Alaska Native Tribal Health Consortium

**Division of Environmental Health and Engineering**
3900 Ambassador Drive • Suite 301 • Anchorage, Alaska 99508 • Phone: (907) 729-3600 • Fax: (907) 729-4090 • www.anthc.org

April 16, 2013

The Honorable Benjamin Phillip
President
Alakanuk Tribal Council
P.O. Box 149
Alakanuk, AK 99554

Dear President Phillip

Re: Alakanuk Health Clinic

I have enclosed a copy of the report prepared as part of the energy audit of the Alakanuk Health Clinic. The audit was prepared by the Energy Projects Group of the Department of Environmental Health and Engineering (DEHE) at the Alaska Native Tribal Health Consortium (ANTHC). Please feel free to contact me at 907-729-3543 or cremley@anthc.org if you have any questions.

Once the energy efficiency measures are implemented, the fuel and electricity costs to operate the Alakanuk Health Clinic will be reduced by approximately $1,355 per year or 12.5% of the $10,759 annual energy cost in 2011.

The energy audit was performed with EECBG funds provided by Department of Energy grant DE-EE0001883. We encourage the Alakanuk Native Community to implement our recommendations. If funding the implementation is a concern, you might want to apply for the next round of EECBG funding.

Sincerely,

Carl H. Remley
Energy Projects Manager

Enclosure
Alakanuk Health Clinic Report

Cc: Ms. Olga Evan, YKHC w/enclosure
Ms. Deanna Latham, YKHC, w/enclosure
Mr. Greg McIntire, YKHC, w/enclosure
Ms. Susan Hoeldt YKHC w/enclosure

Alaska Native Tribal Health Consortium

**Division of Environmental Health and Engineering**
3900 Ambassador Drive • Suite 301 • Anchorage, Alaska 99508 • Phone: (907) 729-3600 • Fax: (907) 729-4090 • www.anthc.org

April 17, 2013

The Honorable Norbert Beans
President
Algaaciq Native Village
P.O. Box 48
St Mary, Alaska 99658

Dear President Beans

Re: Algaaciq Tribal Office Report

I have enclosed a copy of the report prepared as part of the energy audit of the Algaaciq Tribal Office. The audit was prepared by the Energy Projects Group of the Department of Environmental Health and Engineering (DEHE) at the Alaska Native Tribal Health Consortium (ANTHC). Please feel free to contact me at 907-729-3543 or cremley@anthc.org if you have any questions.

Once the energy efficiency measures are implemented, the fuel and electricity costs to operate the Algaaciq Tribal Office will be reduced by approximately $778 per year or 20.1% of the $3,872 annual energy cost in 2011.

The energy audit was performed with EECBG funds provided by Department of Energy grant DE-EE0001883. We encourage the Algaaciq Native Village to implement our recommendations. If funding the implementation is a concern, you might want to apply for the next round of EECBG funding.

Sincerely,

Carl H. Remley
Energy Projects Manager

Enclosure
Algaaciq Tribal Office Report

Alaska Native Tribal Health Consortium

**Division of Environmental Health and Engineering**
3900 Ambassador Drive • Suite 301 • Anchorage, Alaska 99508 • Phone: (907) 729-3600 • Fax: (907) 729-4090 • www.anthc.org

April 17, 2013

The Honorable William Lord
First Chief
Nenana Traditional Council
P.O. Box 356
Nenana, AK 99760

Dear First Chief Lord

Re: Nenana Multipurpose Building Report

I have enclosed a copy of the report prepared as part of the energy audit of the Nenana Multipurpose Building. The audit was prepared by the Energy Projects Group of the Department of Environmental Health and Engineering (DEHE) at the Alaska Native Tribal Health Consortium (ANTHC). Please feel free to contact me at 907-729-3543 or cremley@anthc.org if you have any questions.

Once the energy efficiency measures are implemented, the fuel and electricity costs to operate the Nenana Multipurpose Building will be reduced by approximately $7,163 per year or 36.9% of the $19,410 annual energy cost in 2012.

The energy audit was performed with EECBG funds provided by Department of Energy grant DE-EE0001883. We encourage the Nenana Traditional Council to implement our recommendations. If funding the implementation is a concern, you might want to apply for the next round of EECBG funding.

Sincerely,

Carl H. Remley
Energy Projects Manager

Enclosure
Nenana Multipurpose Building Report

**Alaska Native Tribal Health Consortium**

**Division of Environmental Health and Engineering**
3900 Ambassador Drive • Suite 301 • Anchorage, Alaska 99508 • Phone: (907) 729-3600 • Fax: (907) 729-4090 • www.anthc.org

April 17, 2013

The Honorable Wilbur Hootch Sr.
Mayor
City of Emmonak
PO Box 9
Emmonak, AK 99581

Dear Mayor Hootch

Re: Emmonak Washeteria Report

I have enclosed a copy of the report prepared as part of the energy audit of the Emmonak Washeteria. The audit was prepared by the Energy Projects Group of the Department of Environmental Health and Engineering (DEHE) at the Alaska Native Tribal Health Consortium (ANTHC). Please feel free to contact me at 907-729-3543 or cremley@anthc.org if you have any questions.

Once the energy efficiency measures are implemented, the fuel and electricity costs to operate the Emmonak Washeteria will be reduced by approximately $11,237 per year or 21.5% of the $52,247 annual energy cost in 2012.

The energy audit was performed with EECBG funds provided by Department of Energy grant DE-EE0001883. We encourage the City of Emmonak to implement our recommendations. If funding the implementation is a concern, you might want to apply for the next round of EECBG funding.

Sincerely,

Carl H. Remley
Energy Projects Manager

Enclosure
Emmonak Washeteria Report

Cc: Greg Magee, Program Manager, Village Safe Water
Billy Westlock, Remote Maintenance Worker

# Comprehensive Energy Audit
# For
# Alakanuk Clinic

Prepared For
**Alakanuk Tribal Council**

**January 30, 2013**

**Prepared By:**

**ANTHC-DEHE**
**Energy Projects Group**
**3900 Ambassador Drive, Suite 301**
**Anchorage, AK 99515**

# Table of Contents



**PREFACE**

The Energy Projects Group at the Alaska Native Tribal Health Consortium (ANTHC) prepared this document for the Alakanuk Tribal Council. The authors of this report are Carl Remley, Certified Energy Auditor (CEA) and Gavin Dixon.

The purpose of this report is to provide a comprehensive document that summarizes the findings and analysis that resulted from an energy audit conducted over the past couple 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 Energy Projects Group gratefully acknowledges the assistance of the staff of the Health Clinic.

# 1. EXECUTIVE SUMMARY

This report was prepared for the Native Village of Alakanuk. The scope of the audit focused on Alakanuk 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 predicted energy costs for the buildings analyzed are $3,683 for Electricity and $7,076 for #1 Oil, with total energy costs of $10,759 per year.

It should be noted that this facility received the power cost equalization (PCE) subsidy from the state of Alaska last year. If this facility had not received PCE, total electrical costs would have been $11,699.

Table 1.1 below summarizes the energy efficiency measures analyzed for the Alakanuk 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 Occupied Space | Implement a Heating Temperature Unoccupied Setback to 60.0 deg F for the Clinic Occupied Space space. | $884 | $3,000 | 3.88 | 3.4 |
| 2 | Air Tightening | Perform air sealing to reduce air leakage by 250 cfm at 50 Pascals. | $328 | $1,250 | 2.39 | 3.8 |
| 3 | Other Electrical - Controls Retrofit: Copy Machine | Set to Energy Saving Mode. | $2 | $2 | 1.33 | 1.2 |
| 4 | HVAC And DHW | Vent in forced air into pharmacy, and stop using the electric heater. Additionally, filters should be replaced on the furnace to allow maximum air flow and the cleanest possible air. | $141 + $10 Maint. Savings | $990 | 1.00 | 7.0 |
| | **TOTAL, all measures** | | **$1,355 + $10 Maint. Savings** | **$5,242** | **2.98** | **3.9** |

***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 $1,355 per year, or 12.6% of the buildings' total energy costs. These measures are estimated to cost $5,242, for an overall simple payback period of 3.9 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 | Refrigeration | Other Electrical | Cooking | Clothes Drying | Ventilation Fans | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|
| Existing Building | $6,397 | $0 | $1,789 | $933 | $296 | $1,344 | $0 | $0 | $0 | **$10,759** |
| With All Proposed Retrofits | $5,070 | $0 | $1,789 | $933 | $296 | $1,317 | $0 | $0 | $0 | **$9,404** |
| SAVINGS | $1,327 | $0 | $0 | $0 | $0 | $28 | $0 | $0 | $0 | **$1,355** |

# 2. AUDIT AND ANALYSIS BACKGROUND

## *2.1 Program Description*

This audit included services to identify, develop, and evaluate energy efficiency measures at the Alakanuk 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 Alakanuk 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.

Alakanuk Clinic is classified as being made up of the following activity areas:

1) Clinic Occupied Space: 1,737 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. Alakanuk Clinic

## *3.1. Building Description*

The 1,737 square foot Alakanuk Clinic was constructed in 2001, with a normal occupancy of 5 people. The number of hours of operation for this building average 6.4 hours per day, considering all seven days of the week.

**Description of Building Shell**

The exterior walls are constructed with six inch SIP panels with 5.5 inches of polyurethane insulation.

The roof of the building is a warm roof with 8 inches of polyurethane insulation.

The floor of the building is built on pilings with ten inches of polyurethane insulation.

Typical windows throughout the building are double paned insulated vinyl operable windows.

Doors are metal with a urethane core.

**Description of Heating Plants**

The Heating Plants used in the building are:

Forced Air Furnace

| | |
|---|---|
| Nameplate Information: | Adams AACOU 230 forced air furnace |

Beckett AFG Burner

| | |
|---|---|
| Fuel Type: | #1 Oil |
| Input Rating: | 230,000 BTU/hr |
| Steady State Efficiency: | 78 % |
| Idle Loss: | 1.5 % |
| Heat Distribution Type: | Air |
| Notes: | 1.35 gph nozzle |

Bock C Glass Water Heater

Nameplate Information: Bock C Glass Model 32 E

Beckett AF Burner

Fuel Type: #1 Oil

Input Rating: 104,000 BTU/hr

Steady State Efficiency: 78 %

Idle Loss: 1.5 %

Heat Distribution Type: Water

Boiler Operation: All Year

Notes: .75 gph, 80A

32gallons of storage

Toyotomi

Nameplate Information: Laser 73

Fuel Type: #1 Oil

Input Rating: 40,000 BTU/hr

Steady State Efficiency: 86 %

Idle Loss: 0 %

Heat Distribution Type: Air

Notes: Set to 68 degrees, turns on usually only in winter

Electric Heater for Pharmacy

Fuel Type: Electricity

Input Rating: 0 BTU/hr

Steady State Efficiency: 100 %

Idle Loss: 0 %

Heat Distribution Type: Air

## Domestic Hot Water System

Domestic hot water is heated with an oil fired hot water heater, but is primarily only used for hot water in the showers, most often when guests are staying in the clinic.

## Description of Building Ventilation System

The existing building ventilation system consists of a fan that brings in a certain parentage of outside air as determined by the DDC system, mixes it with heated re-circulated air and distributes it to the facility.

## Lighting

Typical lighting throughout the facility is made up of T8 32 watt electronic ballast fixtures.

## Plug Loads

Plug loads in the facility are made up primarily of computers, phones, the copy machine, and the various medical equipment throughout the facility. This include dental equipment, optometry equipment, and various other medical equipment as well as the Afhcan telemedicine machine. The largest loads however are by the two refrigerators, one for staff and one for the pharmacy.

**Major Equipment**

There are two heat tapes for the sewage main and the sewage collection tank. A space heater is also used in the box in times of extreme cold. This heater should be used sparingly and only when necessary to either thaw a freeze-up or in times of extreme cold, as it is an inefficient way of keeping the system from freezing.

## *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) and maximum demand in kilowatts (kW). 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: AVEC-Alakanuk - 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 | $ 0.17/kWh |
| #1 Oil | $ 6.45/gallons |

#### 3.2.1.1 Total Energy Use and Cost Breakdown

At current rates, YKHC pays approximately $10,759 annually for electricity and other fuel costs for the Alakanuk 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

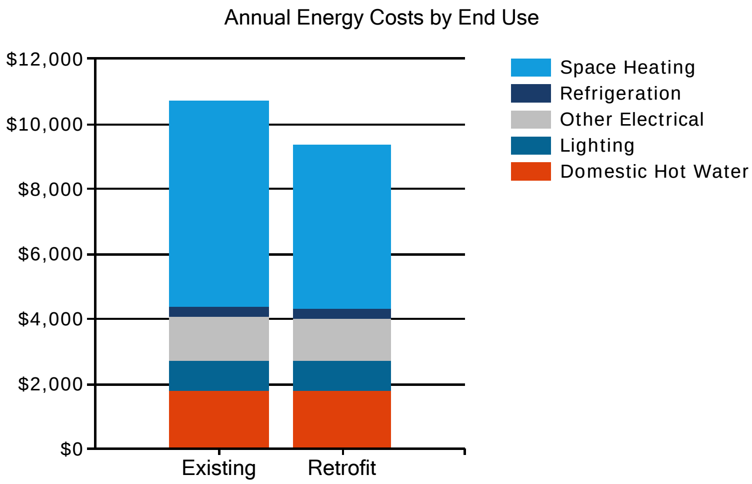



Figure 3.2 below shows how the annual energy cost of the building splits between the different fuels used by the building. The "Existing" bar shows the breakdown for the building as it is now; the "Retrofit" bar shows the predicted costs if all of the energy efficiency measures in this report are implemented.

## Figure 3.2
## Annual Energy Costs by Fuel Type

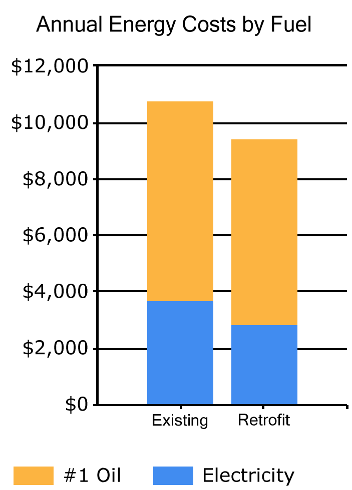
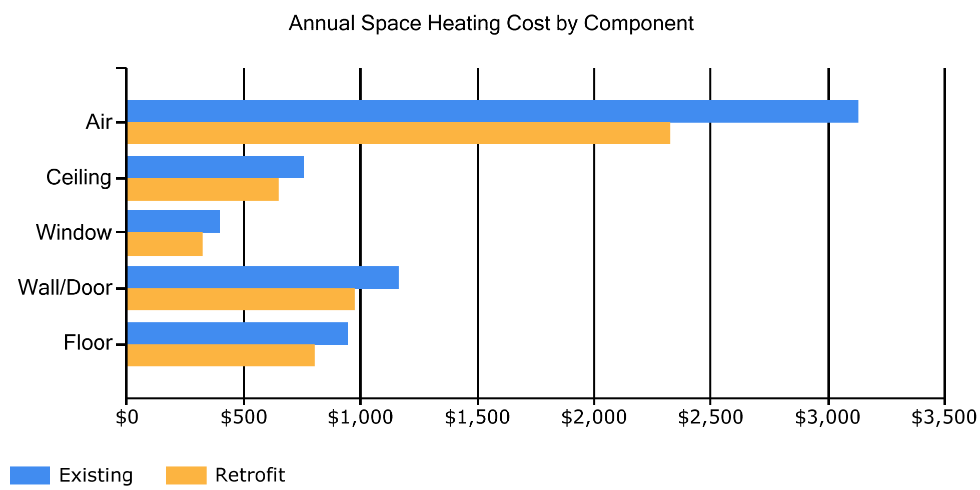



Figure 3.3 below addresses only Space Heating costs. The figure shows how each heat loss component contributes to those costs; for example, the figure shows how much annual space heating cost is caused by the heat loss through the Walls/Doors. For each component, the space heating cost for the Existing 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 | 487 | 443 | 487 | 471 | 442 | 426 | 441 | 441 | 426 | 466 | 471 | 487 |
| Other_Electrical | 963 | 878 | 963 | 932 | 342 | 311 | 321 | 321 | 311 | 673 | 932 | 963 |
| Refrigeration | 148 | 135 | 148 | 143 | 148 | 143 | 148 | 148 | 143 | 148 | 143 | 148 |
| Ventilation_Fans | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| DHW | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| Space_Heating | 1141 | 1024 | 919 | 525 | 194 | 61 | 39 | 65 | 155 | 451 | 753 | 1143 |

| Fuel Oil #1 Consumption (Gallons) | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sept | Oct | Nov | Dec |
| DHW | 23 | 21 | 23 | 23 | 23 | 23 | 23 | 23 | 23 | 23 | 23 | 23 |
| Space_Heating | 125 | 112 | 104 | 67 | 37 | 23 | 22 | 24 | 32 | 61 | 88 | 125 |

### 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):

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

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

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

**Table 3.4**
**Alakanuk 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 | 21,665 kWh | 73,944 | 3.340 | 246,974 |
| #1 Oil | 1,097 gallons | 144,810 | 1.010 | 146,258 |
| **Total** | | **218,754** | | **393,231** |
| | | | | |
| BUILDING AREA | | 1,737 | Square Feet | |
| BUILDING SITE EUI | | 126 | kBTU/Ft²/Yr | |
| **BUILDING SOURCE EUI** | | 226 | **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 Alakanuk Clinic was modeled using AkWarm© energy use software to establish a baseline space heating and cooling energy usage. Climate data from Alakanuk 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 Alakanuk. 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**
**Alakanuk Clinic, Alakanuk, 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 Occupied Space | Implement a Heating Temperature Unoccupied Setback to 60.0 deg F for the Clinic Occupied Space space. | $884 | $3,000 | 3.88 | 3.4 |
| 2 | Air Tightening | Perform air sealing to reduce air leakage by 250 cfm at 50 Pascals. | $328 | $1,250 | 2.39 | 3.8 |
| 3 | Other Electrical - Controls Retrofit: Copy Machine | Set to Energy Saving Mode. | $2 | $2 | 1.33 | 1.2 |

| Table 4.1<br>Alakanuk Clinic, Alakanuk, Alaska<br>PRIORITY LIST – ENERGY EFFICIENCY MEASURES | | | | | | |
|---|---|---|---|---|---|---|
| **Rank** | **Feature** | **Improvement Description** | **Annual Energy Savings** | **Installed Cost** | **Savings to Investment Ratio, SIR** | **Simple Payback (Years)** |
| 4 | HVAC And DHW | Vent in forced air into pharmacy, and stop using the electric heater. Additionally, filters should be replaced on the furnace to allow maximum air flow and the cleanest possible air. | $141 + $10 Maint. Savings | $990 | 1.00 | 7.0 |
| | **TOTAL, all measures** | | **$1,355 + $10 Maint. Savings** | **$5,242** | **2.98** | **3.9** |

## *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*

### *4.3.1 Air Sealing Measures*

| **Rank** | **Location** | **Existing Air Leakage Level (cfm@50/75 Pa)** | | **Recommended Air Leakage Reduction (cfm@50/75 Pa)** | |
|---|---|---|---|---|---|
| 2 | | Air Tightness from Blower Door Test: 2250 cfm at 50 Pascals | | Perform air sealing to reduce air leakage by 250 cfm at 50 Pascals. | |
| **Installation Cost** | $1,250 | **Estimated Life of Measure (yrs)** | 10 | **Energy Savings (/yr)** | $328 |
| **Breakeven Cost** | $2,989 | **Savings-to-Investment Ratio** | 2.4 | **Simple Payback yrs** | 4 |
| Auditors Notes: Windows should be sealed, and the floor vent in the pharmacy should also be sealed. Additionally ,the gravity dampener on the furnace should be replaced. | | | | | |

## *4.4 Mechanical Equipment Measures*

### *4.4.1 Heating/Cooling/Domestic Hot Water Measure*

| **Rank** | **Recommendation** | | | | |
|---|---|---|---|---|---|
| 4 | Vent in forced air into pharmacy, and stop using the electric heater. Additionally, filters should be replaced on the furnace to allow maximum air flow and the cleanest possible air. | | | | |
| **Installation Cost** | $990 | **Estimated Life of Measure (yrs)** | 20 | **Energy Savings (/yr)** | $141 |
| | | | | **Maintenance Savings (/yr)** | $10 |
| **Breakeven Cost** | $991 | **Savings-to-Investment Ratio** | 1.0 | **Simple Payback yrs** | 7 |
| Auditors Notes: Electric heat is much more expensive and less efficient than the furnace, running vents to the pharmacy and eliminating the electric heater would be a large savings, and much more effectively heat the space. | | | | | |

### *4.4.2 Night Setback Thermostat Measures*

| **Rank** | **Building Space** | | | **Recommendation** | |
|---|---|---|---|---|---|
| 1 | Clinic Occupied Space | | | Implement a Heating Temperature Unoccupied Setback to 60.0 deg F for the Clinic Occupied Space space. | |
| **Installation Cost** | $3,000 | **Estimated Life of Measure (yrs)** | 15 | **Energy Savings (/yr)** | $884 |
| **Breakeven Cost** | $11,636 | **Savings-to-Investment Ratio** | 3.9 | **Simple Payback yrs** | 3 |
| Auditors Notes: The current DDC system in the clinic is not functioning correctly. The DDC system should be replaced with a simpler programmable thermostat to control heat in the facility. The heating level in the facility should be set to 60 degrees at times when the facility is unoccupied, such as at nights and on weekends. This project should be done in coordination with YKHC to match other clinics. | | | | | |

## *4.5 Electrical & Appliance Measures*

### *4.5.3 Other Electrical Measures*

| **Rank** | **Location** | **Description of Existing** | | **Efficiency Recommendation** | |
|---|---|---|---|---|---|
| 3 | Copy Machine | Xerox Workcentre 4510 with Manual Switching | | Remove Manual Switching and Add new Other Controls | |
| **Installation Cost** | $2 | **Estimated Life of Measure (yrs)** | 7 | **Energy Savings (/yr)** | $2 |
| **Breakeven Cost** | $3 | **Savings-to-Investment Ratio** | 1.3 | **Simple Payback yrs** | 1 |
| Auditors Notes: Set Work centre 4510 to Energy Saver mode so that it uses less energy, and is set on standby for longer periods of time. | | | | | |

# 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.

# 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