kBTU/Ft ² /Yr		
BUILDING SOURCE EUI		63 kBTU/Ft ² /Yr		
* Site - Source Ratio data is provided by the Energy Star Performance Rating Methodology for Incorporating Source Energy Use document issued March 2011.				

Table D-3 shows information on common energy use benchmarks used to characterize the efficiency of a building.

Table D-3: Building Benchmarks for the Alaska Native Brotherhood Hall

Building Benchmarks			
Description	EUI (kBTU/Sq.Ft.)	EUI/HDD (BTU/Sq.Ft./HDD)	ECI (\$/Sq.Ft.)
Existing Building	51.5	5.67	\$1.78
With Proposed Retrofits	36.1	3.97	\$1.30
EUI: Energy Use Intensity - The annual site energy consumption divided by the structure's conditioned area. EUI/HDD: Energy Use Intensity per Heating Degree Day. ECI: Energy Cost Index - The total annual cost of energy divided by the square footage of the conditioned space in the building.			

Appendix E – Materials List and Labor Estimation

Tables E-1 and E-2: ANTHC Materials List and Cost Estimation for the Alaska Native Brotherhood Hall EEM's

Energy Retrofit	Required Materials	Quantity ^a	Cost per Item	Total Materials Cost	Total Project Cost ^b
LED Lighting	100W equivalent (2 pack)		\$		
	60W equivalent				
	T-12 equivalent				
Air Draft Reduction	Window film (9 pack, 62x42in. ea.)				
	Window film (2 pack, 62x21in. ea.)				
Insulation	R-21 faced fiberglass batt (pallet)				
	Vapor barrier				
	Plywood sheets				
	Insulation supports (100 per pack)				
	Screws				
	Staples				
Boiler	Burner, controls, tune up				

^a 10% surplus included.

^b Project costs include materials, freight (15% of materials cost, and labor).

Category	Cost (\$)
Labor	
Materials	
Freight	
Travel ^c	
Indirect ^d	
Estimated Total (without indirect)	
Estimated Total (with indirect)	

^c Travel costs for an ANTHC Maintenance Specialist or boiler mechanic to travel to Yakutat from Anchorage. Includes roundtrip airfare, \$150 for lodging per night, and \$60 per diem (based on 10 hour days).

^d Indirect rate is 30% (of the total estimated labor, travel, materials, and freight costs). This represents an estimate of contractor profit, insurance, and bonding costs.

Appendix F – Materials Specifications

Lighting

EarthLED T-8 or T-12 Equivalent Bulbs

EarthLED Total Product Insight	
Performance Specifications	
REPLACEMENT FOR:	T8 OR T12 4 FOOT FLUORESCENT TUBE
BRIGHTNESS (LUMENS):	2000
COLOR TEMPERATURE:	4000K 5000K
COLOR ACCURACY (CRI):	80
DIMENSIONS:	1.02" X 47.2"
POWER CONSUMPTION:	18 WATTS
VOLTAGE:	120-277 VOLTS
DIMMABLE:	NO
Dimensions / Additional Data	
CERTIFICATIONS:	UL DESIGNLIGHTS (DLC)
PRODUCT/ORDER CODE:	4000K - 18WT8P-4F-40K-BYP 5000K - 18WT8P-4F-50K-BYP
Lifespan / Cost To Run	
PROJECTED LIFE @3 HRS DAY	50,000 HRS
YEARLY ENERGY COST: 3 HRS/DAY @ 11 KWH	\$2.17
WARRANTY:	5 YEAR THINKLUX LIGHTING LIMITED WARRANTY <u>EARTHLED PRODUCT PROTECTION PLAN IS AVAILABLE</u>

Phillips 100W Equivalent Daylight A19 LED Light Bulb (2-pack)

This Phillips 14-Watt LED A19 household light bulb is the perfect replacement for anywhere traditional light bulbs are used, such as table or floor lamps. This 14-Watt 5,000K LED A19 provides a light similar to natural daylight, perfect for your living room, bedroom, kitchen or any place in your home where you would use a standard incandescent light bulb. The Philips LED A19 household light bulb provides 360 Degree all around light and can replace your current 60-Watt light bulb. Philips LED A-shape light bulbs are a smart alternative to standard incandescent and designed to deliver everyday value and effective, consistent light.

- Brightness: 1,500 Lumens
- Estimated yearly energy cost: \$1.69 (based on 3 hours/day, 11¢/kWh, cost depends on rates and use)
- Life hours: 1,000 hours (based on 3 hours/day)
- Light appearance: 5,000K (daylight)
- Energy used: 14-Watt (equivalent to a 100-Watt standard incandescent light bulb)
- Lumens per watt: 107.14
- Functional light quality, designed to deliver everyday value without compromising in performance
- Ideal for any room in your home such as bedrooms and living rooms
- Use in table or floor lamps, or anywhere traditional light bulbs are used
- Provides a light similar to natural daylight

Euri 9W LED A19 Light Bulb – 60W Equivalent – Dimmable - Shatterproof

EarthLED Total Product Insight	
Performance Specifications	
REPLACEMENT FOR:	A19
BRIGHTNESS (LUMENS):	800
COLOR TEMPERATURE:	2700K 3000K 5000K
COLOR ACCURACY (CRI):	80
TRADITIONAL WATTAGE EQUIVALENT:	60 WATTS
POWER CONSUMPTION:	9 WATTS
VOLTAGE:	120 VOLTS
DIMMABLE:	YES
MOISTURE RATING:	DAMP
FIXTURE RATING:	OPEN FIXTURES
BASE TYPE:	E26
ENERGYSTAR QUALIFIED:	YES
Dimensions / Additional Data	
BULB DIAMETER:	2.4 IN
MAXIMUM OVERALL LENGTH:	4.6 IN
PRODUCT WEIGHT:	4.2 OUNCES
CERTIFICATIONS:	UL

PRODUCT ORDER CODE:	2700K - EA19-3020E 3000K - EA19-3000E 5000K - EA19-3050E
Lifespan / Cost To Run	
PROJECTED LIFE @3 HRS/DAY	25,000 HRS
YEARLY ENERGY COST 3 HRS/DAY @ .11 KWH	\$1.08
WARRANTY	3 YEAR EURI LIGHTING LIMITED WARRANTY <u>EARTHLED PRODUCT PROTECTION PLAN IS AVAILABLE</u>

Air Draft Reduction

Frost King Model # V73/9T: E/O Indoor Window Insulation Kit (9 per Pack)

The Thermwell Products Co., Inc. Frost King Window Insulation Kit includes 9-pre-cut sheets to make it easy to insulate 9 standard windows. The 62 in. L x 42 in. W sheets help stop cold drafts and limit heat loss

- 9 sheets insulate up to 9 standard windows
- 62 in. L x 42 in. W sheets
- Limit energy loss and boost the R-value of single-pane windows
- Shrink sheets help stop cold drafts and heat loss
- Pre-cut sheets offer fast, easy installation
- Includes 162 ft. of 1/2 in. double-sided tape

Frost King Model #V75/2T: E/O 62 in. x 210 in. Polyurethane Extra-Large Shrink Window Insulation (2 per pack)

The Thermwell Products Co., Inc. 62 in. x 210 in. Polyurethane Extra-Large Shrink Window Insulation (2-Pack) helps improve the R-value of a single-pane window by up to 90%. The insulation features polyurethane construction.

- Package contents cover 2 of most picture windows or 10 separate windows
- Helps improve the R-value of a single-pane window by up to 90%
- Polyurethane construction
- Double-faced shrink film tape included
- Includes two 62 in. x 210 in. sheets

Insulation

Owens Corning R-21 Insulation Kraft Faced Batts (10 bags per pallet)

Owens Corning EcoTouch Insulation is soft to the touch, easy to cut and install. It delivers comfort – helping homes stay cooler in the summer and warmer in the winter to reduce energy costs. The R21 Kraft Faced Batts Insulation has pre-cut widths to fit between the studs and joists in your home. It offers exceptional thermal and sound control performance.

- Dimensions: 5-1/2 in. x 23 in. x 93 in., 6 pieces (89.13 sq. ft./bag)
- 10 Bags/pallet = 60 pieces/891.30 sq. ft.
- Application: 2x6 walls (interior/exterior), floors
- 5-1/2 in. R21 high-density insulation delivers 19% more R-value than 6-1/4 in. R19 insulation in a 2x6 wall
- Completely fills the cavity, eliminating gaps and the need for additional handwork
- Provides thermal performance and helps lower monthly heating/cooling costs
- EcoTouch insulation helps control sound, add to bedrooms, home office, family room, utility room, kitchen and bathroom
- Can be combined with Foamular insulating sheathing to achieve greater R-value in exterior wall applications

Tyvek HomeWrap 3 ft. x 165 ft. Roll Housewrap

Pressure-Treated Plywood Rated Sheathing (Common: 23/32 in. x 4 ft. x 8 ft.; Actual: 0.703 in. x 48 in. x 96 in.)

Screws

Simpson Strong-Tie 24 in. Insulation Support (100-Qty)

Appendix G – Air Source Heat Pump Feasibility Study

INTRODUCTION

An alternative to traditional heating systems such as boilers or furnaces, electrically powered air-source heat pumps draw heat from the environment and transfer it into a building through a reverse refrigeration process. Newer models are extremely efficient at moderately cold temperatures (20°-50°F), but their efficiencies quickly decrease once temperatures drop below 0°F. Air-source heat pumps have grown in popularity in the northeast continental U.S., and are beginning to be adopted in the Northwest Arctic Borough of Alaska. Due to the temperate climate in Yakutat, air-source heat pumps may be a viable alternative heating source to at least partially offset the #2 fuel oil-fired boiler in the Yakutat Alaska Native Brotherhood (ANB) Hall.

This feasibility study considered five air-source heat pump models for two building conditions for the ANB Hall. It should be noted that this study is only a preliminary assessment. The results should be verified by a licensed contractor before a design is finalized and implemented.

METHODOLOGY

The building's heat loss was calculated following the methodology outlined in Siegenthaler, P.E. Two building shell options were considered: one used the building as is, and the other factored in an R-21 fiberglass batting insulation retrofit underneath the floor. The following interior and exterior temperatures were also taken into account:

- Occupied vs. unoccupied heating schedules: The ANB Hall thermostat is currently set to 75°F (when the boiler is on) and 55°F (when the building is unoccupied).
- Design temperature: AkWarm uses a standard outdoor temperature of 2.1°F for Yakutat.
- Specification temperatures: The Northeast Energy Efficiency Partnerships (NEEP) provide energy usage and performance data for cold-climate rated air source heat pumps at 47°F, 17°F and 5°F. Only 47°F and 17°F were considered for this feasibility study due to Yakutat's climate and assuming that the oil-fired boiler would be retained for extremely cold temperatures.
- Average high and low temperatures: Monthly high and low averages were sourced from the U.S. Climate Data website.

Five air-source heat pumps were selected from NEEP's most recent Cold Climate Air-Source Heat Pump Specification Listing (NEEP, 2017) based on the heat loss calculation results for the conditions described above.

TABLE I. Air-Source Heat Pump Model Options

Make and Model	Type¹	Cooling Capacity (BTUh)²	HSPF³	Building Shell
Trane TruComfort XV18⁴	Centrally Ducted	54,000	10	Both
LG Electronics USA, Inc., Outdoor Model: LMU4480HV	Ductless	48,000	10	No insulation improvements
Mitsubishi, Outdoor Model: PUMY-P48NKMU1	Ductless	48,000	11.7	No insulation improvements
LG Electronics USA, Inc. Outdoor Model: LMU420HHV	Ductless	42,000	10.5	R-21 batt installed
Mitsubishi, Outdoor Model: MXZ-5C42NAHZ	Ductless	42,000	11	R-21 batt installed

¹ Centrally ducted units connect to existing ventilation ductwork. Ductless units allow for more placement flexibility, but require separate indoor units. These increase the installation, maintenance, and operations costs.

² Cooling capacity may be used as an estimate of the air-source heat pump’s heating capacity.

³ The Heating Season Performance Factor (HSPF) is the BTUs of heat produced by the unit divided by the Watt hours consumed by the unit over a period of time. The higher the HSPF, the more efficient the model is.

⁴ The Trane model would be able to fully replace the oil-fired boiler for both building shell conditions at the design temperature (2.1F). However, the monthly average temperatures are significantly higher than the design temperature, meaning that this model would likely be oversized for a majority of the year.

All of the models in Table I have variable frequency drives (VFDs); their electrical consumption and heat output depend on the current indoor and outdoor temperatures. To estimate the models’ monthly energy consumption, a percent operating time was calculated using the pump’s heating capacity (BTU/hr) at 47°F or 17°F, the building’s estimated heat loss for the monthly average high and low temperatures, and the occupied/unoccupied temperatures. The NEEP 47°F performance ratings were used for all outdoor temperatures 40°F and higher; the 17°F performance ratings were used for all temperatures below 40°F. The percent operating time was then multiplied by the energy consumption of each unit (based on the NEEP performance ratings), and adjusted to match the occupancy/heating schedule used in the initial AkWarm model of the ANB Hall.

RESULTS

Tables II and III compare the current boiler's monthly and annual operating costs with the estimated operating costs of the five air-source heat pumps. The cost for #2 fuel oil is \$3.71 per gallon and electricity is \$0.39 per kilowatt hour in May 2017; these prices were used in the tables below.

TABLE II. Estimated Operating Costs with No Insulation Improvement

	BCL190 Oil-fired Boiler			Trane TruComfort		LG LMU4480HV ¹		Mitsubishi PUMY-P48NKMU1 ¹	
	Oil (gal)	Electrical (kWh)	Cost (\$/mo.)	Electrical (kWh)	Cost (\$/mo.)	Electrical (kWh)	Cost (\$/mo.)	Electrical (kWh)	Cost (\$/mo.)
Jan	165	45.0	629.7	413.3	161.2	529.3	206.4	599.5	233.8
Feb	135	40.7	516.7	354.4	138.2	454.2	177.2	514.5	200.7
Mar	100	0.1	371.0	1808.4	705.3	1363.2	531.6	1543.3	601.9
Apr	60	0.0	222.6	1185.3	462.3	1567.5	611.3	989.3	385.8
May	30	0.0	111.3	802.5	313.0	837.0	326.4	677.1	264.1
Jun	20	0.0	74.2	242.8	94.7	1007.0	392.7	180.3	70.3
Jul	20	0.0	74.2	136.9	53.4	567.6	221.3	101.6	39.6
Aug	20	0.0	74.2	182.5	71.2	756.8	295.1	135.5	52.8
Sep	20	0.0	74.2	309.0	120.5	1281.6	499.8	229.4	89.5
Oct	60	2.5	223.6	847.3	330.4	1130.7	441.0	711.9	277.6
Nov	115	2.7	427.7	1510.2	589.0	1149.9	448.4	1301.7	507.7
Dec	140	10.0	523.3	1577.7	615.3	1236.3	482.2	1399.6	545.9
Annual (\$)			3,322.7		3,654.4		4,633.6		3,269.6

¹ Mini-ductless indoor units not included.

TABLE III. Estimated Operating Costs with R-21 Batting Installed under Flooring

	BCL190 Oil-fired Boiler			Trane TruComfort		LG LMU420HHV ¹		Mitsubishi MXZ-5C42NAHZ ¹	
	Oil (gal)	Electrical (kWh)	Cost (\$/mo.)	Electrical (kWh)	Cost (\$/mo.)	Electrical (kWh)	Cost (\$/mo.)	Electrical (kWh)	Cost (\$/mo.)
Jan	125	45.0	481.3	504.4	196.7	485.2	189.2	417.3	162.8
Feb	105	40.7	405.4	432.9	168.8	398.6	155.5	322.1	125.6
Mar	75	0.1	278.3	1420.5	554.0	1308.1	510.2	835.7	325.9
Apr	40	0.0	148.4	930.9	363.0	902.2	351.9	571.5	222.9
May	20	0.0	74.2	630.2	245.8	595.9	232.4	379.0	147.8
Jun	15	0.0	55.7	190.7	74.4	230.6	89.9	141.4	55.1
Jul	15	0.0	55.7	107.5	41.9	130.0	50.7	79.7	31.1
Aug	15	0.0	55.7	143.3	55.9	173.3	67.6	106.2	41.4
Sep	15	0.0	55.7	242.7	94.7	293.5	114.5	179.9	70.2
Oct	45	2.5	167.9	665.4	259.5	649.2	253.2	410.9	160.2
Nov	85	2.7	316.4	1195.7	466.3	1101.1	429.4	707.6	276.0
Dec	140	10.0	523.3	1278.1	498.4	1181.4	460.8	768.9	299.9
Annual (\$)			2,617.8		3,019.5		2,905.2		1,918.8

¹ Mini-ductless indoor unit costs not included.

A cost estimate and an energy model in AkWarm were developed for the Mitsubishi MXZ-5C42NAHZ outdoor unit. This unit would require two to eight mini-ductless units to distribute the heat indoors. Each mini-ductless unit consumes approximately 230 Watts. Four wall mounted ductless heating units were considered here (2- 6,000 BTU and 2- 18,000 BTU Mitsubishi FH-Series units).

TABLE IV. Estimated Utility Costs for the Mitsubishi MXZ-5C42NAHZ with 4 Indoor Units

	Electrical (kWh)	Cost (\$/mo.)
Jan	535.3	208.8
Feb	437.2	170.5
Mar	1298.8	506.5
Apr	915.1	356.9
May	598.3	233.3
Jun	252.5	98.5
Jul	142.3	55.5
Aug	189.8	74.0
Sep	321.4	125.3
Oct	659.0	257.0
Nov	1095.8	427.4
Dec	1179.0	459.8
Annual (\$)		2,973.5

Installing the Mitsubishi MXZ-5C42NAHZ system would cost about \$24,000, including materials, shipping, labor (with lodging and per diem), and a contractor’s indirect rate (30% of the materials, shipping, and labor costs). Using the May 2017 prices for electricity and fuel oil, the air-source heat pump is not an economically viable option at this time (annual energy savings= \$191; Savings to Investment Ratio (SIR)= 0.35; simple payback= 105.2 years). The system becomes economically viable (SIR>1) when the price of #2 fuel increases to \$5.75 per gallon or more, or if the price of electricity drops to \$0.15 per kWh or lower (assuming the other utility stays the same).

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