Comprehensive Energy Audit
For
Sleetmute Health Clinic

Prepared For

Traditional Council of Sleetmute

August 17, 2011

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PREFACE

The Energy Projects Group at the Alaska Native Tribal Health Consortium (ANTHC) prepared this document for the Traditional Council of Sleetmute and the Yukon Kuskokwim Health Corporation (YKHC). The authors of this report are Carl Remley, Certified Energy Auditor (CEA) and Certified Energy Manager (CEM), Chris Mercer CEA and PE, and Gavin Dixon.

The purpose of this report is to provide a comprehensive document of the findings and analysis that resulted from an energy audit conducted over the past several months by the Energy Projects Group of ANTHC. This report analyzes historical energy use and identifies costs and savings of recommended energy efficiency measures. Discussions of site specific concerns and an Energy Efficiency Action Plan are also included in this report.

ACKNOWLEDGMENTS

The ANTHC Energy Projects Group gratefully acknowledges the assistance of Mr. Marion Parrish and Ms. Jane Parrish of the Traditional Council of Sleetmute and Ms. Gladys Fredericks of the Yukon Kuskokwim Health Corporation.

1. EXECUTIVE SUMMARY

This report was prepared for the Traditional Council of Sleetmute. The scope of the audit focused on the Sleetmute Health Clinic. The scope of this report is a comprehensive energy study, which included an analysis of building shell, interior and exterior lighting systems, HVAC systems, and plug loads.

Based on electricity and fuel oil prices in effect at the time of the audit, the annual energy cost for the building analyzed were $3,171 for electricity, and $14,633 for #1 fuel oil, for a total energy cost of $17,804 per year.

It should be noted that this facility received the power cost equalization (PCE) subsidy last year. If it did not receive the PCE subsidy the annual electricity cost would have been $9,081 and The total energy costs would be $23,714 per year.

Table 1.1 below summarizes the energy efficiency measures analyzed for the Sleetmute Health Clinic. Listed are the estimates of the annual savings, installed costs, and two different financial measures of investment return.

Table 1.1
PRIORITY LIST – ENERGY EFFICIENCY MEASURES

Rank	Feature	Improvement Description	Annual Energy Savings	Installed Cost	Savings to Investment Ratio, SIR[1]	Simple Payback (Years)[2]
1	Setback Thermostat: Clinic Back Area	Implement a Heating Temperature Unoccupied Setback to 55.0 deg F for the Clinic Back Area space.	$465	$200	34.88	0.4
2	Heating, Ventilation, and Domestic Hot Water	Remove the non-functioning direct digital control system and convert the heating and ventilation controls to conventional controls that can be maintained by the Tribal Council. Utilize the setback thermostat to also shut off the hot water heater circulator during unoccupied hours.	$9,890	$8,000	23.31	0.8
3	Air Tightening	Perform air sealing to reduce air leakage by 200 cfm at 50 Pascals.	$198	$500	4.08	2.5
4	Lighting: Exterior Lighting	Replace existing exterior fixtures with 2 LED 17W fixtures	$68	$400	1.09	5.9
	TOTAL, all measures		**$10,621**	**$9,100**	**21.53**	**0.9**

Table Notes:

[1] Savings to Investment Ratio (SIR) is a life-cycle cost measure calculated by dividing the total savings over the life of a project (expressed in today's dollars) by its investment costs. The SIR is

an indication of the profitability of a measure; 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). Remember that this profitability is based on the position of that Energy Efficiency Measure (EEM) in the overall list and assumes that the measures above it are implemented first.

[2] Simple Payback (SP) is a measure of the length of time required for the savings from an EEM to payback the investment cost, not counting interest on the investment and any future changes in energy prices. It is calculated by dividing the investment cost by the expected first-year savings of the EEM.

With all of these energy efficiency measures in place, the annual utility cost can be reduced by $10,621 per year, or 59.7% of the buildings' total energy costs. These measures are estimated to cost $9,100, for an overall simple payback period of 0.9 years.

Table 1.2 below is a breakdown of the annual energy cost across various energy end use types, such as Space Heating and Water Heating. The first row in the table shows the breakdown for the building as it is now. The second row shows the expected breakdown of energy cost for the building assuming all of the retrofits in this report are implemented. Finally, the last row shows the annual energy savings that will be achieved from the retrofits.

Table 1.2
Annual Energy Cost Estimate

Description	Space Heating	Space Cooling	Water Heating	Lighting	Other Electrical	Cooking	Clothes Drying	Ventilation Fans	Service Fees	Total Cost
Existing Building	$15,593	$0	$462	$743	$887	$0	$0	$0	$0	**$17,804**
With All Proposed Retrofits	$5,122	$0	$381	$675	$887	$0	$0	$0	$0	**$7,183**
SAVINGS	$10,471	$0	$82	$68	$0	$0	$0	$0	$0	**$10,621**

2. AUDIT AND ANALYSIS BACKGROUND

2.1 Program Description

This audit included services to identify, develop, and evaluate energy efficiency measures at the Clinic. The scope of this project included evaluating building shell, lighting and other electrical systems, and HVAC equipment, motors and pumps. Measures were analyzed based on life-cycle-cost techniques, which include the initial cost of the equipment, life of the equipment, annual energy cost, annual maintenance cost, and a discount rate of 3.0%/year in excess of general inflation.

2.2 Audit Description

Preliminary audit information was gathered in preparation for the site survey. The site survey provides critical information in deciphering where energy is used and what opportunities exist within a building. The entire site was surveyed to inventory the following to gain an understanding of how each building operates:

- Building envelope (roof, windows, etc.)
- Heating, ventilation, and air conditioning equipment (HVAC)
- Lighting systems and controls
- Building-specific equipment

The building site visit was performed to survey all major building components and systems. The site visit included detailed inspection of energy consuming components. Summary of building occupancy schedules, operating and maintenance practices, and energy management programs provided by the building manager were collected along with the system and components to determine a more accurate impact on energy consumption.

Details collected from Clinic enable a model of the building's energy usage to be developed, highlighting the building's total energy consumption, energy consumption by specific building component, and equivalent energy cost. The analysis involves distinguishing the different fuels used on site, and analyzing their consumption in different activity areas of the building.

The clinic has two main zones, the first is the active clinic and exam rooms with 1,278 square feet. The back area of the clinic is made up of storage and temporary quarters for visiting medical staff with 456 square feet, for a total of 1,734 square feet.

In addition, the methodology involves taking into account a wide range of factors specific to the building. These factors are used in the construction of the model of energy used. The factors include:

- Occupancy hours
- Local climate conditions
- Prices paid for energy

2.3. Method of Analysis

Data collected was processed using AkWarm© Energy Use Software to estimate energy savings for each of the proposed energy efficiency measures (EEMs). The recommendations focus on the building envelope; HVAC; lighting, plug load, and other electrical improvements; and motor and pump systems that will reduce annual energy consumption.

EEMs are evaluated based on building use and processes, local climate conditions, building construction type, function, operational schedule, existing conditions, and foreseen future plans. Energy savings are calculated based on industry standard methods and engineering estimations.

Our analysis provides a number of tools for assessing the cost effectiveness of various improvement options. These tools utilize **Life-Cycle Costing**, which is defined in this context as a method of cost analysis that estimates the total cost of a project over the period of time that includes both the construction cost and ongoing maintenance and operating costs.

Savings to Investment Ratio (SIR) = **Savings** divided by **Investment**

Savings includes the total discounted dollar savings considered over the life of the improvement. When these savings are added up, changes in future fuel prices as projected by the Department of Energy are included. Future savings are discounted to the present to account for the time-value of money (i.e. money's ability to earn interest over time). The **Investment** in the SIR calculation includes the labor and materials required to install the measure. An SIR value of at least 1.0 indicates that the project is cost-effective—total savings exceed the investment costs.

Simple payback is a cost analysis method whereby the investment cost of a project is divided by the first year's savings of the project to give the number of years required to recover the cost of the investment. This may be compared to the expected time before replacement of the system or component will be required. For example, if a boiler costs $12,000 and results in a savings of $1,000 in the first year, the payback time is 12 years. If the boiler has an expected life to replacement of 10 years, it would not be financially viable to make the investment since the payback period of 12 years is greater than the project life.

The Simple Payback calculation does not consider likely increases in future annual savings due to energy price increases. As an offsetting simplification, simple payback does not consider the need to earn interest on the investment (i.e. it does not consider the time-value of money). Because of these simplifications, the SIR figure is considered to be a better financial investment indicator than the Simple Payback measure.

Measures are implemented in order of cost-effectiveness. The program first calculates individual SIRs, and ranks all measures by SIR, higher SIRs at the top of the list. An individual measure must have an individual SIR>=1 to make the cut. Next the building is modified and re-simulated with the highest ranked measure included. Now all remaining measures are re-evaluated and ranked, and the next most cost-effective measure is implemented. AkWarm goes through this iterative process until all appropriate measures have been evaluated and installed.

It is important to note that the savings for each recommendation is calculated based on implementing the most cost effective measure first, and then cycling through the list to find the next most cost effective measure. Implementation of more than one EEM often affects the savings of other EEMs. The savings may in some cases be relatively higher if an individual EEM is implemented in lieu of multiple recommended EEMs. For example implementing a reduced operating schedule for inefficient lighting will result in relatively high savings. Implementing a reduced operating schedule for newly installed efficient lighting will result in lower relative savings, because the efficient lighting system uses less energy during each hour of operation. If multiple EEM's are recommended to be implemented, AkWarm calculates the combined savings appropriately.

Cost savings are calculated based on estimated initial costs for each measure. Installation costs include labor and equipment to estimate the full up-front investment required to implement a change. Costs are derived from Means Cost Data, industry publications, and local contractors and equipment suppliers.

2.4 Limitations of Study

All results are dependent on the quality of input data provided, and can only act as an approximation. In some instances, several methods may achieve the identified savings. This report is not intended as a final design document. The design professional or other persons following the recommendations shall accept responsibility and liability for the results.

3. Clinic

3.1. Building Description

The 1,734 square foot Clinic was constructed in 2003, with a normal occupancy of 3 people. The building is in operation 7 hours a day, Monday through Friday.

The clinic is built with a post and pad foundation and has 1,734 square feet of flooring insulated with 10 inches of polyurethane. The walls are 2x6 construction with 5.5 inches of polyurethane insulation. The roof is a hot roof with a dropped ceiling for sound isolation and ventilation. The roof is insulated with 10 inches of polyurethane. There are two metal doors, and the windows are operable wood/vinyl framed, and double paned.

Description of Heating Plants

The Heating Plants used in the building are:

Toyo Stove

Fuel Type:	#1 Oil
Input Rating:	40,000 BTU/hr
Steady State Efficiency:	87 %
Idle Loss:	0.5 %
Heat Distribution Type:	Air

Forced Air Furnace

Fuel Type:	#1 Oil
Input Rating:	168,000 BTU/hr
Steady State Efficiency:	74 %
Idle Loss:	18 %
Heat Distribution Type:	Water
Boiler Operation:	Sep – Jun

Oil fired Hot Water Tank

Fuel Type:	#1 Oil
Input Rating:	50,000 BTU/hr
Steady State Efficiency:	75 %
Idle Loss:	1.5 %
Heat Distribution Type:	Water
Boiler Operation:	All Year

Space Heating Distribution Systems

The building is primarily heated by a forced air furnace pulling lots of outside air. A Toyotomi Laser 73 stove has been put in Exam Room One to reduce the load of the forced air furnace and provide additional heating for the front of the building.

Domestic Hot Water System

The domestic hot water system is a 50 gallon oil fired hot water heater and the water is circulated by a 50 watt circulation pump.

Waste Heat Recovery Information

There is currently no waste heat recovery system for the clinic.

Description of Building Ventilation System

The building is ventilated through an outside air makeup distributed through the forced air furnace fan.

Lighting

The building is primarily lit by 32 watt, T8 fluorescent lighting fixtures, and has several metal halide exterior lights.

Plug Loads

Primary plug loads in the building come from a multitude of desktop computers, monitors, and printers, and the Afhcan telemedicine machine. Additional medical equipment makes up a significant portion of the load, and the server bank accounts for a similar percentage of electrical use.

3.2 Predicted Energy Use

3.2.1 Energy Usage / Tariffs

The electric usage profile charts (below) represents the predicted electrical usage for the building. If actual electricity usage records were available, the model used to predict usage was calibrated to approximately match actual usage. The electric utility measures consumption in kilowatt-hours (kWh). One kWh usage is equivalent to 1,000 watts running for one hour.

The fuel oil usage profile shows the fuel oil usage for the building. Fuel oil consumption is measured in gallons. One gallon of #1 fuel oil provides approximately 132,000 BTUs of energy.

The following is a list of the utility companies providing energy to the building and the class of service provided:

Electricity: Middle Kuskokwim Electric Coop - Commercial - Sm

The average cost for each type of fuel used in this building is shown below in Table 3.1. This figure includes all surcharges, subsidies, and utility customer charges:

Table 3.1 – Average Energy Cost	
Description	**Average Energy Cost**
Electricity	$ 0.26/kWh
#1 Oil	$ 6.02/gallons

3.2.1.1 Total Energy Use and Cost Breakdown

At current rates, YKHC pays approximately $17,804 annually for electricity and other fuel costs for the Clinic.

Figure 3.1 below reflects the estimated distribution of costs across the primary end uses of energy based on the AkWarm© computer simulation. Comparing the "Retrofit" bar in the figure to the "Existing" bar shows the potential savings from implementing all of the energy efficiency measures shown in this report.

Figure 3.1
Annual Energy Costs by End Use

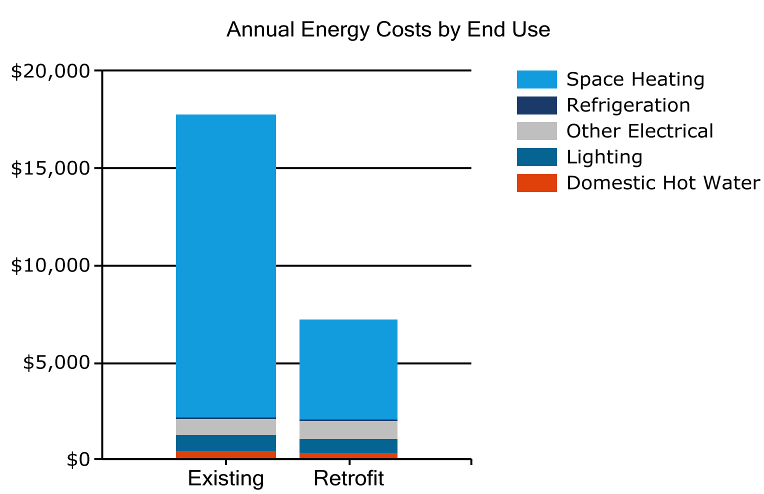


Figure 3.2 below shows how the annual energy cost of the building splits between the different fuels used by the building. The "Existing" bar shows the breakdown for the building as it is now; the "Retrofit" bar shows the predicted costs if all of the energy efficiency measures in this report are implemented.

Figure 3.2
Annual Energy Costs by Fuel Type

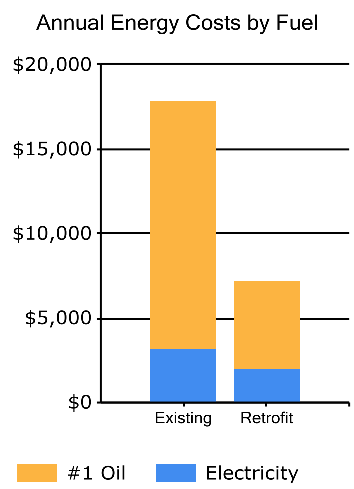
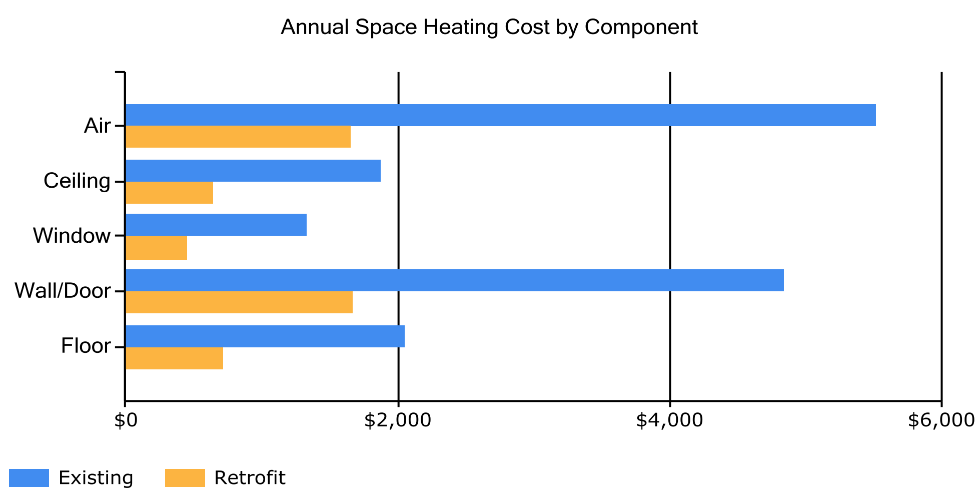


Figure 3.3 below addresses only Space Heating costs. The figure shows how each heat loss component contributes to those costs; for example, the figure shows how much annual space heating cost is caused by the heat loss through the Walls/Doors. For each component, the space heating cost for the Existing building is shown (blue bar) and the space heating cost assuming all retrofits are implemented (yellow bar) are shown.

Figure 3.3
Annual Space Heating Cost by Component



The tables below show AkWarm's estimate of the monthly fuel use for each of the fuels used in the building. For each fuel, the fuel use is broken down across the energy end uses. Note, in the tables below "DHW" refers to Domestic Hot Water heating.

Electrical Consumption (kWh)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Lighting	285	260	285	194	201	194	201	201	194	255	289	299
Other_Electrical	289	264	289	280	289	280	289	289	280	289	280	289
Refrigeration	39	35	39	38	39	38	39	39	38	39	38	39
Ventilation_Fans	0	0	0	0	0	0	0	0	0	0	0	0
DHW	37	34	37	36	37	36	37	37	36	37	36	37
Space_Heating	440	398	432	411	420	403	417	417	407	427	420	440
Space_Cooling	0	0	0	0	0	0	0	0	0	0	0	0

Fuel Oil #1 Consumption (Gallons)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
DHW	5	4	5	5	5	5	5	5	5	5	5	5
Space_Heating	358	298	283	209	172	1	1	1	169	233	291	356

3.2.2 Energy Use Index (EUI)

Energy Use Index (EUI) is a measure of a building's annual energy utilization per square foot of building. This calculation is completed by converting all utility usage consumed by a building for one year, to British Thermal Units (Btu) or kBtu, and dividing this number by the building square footage. EUI is a good measure of a building's energy use and is utilized regularly for comparison of energy performance for similar building types. The Oak Ridge National Laboratory (ORNL) Buildings Technology Center under a contract with the U.S. Department of Energy maintains a Benchmarking Building Energy Performance Program. The ORNL website determines how a building's energy use compares with similar facilities throughout the U.S. and in a specific region or state.

Source use differs from site usage when comparing a building's energy consumption with the national average. Site energy use is the energy consumed by the building at the building site only. Source energy use includes the site energy use as well as all of the losses to create and distribute the energy to the building. Source energy represents the total amount of raw fuel that is required to operate the building. It incorporates all transmission, delivery, and production losses, which allows for a complete assessment of energy efficiency in a building. The type of utility purchased has a substantial impact on the source energy use of a building. The EPA has determined that source energy is the most comparable unit for evaluation purposes and overall global impact. Both the site and source EUI ratings for the building are provided to understand and compare the differences in energy use.
The site and source EUIs for this building are calculated as follows. (See Table 3.4 for details):

$$\textit{Building Site EUI} = \frac{(\textit{Electric Usage in kBtu + \#1 Fuel Oil})}{\textit{Building Square Footage}}$$

$$\textit{Building Source EUI} = \frac{(\textit{Electric Usage in kBtu X SS Ratio + \#1 Fuel Oil})}{\textit{Building Square Footage}}$$

where "SS Ratio" is the Source Energy to Site Energy ratio for the particular fuel.

Table 3.4
Clinic EUI Calculations

Energy Type	Building Fuel Use per Year	Site Energy Use per Year, kBTU	Source/Site Ratio	Source Energy Use per Year, kBTU
Electricity	12,198 kWh	41,630	3.340	139,045
#1 Oil	2,431 gallons	320,853	1.010	324,062
Total		**362,484**		**463,107**
BUILDING AREA		1,734	Square Feet	
BUILDING SITE EUI		209	kBTU/Ft²/Yr	
BUILDING SOURCE EUI		267	**kBTU/Ft²/Yr**	
* Site - Source Ratio data is provided by the Energy Star Performance Rating Methodology for Incorporating Source Energy Use document issued March 2011.				

3.3 AkWarm© Building Simulation

An accurate model of the building performance can be created by simulating the thermal performance of the walls, roof, windows and floors of the building. The HVAC system and central plant are modeled as well, accounting for the outside air ventilation required by the building and the heat recovery equipment in place.

The model uses local weather data and is trued up to historical energy use to ensure its accuracy. The model can be used now and in the future to measure the utility bill impact of all types of energy projects, including improving building insulation, modifying glazing, changing air handler schedules, increasing heat recovery, installing high efficiency boilers, using variable air volume air handlers, adjusting outside air ventilation and adding cogeneration systems.

For the purposes of this study, the Clinic was modeled using AkWarm© energy use software to establish a baseline space heating and cooling energy usage. Climate data from Sleetmute was used for analysis. From this, the model was be calibrated to predict the impact of theoretical energy savings measures. Once annual energy savings from a particular measure were predicted and the initial capital cost was estimated, payback scenarios were approximated. Equipment cost estimate calculations are provided in Appendix D.

Limitations of AkWarm© Models

• The model is based on typical mean year weather data for Sleetmute. This data represents the average ambient weather profile as observed over approximately 30 years. As such, the gas and electric profiles generated will not likely compare perfectly with actual energy billing information from any single year. This is especially true for years with extreme warm or cold periods, or even years with unexpectedly moderate weather.
• The heating and cooling load model is a simple two-zone model consisting of the building's core interior spaces and the building's perimeter spaces. This simplified approach loses accuracy for buildings that have large variations in cooling/heating loads across different parts of the building.
• The model does not model HVAC systems that simultaneously provide both heating and cooling to the same building space (typically done as a means of providing temperature control in the space).

The energy balances shown in Section 3.1 were derived from the output generated by the AkWarm© simulations.

4. ENERGY COST SAVING MEASURES

4.1 Summary of Results

The energy saving measures are summarized in Table 4.1. Please refer to the individual measure descriptions later in this report for more detail. Calculations and cost estimates for analyzed measures are provided in Appendix C.

Table 4.1
Clinic, Sleetmute, Alaska
PRIORITY LIST – ENERGY EFFICIENCY MEASURES

Rank	Feature	Improvement Description	Annual Energy Savings	Installed Cost	Savings to Investment Ratio, SIR	Simple Payback (Years)
1	Setback Thermostat: Clinic Back Area	Implement a Heating Temperature Unoccupied Setback to 55.0 deg F for the Clinic Back Area space.	$465	$200	34.88	0.4
2	Heating, Ventilation, and Domestic Hot Water	Remove the non-functioning direct digital control system and convert the heating and ventilation controls to conventional controls that can be maintained by the Tribal Council. Utilize the setback thermostat to also shut off the hot water heater circulator during unoccupied hours.	$9,890	$8,000	23.31	0.8
3	Air Tightening	Perform air sealing to reduce air leakage by 200 cfm at 50 Pascals.	$198	$500	4.08	2.5
4	Lighting: Exterior Lighting	Replace existing metal halide fixtures with 2 LED 17W Fixtures	$68	$400	1.09	5.9
	TOTAL, all measures		**$10,621**	**$9,100**	**21.53**	**0.9**

4.2 Interactive Effects of Projects

The savings for a particular measure are calculated assuming all recommended EEMs coming before that measure in the list are implemented. If some EEMs are not implemented, savings for the remaining EEMs will be affected. For example, if ceiling insulation is not added, then savings from a project to replace the heating system will be increased, because the heating system for the building supplies a larger load.

In general, all projects are evaluated sequentially so energy savings associated with one EEM would not also be attributed to another EEM. By modeling the recommended project sequentially, the analysis accounts for interactive affects among the EEMs and does not "double count" savings.

Interior lighting, plug loads, facility equipment, and occupants generate heat within the building. When the building is in cooling mode, these items contribute to the overall cooling demands of the building; therefore, lighting efficiency improvements will reduce cooling requirements in air-conditioned buildings. Conversely, lighting-efficiency improvements are anticipated to slightly increase heating requirements. Heating penalties and cooling benefits were included in the lighting project analysis.

4.3 Building Shell Measures

Building shell improvements are those that reduce heating costs by reducing the heat lost through the floor, walls, ceiling, windows and doors. AKWarm can automatically calculate the appropriate places to add insulation, how much to add, and the installed cost. The costs have a built in location factor that includes shipping and the installation cost is factored for local costs for labor, including travel where necessary.

4.3.1. Energy Efficiency Measure: Seal Air Leaks

Rank	Estimated Air Leakage	Recommended Air Leakage Target	Energy Auditor Comments	Cost	Savings
3	Air Tightness from Blower Door Test: 1890 cfm at 50 Pascals	Perform air sealing to reduce air leakage by 200 cfm at 50 Pascals.		$500	$198

Many buildings, especially older ones, have air leaks allowing heated and cooled air to escape when the air pressure differs between the inside and outside of the building. Because these leaks allow unconditioned air to enter as conditioned air is lost, air leaks can be a significant waste of energy and money. They also make the building drafty. Many buildings have hidden air leaks requiring a weatherization technician to find and seal. Buildings with indoor air pollution caused by combustion heating, tobacco smoking, or moisture problems, may require more ventilation than average buildings. Reducing the makeup air intake in the mechanical room, and putting weather stripping around doors are easy ways to increase efficiency and reduce the infiltration by the 200 CFM listed above.

4.4 Heating Measures

4.4.1. EEM Heating Plants and Distribution Systems

A heating system is expected to last approximately 20-25 years, depending on the system. If the system is nearing the end of its life, it is better to replace it sooner rather than later to avoid being without heat for several days when it fails. However, your heating systems are fairly new therefore we recommend the following retrofits.

Recommendation: Remove the non-functioning direct digital control system and convert the heating and ventilation controls to conventional controls that can be maintained by the Tribal Council. Utilize the setback thermostat to also shut off the hot water heater circulator during unoccupied hours. Increasing the efficiency of the forced air furnace through conventional controls would yield significant energy savings in the building.

Estimated Cost: $8,000

Estimate Savings per Year: $9,890

Energy Auditor Comments: None

4.4.1.1. EXISTING SYSTEMS

4.4.1.1.1 Toyotomi Stove
Description: heating plant fueled by #1 Fuel Oil, with a Natural draft.
Size : 40,000 BTU/h
Efficiency (Steady State & Idle): 87%
Portion of heat supplied by this unit: 5%
Notes:

4.4.1.1.2 Forced Air Furnace
Description: heating plant fueled by #1 Fuel Oil, with a Natural draft.
Size : 168,000 BTU/h
Efficiency (Steady State & Idle): 74%
Portion of heat supplied by this unit: 95%
Notes:

4.4.1.1.3 Oil Fired Hot Water Tank
Description: heating plant fueled by #1 Fuel Oil, with a Natural draft.
Size : 50,000 BTU/h
Efficiency (Steady State & Idle): 75%
Portion of heat supplied by this unit: 0%
Notes:

4.4.1.1.4 Space Heating for the Clinic

Notes: Clinic has two zones, one is rarely used and comprises storage and guest quarters in the back. This zone is kept at 72 degrees. The front zone which is heated by both a Toyotomi stove and the forced hot air furnace is kept at 65 degrees.

4.4.2 Programmable Thermostat

Location	Existing Situation	Recommended Improvement	Install Cost	Annual Savings	Notes
Clinic Back Area	Existing Unoccupied Heating Setpoint: 72.0 deg F	Implement a Heating Temperature Unoccupied Setback to 55.0 deg F for the Clinic Back Area space.	$200	$465	

Recommendation: We recommend that you take advantage of the built in temperature set back capability of a new simpler set of conventional controls as well as the built in setback capability of the Toyotomi in the front office and set unoccupied temperature setbacks to 55 degrees in the back area of the building, which is rarely used.

4.5 LIGHTING UPGRADES

The goal of this section is to present any lighting energy conservation measures that may also be cost beneficial. It should be noted that replacing current bulbs with more energy-efficient equivalents will have a small effect on the building heating and cooling loads. The building cooling load will see a small decrease from an upgrade to more efficient bulbs and the heating load will see a small increase, as the more energy efficient bulbs give off less heat.

4.5.1 Lighting Upgrade – Replace Existing Fixtures and Bulbs

Location	Existing Lighting	Recommended Improvement	Install Cost	Annual Savings	Notes
Exterior Lighting Schedule	2 MH 100 Watt Magnetic ballast with Manual Switching, Photocell	Replace with 2 LED 17W Module Electronic	$400	$68	

Description: This recommendation involves replacing the two 100 watt metal halide exterior lights with LED wall packs, which are more energy efficient, longer lasting, and work well in the cold.

5. ENERGY EFFICIENCY ACTION PLAN

Through inspection of the energy-using equipment on-site and discussions with site facilities personnel, this energy audit has identified several energy-saving measures. The measures will reduce the amount of fuel burned and electricity used at the site. The projects will not degrade the performance of the building and, in some cases, will improve it.

Several types of EEMs can be implemented immediately by building staff, and others will require various amounts of lead time for engineering and equipment acquisition. In some cases, there are logical advantages to implementing EEMs concurrently. For example, if the same electrical contractor is used to install both lighting equipment and motors, implementation of these measures should be scheduled to occur simultaneously.

Attached to this report is Appendix A. The objective of this appendix is to provide the City of Eek and the Eek Traditional Council with a wide range of websites to further your knowledge of both energy conservation and renewable energy.

Appendix A – Listing of Energy Conservation and Renewable Energy Websites

Lighting
Illumination Engineering Society - http://www.iesna.org/

Energy Star Compact Fluorescent Lighting Program - www.energystar.gov/index.cfm?c=cfls.pr_cfls

DOE Solid State Lighting Program - http://www1.eere.energy.gov/buildings/ssl/

DOE office of Energy Efficiency and Renewable Energy - http://apps1.eere.energy.gov/consumer/your_workplace/

Energy Star – http://www.energystar.gov/index.cfm?c=lighting.pr_lighting

Hot Water Heaters

Heat Pump Water Heaters - http://apps1.eere.energy.gov/consumer/your_home/water_heating/index.cfm/mytopic=12840

Solar Water Heating

FEMP Federal Technology Alerts – http://www.eere.energy.gov/femp/pdfs/FTA_solwat_heat.pdf

Solar Radiation Data Manual – http://rredc.nrel.gov/solar/pubs/redbook

Plug Loads

DOE office of Energy Efficiency and Renewable Energy – http:apps1.eere.energy.gov/consumer/your_workplace/

Energy Star – http://www.energystar.gov/index.cfm?fuseaction=find_a_product

The Greenest Desktop Computers of 2008 - http://www.metaefficient.com/computers/the-greenest-pcs-of-2008.html

Wind

AWEA Web Site – http://www.awea.org

National Wind Coordinating Collaborative – http:www.nationalwind.org

Utility Wind Interest Group site: http://www.uwig.org

WPA Web Site – http://www.windpoweringamerica.gov

Homepower Web Site: http://homepower.com

Windustry Project: http://www.windustry.com

Solar

NREL – http://www.nrel.gov/rredc/

Firstlook – http://firstlook.3tiergroup.com

TMY or Weather Data – http://rredc.nrel.gov/solar/old_data/nsrdb/1991-2005/tmy3/

State and Utility Incentives and Utility Policies - http://www.dsireusa.org