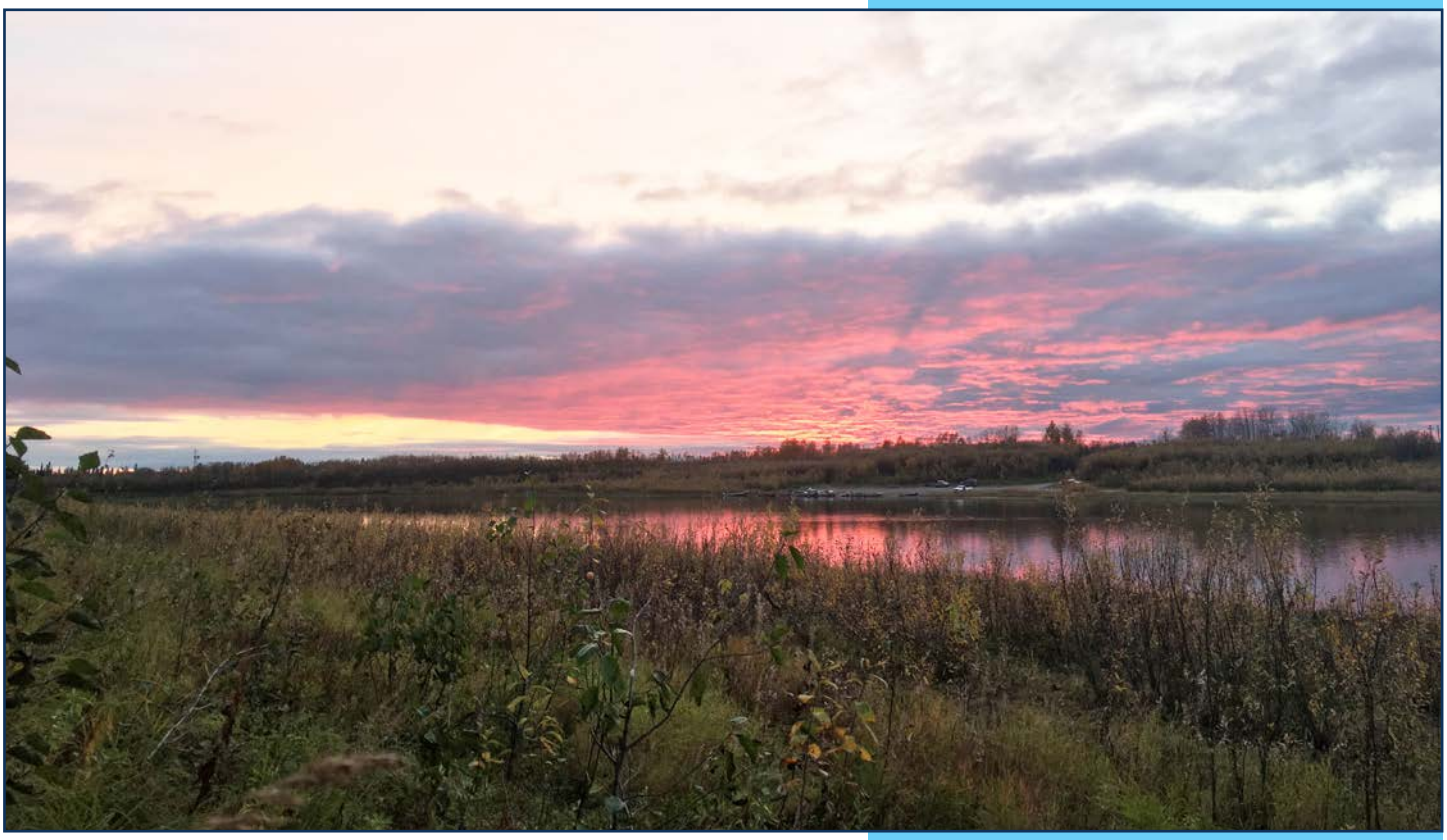
ANIAK

Energy Action Plan

6/15/2019



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DISCLAIMER

LIST OF ACRONYMS

AHU	Air Handling Unit
AK	Alaska
ATC	Aniak Traditional Council
AVCP	Association of Village Council Presidents
BTU	British Thermal Unit
CCHRC	Cold Climate Housing Research Center
CFL	Compact Fluorescent Light
CO	Carbon Monoxide
DOE	Department of Energy
ECM	Energy Conservation Measure
EEM	Energy Efficiency Measure
EOL	End Of Life
FAA	Federal Aviation Adminstration
Ft	Foot
HID	High Intensity Discharge
HVAC	Heating, Ventilation, and Air-Conditioning
ISER	Institute of Social and Economic Research
KNA	Kuskokwim Native Association
kW	Kilowatt
kWh	Kilowatt-hour
LED	Light-Emitting Diode
MBTU	One Million British Thermal Units
O&M	Operations & Maintenance
ONAP	Office of Native American Programs
TBA	To Be Announced
UAA	University of Alaska Anchorage
VPSO	Village Public Safety Officer
W	Watt

ABSTRACT

In 2017, the Native Village of Aniak received a grant for the Aniak Energy Efficiency Project from the United States Department of Energy Office of Indian Energy policy and programs. The objective of the project was to reduce and stabilize energy costs in tribal buildings by setting energy efficiency improvement goals to provide direction for a future retrofit project. This final report begins with information about the community of Aniak and the project procedure. Chapters follow on each component of the project. The project team began by recording information about the seven project buildings as well as the Aniak Traditional Council's goals for each building. Tribal staff also gathered baseline data on each building, including their energy use and general condition. An energy professional surveyed each building, prepared an energy model using AkWarm-C energy modeling software to determine energy-saving retrofits, and completed energy audits, summarized within this report. Each energy audit lists energy efficiency measures and energy conservation measures to pursue to improve the building and decrease its energy use. This report also contains three resources to help with the next steps in an energy retrofit project: a data monitoring plan to track the building condition and energy use through a retrofit project, a maintenance plan to facilitate energy conservation, and a list of funding and training opportunities that could provide resources for a retrofit or training for maintenance staff. Finally, readers can find materials from the outreach component of the project which demonstrated sustainable practices to the community. This Energy Action Plan marks the conclusion of the Aniak Energy Efficiency Project, but is meant to lead to the next step towards safe, comfortable, and energy efficient tribal buildings that will continue to benefit the community of Aniak for many years to come.

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INTRODUCTION

The Native Village of Aniak received a grant from the United States Department of Energy Office of Indian Energy in 2017 to promote energy efficiency in tribal buildings. This resulting Energy Action Plan is intended to lead into the next step of a comprehensive energy project. It contains the energy efficiency improvement goals for each building that participated in the project, as well as supplementary resources to help develop and implement energy saving solutions and reduce energy costs for the Native Village of Aniak.

Community information

The Native Village of Aniak is a remote Yup'ik community in western Alaska. The name "Aniak" means "the place where it comes out" in Yup'ik, and refers to the Aniak River which flows into the larger Kuskokwim River at the village site. The surrounding area consists of rolling hills, tundra, and boreal forest. In summer, the rivers and land provide fish, moose, bear, birds, berries, and gardens to support the subsistence lifestyle of residents. In winter, the many snaking rivers freeze and create a snowmachine roadway system used by residents to hunt larger game and travel to nearby villages.

The community serves as a service and transportation hub for nearby villages. There are three schools, a sub-regional clinic providing primary and preventative care, and a runway capable of landing a jet. The largest employers are the local government, the school district, the airlines, and local services. Due to its remote location, all goods reach Aniak via air or boat. Energy costs are high, with a gallon of fuel oil costing $6.07 and residential electricity at $0.73 per kilowatt-hour for non-residential buildings and residents exceeding the limits set out by Alaska's power cost equalization program (ISER / UAA, 2018).

The Aniak Traditional Council governs the community alongside the City Council. This tribal government consists of seven members, including a First and Second Chief. The tribal office has 10 staff positions and administers six programs, including energy assistance and environmental planning. Aniak has a long-term goal to reduce and stabilize energy costs as well as to build the knowledge and skills necessary to implement energy solutions.

There are 501 people in Aniak, 69.5% of whom are Alaska Native (United States Census Bureau, 2010). Most people live a subsistence lifestyle, fishing and hunting throughout the year. People are very involved in the community. They participate in traditional arts and crafts, a variety of athletic activities (most notably basketball, which involves many members of the community), community bingo, and a host of other events, often held at the community center. Aniak has also served as a checkpoint for the annual Kuskokwim 300 dog mushing race, which not only draws many spectators, but directly involves many residents as support volunteers. Due to an unseasonable warm spell near the scheduled race start date, which left many spots along the Kuskokwim River trail unfrozen and dangerous, the 2018 Kuskokwim 300 route was altered and did not include Aniak as a checkpoint, much to the disappointment of the community.

Project objective

The objective of the Aniak Energy Efficiency Project is to reduce and stabilize energy costs in tribal buildings by setting energy efficiency improvement goals to provide direction for future retrofit projects. Energy efficient and safe buildings will empower the Native Village of Aniak by providing warm, comfortable spaces for community events, and decreasing dependence on outside shipments of fuel oil. The project will also demonstrate sustainable practices and behaviors to the entire community.

Project activities

The Aniak Energy Efficiency Project followed a comprehensive procedure so that the Aniak Traditional Council

and project staff could work together to create goals for the participating buildings, collect information on their current status and energy use, and develop the Energy Action Plan. The procedure, described below, began with a decision on which buildings would participate in the project and concluded with the finalization of the Energy Action Plan, a document meant to serve as a starting point for future building retrofit projects.

Decide on buildings: The Aniak Traditional Council chose seven tribal buildings to receive energy audits as part of the project and set goals for each building.

Project kickoff meeting: In January 2018, the Aniak Traditional Council met with project staff to discuss the overall goal of the project, the procedure, the list of buildings participating in the project and their goals for each building. Council members provided information on the specific purpose of each building as well as broader knowledge on past retrofit projects in Aniak, and the Council's overall energy goals. Finally, the Council members and project staff participated in a discussion about how to act on the recommendations from the Energy Action Plan when this project concludes, such as how retrofits might be financed, local staff and contractors that can perform retrofits or maintenance tasks, and how to utilize other local resources. The flyer that guided this meeting is in Appendix A.

Develop data monitoring plan: During the kickoff meeting, the Council decided on metrics, such as energy use and occupant comfort, for tracking each building in the project. The data monitoring plan, found on page 16, also includes details such as how the chosen metrics will be collected, stored, accessed, and analyzed. Monitoring building metrics is important because it shows how the buildings are changing over time and if an investment into energy efficiency retrofits results in improvements such as increased safety, reduced energy use, better occupant comfort, and less maintenance.

Collect baseline data: Project staff worked with tribal office staff and building occupants to benchmark the current condition and energy use of each identified building. The baseline data included both the most recent data, and where available and applicable, data from previous years. It includes energy use broken out by fuel type, occupant comfort, and maintenance tasks where available. This data provides a snapshot of each building at the beginning of the project and a comparison of that building's energy use and condition to similarly sized buildings in the same region. The energy auditor used baseline data to calibrate energy models of each building. Finally, the Traditional Council can use this data to determine if future retrofit projects improve the building's condition or decrease energy use.

Survey buildings: Project staff surveyed each building in the project, collecting basic information such as the layout, envelope insulation values, and occupancy schedule. They also checked the condition of the building systems such as the envelope, heating and ventilation, and electric appliances. During the surveys, staff looked to identify unsafe building features, maintenance needs, and sources of occupant discomfort as well as determining where, when, and how energy is used in the facility.

Building energy audits: Using information collected in the building surveys, the energy auditor drafted diagrams of the building layouts and created energy models of each building using AkWarm-C, an energy modeling software used in Alaska. After identifying potential retrofits, the energy auditor used AkWarm-C to determine the energy savings from each retrofit option to determine whether the retrofit was cost-effective. The final energy audit report for each building, summarized on page 24, contains information on the building features and energy use, benchmark information comparing the building's energy consumption to other buildings with similar size, use, and occupancy, and most importantly, a list of energy efficiency measures ranked by priority. The audits also suggest energy conservation measures that can be implemented by maintenance staff with little or no cost.

Develop draft Energy Action Plan: This document, the Energy Action Plan, builds on the energy audits of the tribal buildings. The objective of the Energy Action Plan is both to summarize the recommendations of the energy audits and to add actionable steps to help lead to and guide future retrofit projects. To create the Energy Action Plan, staff communicated with representatives of the Tribe and consulted with experts throughout Alaska to identify training and financing opportunities, regional resources, and best practices for retrofit projects.

Final project team meeting: In September 2018, the Aniak Traditional Council reviewed a draft of the Energy Action Plan with project staff. They revisited project goals to ensure the Energy Action Plans addressed them adequately, and suggested revisions where appropriate. The Council then considered next steps following the conclusion of the project.

Final Energy Action Plan: Project staff incorporated suggestions of the Traditional Council and other reviewers to create a final Energy Action Plan for the Aniak Energy Efficiency Project.

Outreach: Throughout the project, Council members, tribal administrative staff, and project team members performed outreach activities to publicize the goals, steps, and outcomes of the project. The outreach included a presentation at the United States Department of Energy Office of Indian Energy Program Reviews in 2017 and 2018, as well as flyers and a video advertising the project in the community.

Document overview

This report contains the objective, procedure, and a summary of the building energy audits of the Aniak Energy Efficiency Project. In addition, other chapters supplement the audit recommendations in order to help facilitate audit recommendations and future energy projects to be undertaken by the Aniak Traditional Council.

The introductory chapter explains the project objective and procedure. Readers can find basic information on the participating tribal buildings, and information on their baseline condition and data monitoring in the *Tribal buildings, Data monitoring plan,* and *Baseline data* sections. The energy audits are summarized on page 24. The *Maintenance Plan* chapter suggests a monthly checklist that maintenance personnel can use to help reduce energy costs and improve building safety and comfort. Information on financing options for future retrofit projects and details on how to fund and schedule training for maintenance personnel appears in the *Funding and training opportunities* chapter. The *Outreach* chapter explains project activities that served to showcase the objectives and results of the project to community members, Alaskans, and others. Finally, the Appendices contain documents produced throughout the project, including flyers and resources to help with future energy projects such as a scope of work for contractors and a summary of energy audits of other local buildings that may participate in a community energy reduction project.

Residents of Aniak frequently take to the area's water ways in the summer to fish for salmon to provide for their subsistence lifestyle.

TRIBAL BUILDINGS

The Aniak Traditional Council chose a total of seven tribal buildings to participate in the project. The buildings are a mix of single and 2-story, wood-framed and metal buildings located within the community. The Council wants to reduce electrical and fuel use in five buildings in a future energy retrofit project and upgrade two buildings for conversion into heated structures.

AVCP office

Building goal: Reduce electrical and fuel oil use. Renovate and lease the building as offices in 2018.

The AVCP office provides useable office space for companies and tenants looking to maintain a facility in Aniak.

The 2,861 square-foot office building has a crawlspace foundation that was originally constructed in the 1940s for use by the Federal Aviation Administration (FAA). The building underwent a renovation and location change in 2000. Heating is provided by an oil-fired boiler that directs heat to two building zones, a unit heater in the crawlspace, and the hot water generator. The heating is controlled by a series of manual thermostats. The exterior lighting consists of an LED fixture and an HPS wall-pack. The interior lighting is comprised of a mixture of fluorescent, CFL, and incandescent lamps. Plug loads at the time of the energy audit were low due to the infrequent occupancy. The building has since been leased and occupied since spring 2018. The Aniak Traditional Council is hoping to reduce the energy use of this building in a future energy retrofit project.

This office building, originally built in the 1940s, was renovated in 2000.

Community center

Building goal: Reduce electrical and fuel oil energy use.

The community center is a vibrant component of the village and provides a hosting place for social activities. The center holds bingo games on Tuesdays and Thursdays throughout the year with up to 40 players. Additionally, the center has a laundry facility and is open for other activities during weekdays throughout the year.

The community center building is in poor condition but continues to host social events and house laundry facilities.

The 9,352 square-foot building is a single story, L-shaped structure that was built in 1985. The building shell is in poor condition, especially in the northeast corner where a recent fire damaged the siding. Heating is provided by five oil-fired direct vent heaters. Formerly, heat was provided by two central forced air furnaces. The laundry facility has seven clothes washers and six electric clothes dryers. The exterior lighting is a mix of high-intensity discharge (HID) and light emitting diode (LED) fixtures. The interior lighting is a mix of fluorescent and incandescent fixtures and lamps. The plug loads for the facility are low with the exception of when the electric dryers are in use. The Aniak Traditional Council is hoping to reduce the energy use of this building in a future energy retrofit project.

Duplex

Building goal: Reduce electrical and fuel oil use. Renovate and lease the building as offices in 2018.

The duplex serves a dual purpose for the community as temporary housing for visiting groups and leasable office space and an office for the Alaska State Troopers.

The 1,904 square-foot building was built in 1995 and sits on an elevated pier foundation. The building shell is in average condition. Heating is provided by an oil-fired boiler that directs heat to three building zones. There are two oil-fired direct vent Toyotomi heaters that provide supplemental heat during the colder months. Domestic hot water in this building is created through an oil-fired Toyotomi tankless water heater. The exterior lighting is comprised of incandescent lamps. The interior lighting is a mix of fluorescent, CFL, and incandescent lamps. The plug loads at the time of the energy audit were low due to the infrequent occupancy of the building, which has since been leased and occupied (Spring 2018). The Aniak Traditional Council is hoping to reduce the energy use of this building in a future energy retrofit project and continue using the bunkhouse side as additional leasable office space.

During the course of the project, the Aniak Traditional Council was working to renovate and lease out the space in the duplex.

Large farm building

Building goal: Convert this building into warm storage with a focus on energy efficiency.

The large farm building currently serves as a community cold storage facility.

The 1,920 square-foot facility was built in 2000 and sits on grade with a dirt floor. It is a steel-framed and metal-sided structure. The building shell is in poor condition. There is only insulation on the west side of the building. There is no heating or plumbing in this building. The lighting consists of fluorescent fixtures. The Aniak Traditional Council is hoping to convert this structure into warm storage with a focus on an energy efficient retrofit.

The large farm building is in poor condition and is currently serving as a cold storage facility.

Small farm building

Building goal: Convert this building into warm storage with a focus on energy efficiency.

The small farm building currently serves as a community cold storage facility.

The 600 square-foot building sits on grade with a concrete slab. It is a wood-framed and wood-sided structure. The building shell is in poor condition. There is no insulation in the building. There

The small farm building is in poor condition and is currently serving as a cold storage facility.

is no heat, plumbing, lighting, or electric service to the farm building. There are safety concerns regarding the structural integrity of the roof system. The Aniak Traditional Council is hoping to convert this structure into warm storage with a focus on an energy efficient retrofit.

Tribal office

Building goal: Reduce electrical and fuel oil use.

The Tribal office serves as the administrative hub for the Native Village of Aniak. Currently, there are 14 community members employed in the offices. The facility receives a large amount of local traffic (10-20 daily visitors). The offices are open during normal business hours throughout the year.

The tribal office houses 14 employees that administer tribal programs and help up to 20 visitors daily.

The offices are housed in a two-story, 6,561 square-foot building built in 1985. The building shell is in average condition. Heating is provided by an oil-fired Weil Mclain boiler that distributes heat via baseboard radiators on the first floor and an air handler with a heating coil on the second floor. At the time of the building survey, faulty zone valves have resulted in high heating temperatures in several rooms that cannot be altered by accompanying thermostats. There is potable water and domestic hot water plumbing throughout the building. The interior lighting is mostly fluorescent fixtures with defunct occupancy sensors. The plug loads are high in this building due to its high occupancy rate. The Aniak Traditional Council is hoping to reduce the energy use of this building in a future energy retrofit project.

Village Public Safety Officer (VPSO) office

Building goal: Reduce electrical and fuel oil use.

The VPSO office is an important aspect of the Native Village of Aniak's public safety network. The building is mostly utilized as needed when a cell mate is occupying the holding cell.

The 384 square-foot structure was built in 2013 and is situated on an elevated pier foundation. The building shell is in very good condition due to the building's recent construction. Heating is provided by an oil-fired direct vent Toyotomi heater. Exterior lighting is comprised of motion-detecting LEDs. The interior lighting is a mixture of fluorescent and CFL fixtures. The building has very low plug loads since it is occupied infrequently. The Aniak Traditional Council is hoping to reduce the energy use of this building in a future energy retrofit project.

The VPSO office is in good condition and is mainly used when there is an occupant in the holding cell.

DATA MONITORING PLAN

At the project kickoff meeting, the Aniak Traditional Council worked with CCHRC staff to create a Data Monitoring Plan for the buildings in the project. It is important to document building conditions before, during, and after energy retrofit projects in order to track the building condition and energy use. Before a retrofit project, the building data helps to identify measures that can improve energy performance and lower operating costs. After the retrofit, tracking building metrics shows if the investment resulted in improvements such as increased safety, reduced energy use, better occupant comfort, and less maintenance.

The purpose of the Data Monitoring Plan is to provide a framework to guide the collection, analysis, and storage of data. It helps the project team know who will be responsible for each task, and helps those outside the project quickly review what data is being tracked. Thus, the plan contains building-specific information as to which metrics will be collected and why. It also documents how data on the buildings will be collected, stored, accessed, and analyzed.

Data management overview

In Aniak, the tribal finance director and the tribal building maintenance manager oversee the data monitoring activities. While both of these individuals have access to all building data, the tribal finance director is primarily responsible for monitoring data related to seasonal energy use, while the tribal building maintenance manager is primarily responsible for data related to the operation of the buildings.

Data collection

There are six basic types of data for the tribal buildings in Aniak:

1. Annual fuel oil use: In buildings that are heated using fuel oil combustion appliances, monitoring the annual fuel oil use shows the amount of energy used for heating the building.

2. Monthly electrical energy use: Monitoring electric usage shows the amount of energy used to power the building.

3. Heating appliance temperature sensors: Some buildings have additional temperature sensors to show the performance of the heating appliances. The maintenance manager can remotely check the temperature sensors via a phone app for these buildings to ensure the appliances are working properly.

4. Building temperatures: Some buildings have additional temperature sensors to record the ambient indoor temperature. In these buildings, the maintenance manager can remotely check temperature sensors via a phone app to ensure buildings receive adequate heat.

5. Occupant comfort levels and building condition reports: Occupant comfort and building conditions are established through regular interviews with people who spend the most time in each building. These interviews serve to identify safety issues as well as to document the general condition of the buildings.

6. Maintenance records: Currently, the data monitoring plan does not include maintenance tasks or building condition reports for each building; however, tribal staff may choose to add this metric in the future.

Data storage

The Tribe stores hard copies of all fuel and electrical energy data for each building in a file cabinet in the tribal

office and digital data on Quickbooks.

The building and heating appliance temperature data is stored on the Invita web portal, an online monitoring platform that collects temperature data from registered thermostats over a wireless internet network.

The tribal finance director and tribal maintenance manager will decide where to store building condition and occupant comfort data if they conduct additional surveys during an energy retrofit project.

Project staff also collected baseline data for this project, which consists of energy use, building condition, and occupant comfort data for the period just prior to the energy audit. This data, shown in the *Baseline data* chapter of this report is stored in a project folder on a server at the Cold Climate Housing Research Center and is also available on CCHRC's website at: http://www.cchrc.org/doe-energy-efficiency-and-renewable-energy-projects

Building data

Data requirements, shown in the table below, differ slightly for each building and reflect the systems and conditions of each building during the project period.

	Building	Data	Notes
1	AVCP office	☐ Annual fuel oil use ☐ Monthly electrical energy use ☐ Occupant comfort levels and building condition report ☐ Building internal temperature	This building was unoccupied when building data was initially collected. A poorly-designed crawlspace heating system results in a chronically-overheated crawlspace. The building became occupied in Spring of 2018.
2	Community center	☐ Annual fuel oil use ☐ Monthly electrical energy use ☐ Occupant comfort levels and building condition report temperature ☐ Building internal temperature	The community hall is currently heated by several Toyotomi monitor heating stoves spaced throughout the building.
3	Duplex	☐ Annual fuel oil use ☐ Monthly electrical energy use ☐ Occupant comfort levels and building condition report ☐ Building internal temperature	This building was unoccupied when building data was initially collected. The building became occupied in Spring of 2018.

4	Large farm building		This building is currently unoccupied and is in a state of disrepair. The maintenance manager is observing general building condition and will formally monitor data if and when there is a plan for retrofitting and occupying the building.
5	Small farm building		This building is currently unoccupied, although it is occasionally used for storage. The maintenance manager is observing general building condition and will formally monitor data if and when there is a plan for retrofitting and occupying the building.
6	Tribal office	☐ Annual fuel oil use ☐ Monthly electrical energy use ☐ Occupant comfort levels and building condition report ☐ Building internal temperature	The building's current central heating system is an oil-fired boiler with accompanying zone valves that are prone to failure. The maintenance manager monitors the building's internal temperature to catch failures quickly.
7	VPSO office	☐ Annual fuel oil use ☐ Monthly electrical energy use ☐ Occupant comfort levels and building condition report ☐ Building internal temperature	This building was unoccupied when building data was initially collected but was leased out during the course of the project.

Accessibility

The tribal finance director updates and is able to access the fuel and electrical energy data for each building both in hard copy and on Quickbooks.

The tribal maintenance manager can access the building and heating appliance temperature data via the Invita web portal. Monitoring accounts have also been set up for the tribal finance director and the first chief.

The baseline data for this project, consisting of energy use and occupant comfort data is available on the project webpage (http://www.cchrc.org/doe-energy-efficiency-and-renewable-energy-projects) and is also documented in the *Baseline data* chapter of this report.

Analysis

The tribal finance director and tribal maintenance manager are responsible for monitoring energy use and other data on an ongoing basis. For the baseline period for energy audits for this project, CCHRC staff worked with the finance director and maintenance manager to consolidate energy use and occupant comfort data for each building.

BASELINE DATA

In 2018, project staff worked with the tribal office staff and building occupants to benchmark the current condition and energy use of each building in the project. This baseline, or pre-audit, picture of the buildings is useful for several reasons. First and foremost, it serves to give the building owners and occupants a description of the current state of the buildings. Baseline conditions, in conjunction with the goals and future use of each building, also help to establish a priority for maintenance needs and future energy retrofits. During the energy audit process, the baseline conditions also help the energy auditor calibrate the energy model for the building, meaning that the energy savings estimates for each recommendation are more accurate. Finally, this snapshot of the condition, energy use, and costs for each building can be useful when searching for and filling out applications for grant or loan funding for retrofit construction.

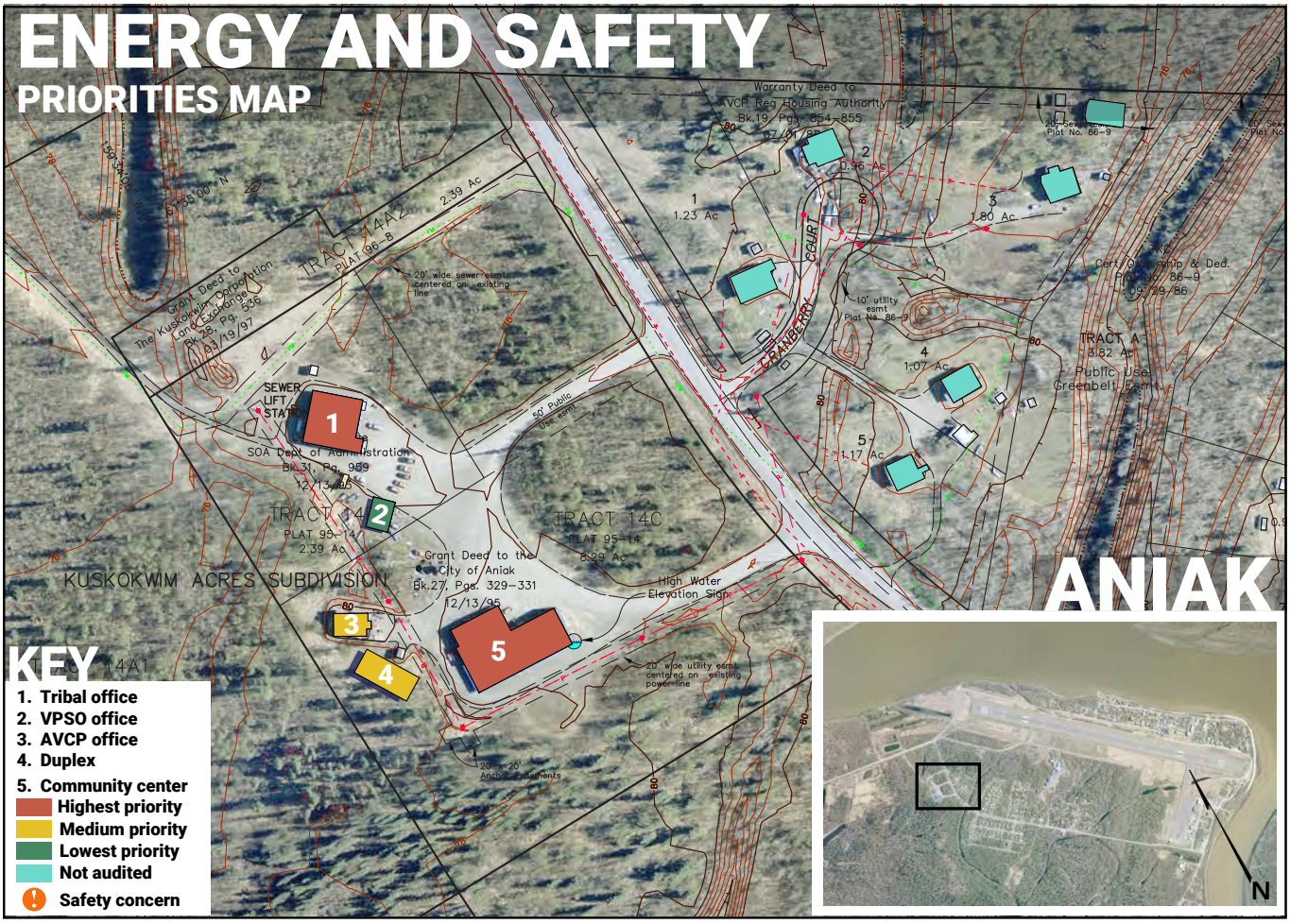
The maps in this section show five of the buildings that participated in this energy audit project. Two of them - the tribal office and the community center - are at a high priority for a retrofit because of high energy costs. The tribal office has the largest energy consumption of all the tribal buildings, and thus has a good potential to realize energy savings from a building retrofit. The community center is the second highest energy user, and also is in generally poor condition.

The building conditions chart in this section provides more details on the buildings, highlighting any safety, maintenance, and occupant comfort concerns of the buildings. Two of the buildings have potential safety issues: the community center and the small farm building. These issues should be a priority of any future retrofit projects.

Aniak, in Southwest Alaska, is located where the Aniak river flows into the Kuskokwim River.

ENERGY AND SAFETY

PRIORITIES MAP



KEY

Fuel Consumption

Electrical Consumption

1K One Thousand BTUs

1M One Million BTUs

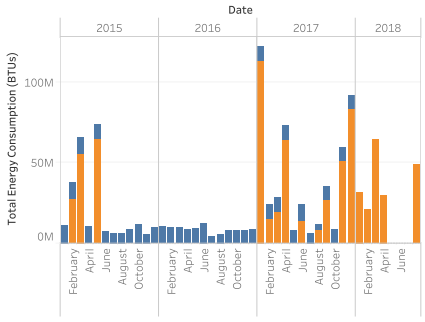
NOTES

Because fuel is purchased when holding tanks are low or empty, fuel records reflect sporadic fuel consumption. Several buildings had periods when they were not occupied, thus reducing demand for fuel. Additionally, consistent fuel records were not available for all buildings, as evidenced by the lack of data within certain years.

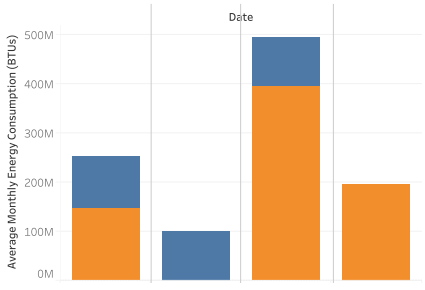
Two additional buildings, the large and small farm buildings located on the KNA farm, are not included in this baseline assessment. Both buildings were unoccupied at the time of the study, and did not have operational heating systems or electricity. Therefore, there is no energy consumption to report.

TRIBAL OFFICE 1

Tribal Office Total Energy Consumption

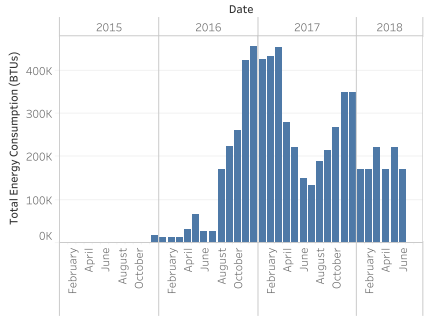


Tribal Office Monthly Energy Consumption Average per Year

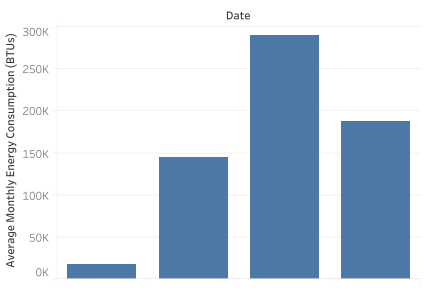


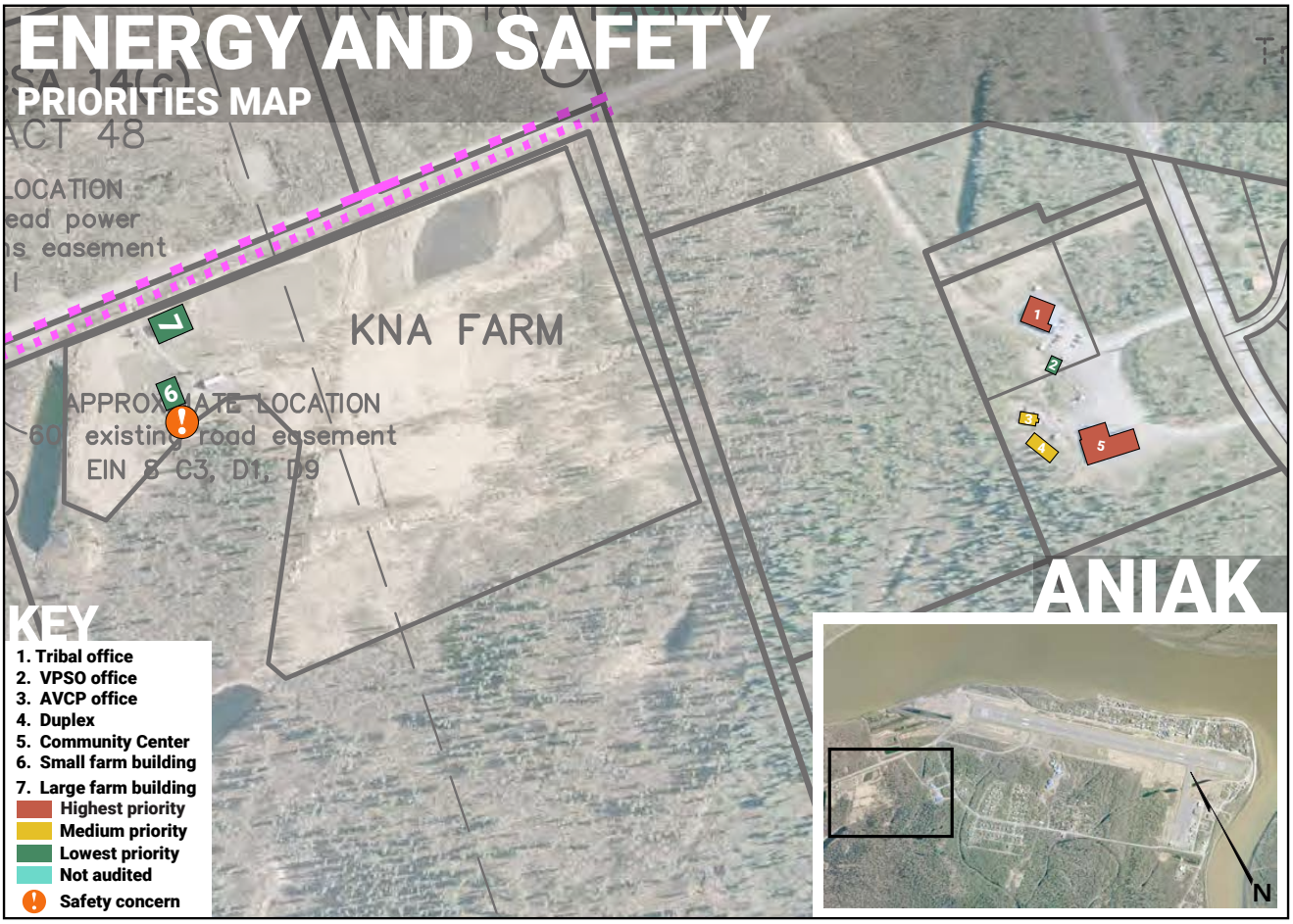
VPSO OFFICE 2

VPSO Building Total Energy Consumption



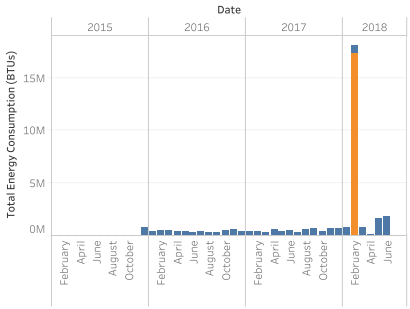
VPSO Building Monthly Energy Consumption Average per Year



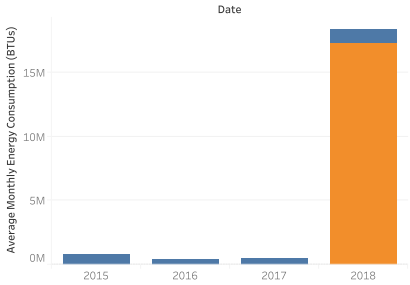


AVCP OFFICE 3

AVCP Rental Total Energy Consumption

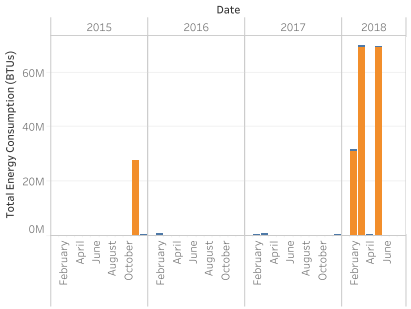


AVCP Rental Monthly Energy Consumption Average per Year

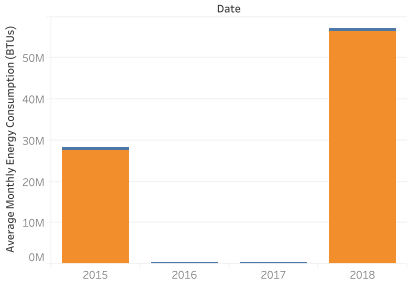


DUPLEX 4

Trooper Duplex Total Energy Consumption

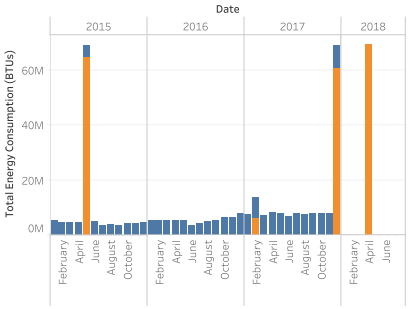


Trooper Duplex Monthly Energy Consumption Average per Year

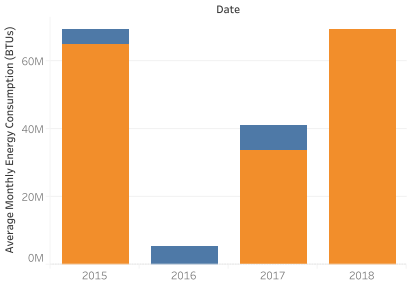


COMMUNITY CTR 5

Community Hall Total Energy Consumption



Community Hall Monthly Energy Consumption Average per Year



Safety, comfort, and maintenance concerns

In addition to energy use, it is paramount to monitor the general condition and safety of buildings. Safe, well-maintained buildings are comfortable for occupants and allow workers and guests to focus on their tasks without being cold or worried about the building condition.

Building name	Building safety, occupant comfort, and maintenance concerns
AVCP office	This building is in average condition and has two maintenance issues. First, the water lines may be susceptible to freezing temperatures and should be insulated. Second, there is an unintentional opening at the rear corner of the crawlspace, and the crawlspace is chronically overheated.
Community center	This building is in poor condition. Some of the siding was damaged by a fire and many windows are broken or missing. The central furnace is not functioning, so several Toyotomi stoves placed throughout the building provide heat instead. The water lines may be susceptible to freezing temperatures and should be insulated. The occupants report uncomfortably cold temperatures in certain areas due to drafts from broken windows and spaces where the heat from the Toyotomi stoves cannot reach.
Duplex	This building is in average condition. The only current maintenance issue is that the water lines may be susceptible to freezing temperatures and should be insulated.
Large farm building	This building is not currently occupied and does not currently have heat or electricity. The building shell is in poor condition. The building is used for cold storage, and if this usage continues minimal improvements are necessary. However if the building is to be used as warm storage or occupied, then the envelope, heating, and lighting systems will need extensive retrofit work.
Small farm building	This building is not currently occupied, and does not have heat or electricity. The building shell is in poor condition and the roof truss system may NOT have the capacity to support regional snow loads without additional reinforcement. Additionally, the doors are damaged. If the building is to be used as cold storage, the doors need replaced, the envelope should be repaired, and the roof needs additional support. For use as warm storage or as a maintenance shop, the building will require extensive retrofit work.
Tribal office	This building is in average condition and has plumbing, potable water, and domestic hot water. The water lines may be susceptible to freezing temperatures and should be insulated. Many occupants report that the building is far too warm, which causes them to keep windows open. This is due to malfunctioning zone valves. The building heat is regulated by changing boiler operating temperature manually, which does not always result in comfortable temperatures.
VPSO office	This building is in excellent condition with one outstanding issue: the water lines may be susceptible to freezing temperatures and should be insulated.

ENERGY AUDIT SUMMARIES

Seven tribal buildings participated in this energy planning project. The project team surveyed each building and gathered baseline energy use. An energy auditor used the building details and past energy use to build an energy model of the building using AkWarm-C software. This allowed the energy auditor to explore different retrofits for each building, and ultimately build a list of recommendations to decrease its energy use. In this chapter, each energy audit is summarized below; the full audits are available on the project web page: http://www.cchrc.org/doe-energy-efficiency-and-renewable-energy-projects.

Energy audits prioritize energy retrofits, or energy efficiency measures (EEMs) that improve the safety of the building. They then rank remaining EEMs according to their simple payback, or the amount of time it takes to earn back the installation cost through energy savings. Low simple payback periods, indicating retrofits that are quickly cost-effective, have the highest priority. Audits also include suggestions for energy conservation measures (ECMs). ECMs are recommendations for occupants to reduce energy consumption and costs which have little or no cost and can often be implemented by maintenance staff or directly by the occupants.

The auditor identified several recommendations that applied almost universally to the tribal buildings, including installing and using setback thermostats to decrease the temperature set point when the buildings are unoccupied, and upgrading lighting to LED bulbs. Additionally, many of the buildings could benefit from servicing the heating systems and fixing zone valve malfunctions, as well as door and window upgrades, and increasing insulation in the attic or walls.

Similarly, many ECMs apply to all tribal buildings in the project. Ongoing energy monitoring can identify opportunities to decrease energy use, reducing air infiltration through air-sealing saves heating oil, and annual servicing of HVAC equipment keeps equipment operating at peak efficiency. Other recommendations include turning off plug loads when buildings are not occupied, and replacing electric appliances with Energy Star versions at their end of life.

AVCP office

The AVCP Office was constructed around 1940 by the Federal Aviation Administration. It was relocated to its current location sometime around 2000 and underwent a complete renovation. Today, the building is typically occupied by 5 individuals, 9 am to 5 pm Monday through Friday. In 2018, the predicted annual energy costs were slightly under $9,000, with slightly more than half of that amount used to purchase fuel oil for heating and the remainder going to electrical use.

The energy auditor reviews recommendations for the AVCP office with Leonard Morgan, the Tribe's maintenance manager.

The energy audit recommends three important actions that should be addressed as soon as possible:

1. Install a three-way zone valve in the crawlspace and replace the thermostat with a unit to control the zone valve and fan.

2. Investigate issues with the east heating zone as it is not functioning properly. Look in particular at the zone valve (leaks) and thermostat (malfunction).

3. Check and repair crawlspace insulation.

Other recommendations include installing setback thermostats in each room, and replacing existing lighting with LEDs.

If the Tribe is able to implement all recommendations, the annual energy use would decrease by 10.1 MBTU, resulting in an energy and maintenance savings of **$1,687**. At an approximate installation cost of $3,141, the simple payback of a retrofit project would be **1.9 years**.

The audit also includes suggestions for several ECMs, including ongoing energy monitoring, efficient building management, reducing air infiltration, turning off plug loads, and servicing HVAC equipment annually. Additionally, specific to the AVCP office, the Tribe should be sure to maintain the air sealing on the envelope, use electronic timers for large electronic equipment, replace appliances at the end of useful life (EOL) with Energy Star versions, and keep heating coils in air handlers, unit heaters, and fan coil units clean.

Community center

The community center hosts community events such as bingo several times a week. In 2018, the predicted annual energy costs were nearly $47,000, the majority of which is used to purchase fuel oil to heat the building.

The energy audit recommends five important actions that should be addressed as soon as possible:

1. Contact the electric utility provider and have the two power meters not currently receiving a PCE discount added to the PCE program.

2. Consider combining the existing five meters into one if it can maintain the PCE discount.

3. Reframe the old window openings on the south wall of the auditorium and add R-30 insulation, finish interior and exterior surfaces appropriately.

The majority of the energy costs for the community center are due to the large space heating load, so many of the audit recommendations address improving the building envelope and heating system.

4. Replace the door in the south wall of the auditorium that is currently boarded up.

5. Replace the three Toyotomi stoves running in the auditorium with oil-fired cabinet unit heaters or unit heaters of appropriate capacity.

6. The lack of mechanical ventilation in the auditorium and the lack of operable windows may be a code violation – **this is a safety issue and should be addressed as soon as possible**

Other recommendations include installing setback thermostats in each room, replacing existing lighting with LEDs, replacing existing hot water heater with an on demand water heater, repairing or replacing the auditorium ceiling insulation adding R-11 to current value, and replace inadequate doors and windows.

If the Tribe is able to implement all recommendations, the annual energy use would decrease by 251.5 MBTU, resulting in an energy and maintenance savings of **$13,546**. At an approximate installation cost of $59,038, the simple payback of a retrofit project would be **4.4 years**.

The audit also includes suggestions for several ECMs, including ongoing energy monitoring, efficient building management, reducing air infiltration, turning off plug loads, and servicing HVAC equipment annually. Additionally, specific to the community center, the Tribe should be sure to maintain the air sealing on the envelope, use electronic timers for large electronic equipment, replace appliances at the end of useful life (EOL) with Energy Star versions, keep heating coils in air handlers, unit heaters, and fan coil units clean, install setback thermostats, and replace the existing clothes washers (when they reach EOL) with more efficient top loading machines.

Duplex

The Aniak Traditional Council leases the two sides of its duplex. In 2018, the predicted annual energy costs were nearly $12,000. This is split between the cost of fuel oil $6,474 used for space heating, and electricity $5,319.

The energy audit recommends three important actions that should be addressed as soon as possible:

1. Investigate attic insulation that has been disturbed or improperly replaced, properly placing two layers of fiberglass batt to maximize insulative value.
2. Use plug load management devices in the State Trooper office.
3. Program both Toyotomi stove clocks and utilize the set-back feature.

Energy efficiency recommendations for the duplex would payback in only one year, and realize an annual savings of over $2,500.

Other recommendations include installing setback thermostats in the State Trooper office and bunkhouse, replacing the existing bath fans with ones with humidistat and occupancy sensors, and replacing existing lighting with LEDs.

If the Tribe is able to implement all recommendations, the annual energy use would decrease by 26 MBTU, resulting in an energy and maintenance savings of **$2,881**. At an approximate installation cost of $2,883, the simple payback of a retrofit project would be **1 year**.

The audit also includes suggestions for several ECMs, including ongoing energy monitoring, efficient building management, reducing air infiltration, turning off plug loads, and servicing HVAC equipment annually. Additionally, specific to the duplex, the Tribe should turn off the boiler in the summer months, turn off the refrigerator in the bunkhouse when it is unoccupied, be sure to maintain the air sealing on the envelope, use electronic timers for large electronic equipment, replace appliances at the end of useful life (EOL) with Energy Star versions, keep heating coils in air handlers, unit heaters, and fan coil units clean, and maintain the set back temperature programming on each Toyotomi, especially after a power outage.

Large farm building

The large farm building is used for unheated storage, and as a result was modeled with four hours of use Monday through Friday with two occupants in the west section and one in the east. In 2018, the annual energy costs would have been $8,500 if it had the modeled occupancy, two thirds of which is used to purchase fuel oil for space heating.

As the building was used for cold storage and has no heat or electrical service, there weren't any items requiring immediate action. The audit's recommendations apply for when the building might be converted to a heated space.

The recommendations include replacing existing lighting with LEDs, setting an unoccupied setback to 50° F for the insulated space in the west side, installing R-19 insulation on the west side wall bordering the uninsulated east side, and adding R-19 insulation to existing insulation on west side ceiling and walls.

If the Tribe is able to implement all recommendations, the annual energy use would decrease by 88.4 MBTU, resulting in an energy and maintenance savings of **$4,301**. At an approximate installation cost of $12,340, the simple payback of a retrofit project would be **2.9 years**.

Small farm building

The small farm building is currently vacant and unused but was modeled with an occupancy of one person for four hours Monday through Friday. In 2018, the predicted annual energy costs were nearly $10,000. This is split between the cost of fuel oil $7,393 used for space heating, and electricity $1,548.

As the building was unoccupied and has no heat or electrical service, there weren't any items requiring immediate action. The audit's recommendations apply for when the building might be converted to a heated space.

Recommendations include setting an unoccupied setback to 60° F, installing R-38 fiberglass batt insulation in the 2x12 stud cavity, installing R-21 fiberglass batt insulation in 2x6 wall, installing vapor barrier and finish interior walls, replacing existing lighting with LEDs, replacing the entry door, and replacing the windows with triple pane windows.

If this structure is converted into warm storage, energy efficiency upgrades to the building envelope would help save over $5,000 per year.

If the Tribe is able to implement all recommendations, the annual energy use would decrease by 128.3 MBTU, resulting in an energy and maintenance savings of **$5,829**. At an approximate installation cost of $12,814, the simple payback of a retrofit project would be **2.2 years**.

Tribal office

The tribal office is occupied by 14 staff and between 10-20 visitors per day Monday through Friday 9 am to 5 pm. In 2018, the predicted annual energy costs were nearly $35,000. This is split roughly evenly between the cost of fuel oil used for space heating and electricity.

The tribal office is heavily used; efficiency upgrades to this building could help save over $10,000 annually in energy bills.

The energy audit recommends several important actions that should be addressed as soon as possible:

1. Set the corridor light timer located in the boiler room to the correct time and confirm that it is working properly.
2. Retro-commission and re-balance HVAC systems.
3. Turn the air handling unit back on after cleaning the heating coil, replace the filters, reprogram the timer to the correct building schedule, and confirm the thermostats, three-way valve, and dampers are operating correctly.
4. Add a cumulative oil meter to fuel oil day tank to monitor monthly oil consumption.
5. Confirm that the thermostats and cabinet unit heaters in both of the south entries are operating correctly – they were both running continually during the site survey.
6. Reprogram the timer controlling the central bathroom exhaust fans and confirm that it is working properly.

Other recommendations include replacing existing lighting with LEDs, installing setback thermostats throughout the building and setback to 63° F when unoccupied, replacing existing circ pumps with variable speed models, replacing boilers at their end of their life with new 87% thermally efficient model, and implementing CO_2 based demand controlled ventilation in the air handling unit.

If the Tribe is able to implement all recommendations, the annual energy use would decrease by 155.4 MBTU, resulting in an energy and maintenance savings of **$12,276**. At an approximate installation cost of $61,727, the simple payback of a retrofit project would be **5 years**.

The audit also includes suggestions for several ECMs, including ongoing energy monitoring, efficient building management, reducing air infiltration, turning off plug loads, and servicing HVAC equipment annually. Additionally, specific to the tribal office, the Tribe should be sure to maintain the air sealing on the envelope, use electronic timers for large electronic equipment, replace refrigerator at end of life (EOL) with an Energy Star rated model, and keep heating coils in air handlers, unit heaters, and fan coil units clean.

VPSO office

The VPSO office is used intermittently by the VPSO as an office when needed and cells are used to hold prisoners. The occupancy schedule varied so much that the model was run with a single occupant, Monday through Friday from 9am to 5pm. In 2018, the predicted annual energy costs were $1,752. This is split between the cost of fuel oil $1,232 used for space heating, and electricity $520.

The energy audit recommends one important action that should be addressed as soon as possible:

1. Set the Toyotomi clock and utilize the temperature set-back feature.

Other recommendations include installing setback thermostats in each room and setting the unoccupied temperature to 60° F, and replacing existing lighting with LEDs.

Energy efficiency recommendations for the VPSO would payback in only four months, and realize an annual savings of over $398

If the Tribe is able to implement all recommendations, the annual energy use would decrease by 6.5 MBTU, resulting in an energy and maintenance savings of **$398**. At an approximate installation cost of $108, the simple payback of a retrofit project would be **4 months**.

The audit also includes suggestions for several ECMs, including ongoing energy monitoring, efficient building management, reducing air infiltration, turning off plug loads, and servicing HVAC equipment annually. Additionally, specific to the VPSO office, the Tribe should make sure to maintain the air sealing on the envelope, use electronic timers for large electronic equipment, and maintain the Toyotomi setback settings, especially after a power outage.

MAINTENANCE PLAN

Writing and following a maintenance plan has many benefits. Regular maintenance check-ups keep buildings safe, comfortable, and functioning properly. They also can alert staff to issues before they grow into large problems – preventing frozen pipes, combustion safety issues, and structural changes. A typical maintenance plan, such as the one suggested in this chapter, mainly consists of a monthly walk-through of the interior and exterior of the building. It's important to keep records of each maintenance check-up, writing notes as you go through the checklist and including photos of anything that is amiss. These records can show how quickly a problem might be growing, can be included in grant applications to help solicit funding for building improvements, and provide contractors with valuable information to order parts and make repairs. If changes to the building occur, ask the contractor if any maintenance items should be added or removed.

A three-ring binder makes an ideal maintenance notebook. Sections might include:

1. Printed copies of monthly maintenance checklists, signed and dated by the person who completed the inspection;
2. Notes on any system or occupant issues;
3. Instruction manuals and warranties for the building's appliances; and
4. Contact numbers for service providers, the local utility, and emergency services.

Energy bill analysis

On a monthly basis, check the fuel and electrical use of each building for irregularly high usage and costs. Fuel use can be checked with a dipstick or some other object that can consistently be used to measure the amount of fuel left in a tank. The amount of fuel should be written down in the maintenance notebook. Electrical use can be checked by getting the bills from the administration office or local utility. These should also be documented in the maintenance notebook. If bills are excessively high, ask the building occupants if their habits have changed or if the use of the building has changed.

Monthly maintenance tasks

The following maintenance items are suggestions of tasks that can be performed on a monthly basis for each tribal building to improve building safety, efficiency, and comfort.

AVCP office

- Heating: Check the thermostat to make sure the boiler is not excessively heating the space when there is no occupant in the building. Create a parts list that can be used for reference when ordering replacement heating components.
- Lighting: Ensure all lighting fixtures are operating and document any failed fixtures. Ensure replacements are LED.
- Appliances: Check to ensure office equipment is not running during off hours and that staff is utilizing plug load management devices.
- Envelope/Structure: Walk around the exterior of the building and document any damage - cracked windows, shifting foundation, or damage to the siding.

Check that the thermostat for the boiler is not excessively heating the space when there is no occupant in the building.

- Health and safety: Check the smoke alarm and CO detector to make sure they have power and the batteries are full.
- Occupants: Talk to the building occupants. Have they noticed anything that is making the building unsafe or uncomfortable? Document their comments in the maintenance notebook and follow up with any concerns.

A visual inspection of the building exterior should be done to document any damage to the structure, such as damaged roofing or siding.

Community center

- Heating: Check that the internal programmable thermostats of the two Toyotomi stoves and one Monitor stove are configured. If they are not, they will need to be reprogrammed to run at lower temperatures when there is no one in the building. Create a parts list that can be used for reference when ordering replacement heating components.
- Plumbing: Check that heat trace is operating during the winter months to keep the pipes from freezing and is off during the summer to save energy.
- Lighting: Ensure all lighting fixtures are operating and document any failed fixtures. Ensure replacements are LED.
- Appliances: Check to ensure that laundry equipment is working properly. Document any failed machines. Replace with Energy Star appliances when possible. Check dryer exhausts for lint. Make sure they are clear to prevent a fire hazard.
- Envelope/Structure: Walk around the exterior of the building and document any damage - cracked windows, shifting foundation and repairs needed.
- Health and safety: Check the smoke alarm and CO detector to make sure they are working properly and that batteries are charged.

Look for and document any damage to the structure, such as damaged roofing or siding in a monthly inspection of the building's exterior.

The laundry equipment should be checked each month to make sure they are working properly.

- Occupants: Talk to the building occupants. Have they noticed anything that is making the building unsafe or uncomfortable? Document their comments in the maintenance notebook, and follow up with any concerns.

The Monitor and Toyotomi stoves should be checked monthly to ensure that the programmable thermostats are running correctly.

Duplex

- Heating: Check that the internal programmable thermostats of the two Toyotomi stoves are configured. If they are not, then it will need to be reprogrammed to run at 63°F when there is no one in the building. Make sure the boiler is not operating during summer months. Create a parts list that can be used for reference when ordering replacement heating components.
- Lighting: Ensure all lighting fixtures are operating and document any failed fixtures. Ensure replacements are LED.
- Appliances: Check to ensure appliances are not running during unoccupied times.
- Envelope/Structure: Walk around the exterior of the building and document any damage - cracked windows, shifting foundation, or damage to the siding.
- Health and safety: Check the smoke alarm and CO detector to make sure they are working properly and that batteries are charged.
- Occupants: Talk to the building occupants. Have they noticed anything that is making the building unsafe or uncomfortable? Document their comments in the maintenance notebook and follow up with any concerns.

The Toyotomi stoves should be checked on monthly to ensure that the programmable thermostat is set at 63°F in the winter during unoccupied times.

A visual inspection of the building exterior should be done to document any damage to the structure, such as damaged roofing or siding.

Large farm building

- Lighting: Ensure all lighting fixtures are operating and document any failed fixtures. Ensure replacements are LED.
- Envelope/Structure: Check the roof's structural integrity to ensure that future retrofits can occur.

A visual inspection of the lighting fixtures in the large farm building should be done to document and replace any failures.

Small farm building

- Envelope/Structure: Check the roof's structural integrity to ensure that future retrofits can occur.

A visual inspection of the small farm building exterior should be done to document any damage to the structure, such as damaged roofing or siding.

Tribal office

- Heating: Check the digital timer for the air handler unit (AHU) that is located in the second floor attic. Make sure the time is set correctly on the digital timer. Check the thermostat located in the same place. It should be set at 65°F in the winter and 55°F in the summer months. Create a parts list that can be used for reference when ordering replacement heating components.
- Plumbing: Check that heat trace operates during the winter months to keep the pipes from freezing and is off during the summer to save energy.
- Lighting: Check and re-schedule, if necessary, the clock in the boiler room that operates the building lights. Ensure all lighting fixtures are operating and document any failed fixtures. Ensure replacements are LED.
- Appliances: Check to ensure office equipment is not running during off hours and that staff is utilizing plug load management devices.
- Envelope/structure: Walk around the exterior of the building and document damage - cracked windows, shifting foundation or damaged siding.
- Health and safety: Check the smoke alarm and CO detector to make sure they are working properly and that batteries are charged.
- Occupants: Talk to the building occupants. Have they noticed anything that is making the building unsafe or uncomfortable? Document their comments in the maintenance notebook and follow up with any concerns.

The thermostat, located in the attic, should be periodically checked to make sure that it is set at 65°F in the winter and 55°F in the summer.

A visual inspection of the building exterior should be done to document any damage to the structure, such as damaged roofing or siding.

The digital timer for the AHU, located in the attic of the tribal office, should be checked monthly to make sure that the timer is set correctly.

VPSO office

- Heating: Check that the internal programmable thermostat of the Toyotomi Laser 73 is configured. If it is not, then it will need to be reprogrammed to run at lower temperatures when there is no one in the building. Create a parts list that can be used for reference when ordering replacement heating components.
- Lighting: Ensure all lighting fixtures are operating and document any failed fixtures. Ensure replacements are LED.
- Appliances: Check to ensure office equipment is not running during off hours and that staff is utilizing plug load management devices.
- Envelope/Structure: Walk around the exterior of the building and document any damage - cracked windows or damage to the siding. Make sure the wooden pilings and pads are still within level.
- Health and safety: Check the smoke alarm and CO detector to make sure they are working properly and that batteries are charged.
- Occupants: Talk to the building occupants. Have they noticed anything that is making the building unsafe or uncomfortable? Document their comments in the maintenance notebook and follow up with any concerns.

A visual inspection of the building exterior should be done to document any damage to the structure, such as damaged roofing or siding.

The Toyotomi stove should be checked monthly to ensure that the programmable thermostat is running correctly.

FUNDING AND TRAINING OPPORTUNITIES

Obtaining an energy audit for a building is an important first step toward realizing lower energy costs. However, the energy audit represents only the beginning of a comprehensive retrofit project and an ongoing operations and maintenance practice. Acting on the energy audit recommendations can be straightforward, but building owners might face multiple hurdles along the way, including a lack of funding, knowledge, equipment, or time.

This chapter is meant to serve as a starting point for addressing some of the larger, more costly recommendations. It contains a table of funding and training opportunities that may apply to a retrofit project for the tribal buildings. However, it is unlikely that funding for a comprehensive retrofit will all come from one source. In reality, it will be up to the Tribe to create a patchwork of funding resources, training opportunities, matching labor, and materials to complete all the audit recommendations. Be creative and ready to adapt new ideas to create a project that will best serve the community. It will be worth it to realize safer, more comfortable buildings along with energy savings!

It is best to consider financing at the beginning of the energy audit process. While a funding search is ongoing, consider the following tips that can help strengthen a future application while improving the buildings immediately:

1. Maintain momentum gained from the energy audits and this Energy Action Plan. No funding is necessary for many energy conservation measures, or for following the monthly checklist in the *Maintenance plan* chapter. It's also possible to continue building monitoring with only a little time invested. Energy and comfort data, maintenance logs, and small completed retrofits will realize immediate energy savings as well as providing valuable input for a future application for funding.

2. When applying for funding for a building energy retrofit project, combine the retrofits for as many buildings as possible, including those that are not owned by the Tribe. Appendix B contains summaries of energy audits that have been completed on other local buildings. Consider contacting these building owners to see if they would participate in an application for funding and a subsequent retrofit project. Combining all of the retrofits within the village into one project has several advantages: the project can leverage contractor travel and shipping of retrofit materials; owners can combine resources for match funding and proposal development; and the increased scale of the project will help bolster its potential impact.

3. In forming a project, list project objectives and how those goals will lead to sustainable results. Funders might be hesitant to fund a capital project for building retrofits if it doesn't include a viable maintenance plan. If energy savings are the goal of the project, address how the future savings will be used in your application. For instance, will a reduction of energy costs and maintenance needs allow the Tribe to repay loans, train personnel, or implement additional projects?

4. Community support for a project indicates to funders that there is a high level of interest and a strong likelihood that the project will be completed. Consider how to show this in an application through community surveys, letters of support, and matching labor. Think about recruiting other project partners to demonstrate cooperation and interest. Community support and other partners indicate the capability of the applicant to gather resources, communicate with stakeholders, and share information.

5. Refer to and use this Energy Action Plan in a future retrofit project. It demonstrates the ability of the Tribe to successfully complete a federal energy planning project, showing that the applicant has a strong skill set to manage a project, gather resources, and complete project requirements.

6. Use the information from the energy audits to develop a thorough and complete project plan. Strong applications have a defined project scope, clear estimate of financial needs, realistic timeline, and demonstrated personnel management. Think about potential risks, and strategies for countering those risks, and list these in your application to show advanced preparation.

7. Reach out to other communities who have completed similar projects to improve their buildings, either through deep retrofit projects or little by little. Ask them for their stories, lessons learned, and advice!

This chapter contains a table of funding and training opportunities that exist at the time of publication in mid-2019. The list contains a lot of variety, including grant and loan programs, training scholarships, and technical assistance. Not all of these apply directly to every building retrofit project, and they are color-coded to indicate their applicability to the audit recommendations in this report. The list is meant to be comprehensive, so that applicants can consider both the building retrofits as a stand-alone comprehensive project, and how they might divide into several smaller projects.

ABBREVIATIONS

AHFC	Alaska Native Health Consortium
AVEC	Alaska Village Electric Cooperative
BIA	Bureau of Indian Affairs
DOE	Department of Energy
DOL	Department of Labor
HUD	US Department of Housing and Urban Development
IEPP	Office of Indian Energy Policies and Programs
OIE	Office of Indian Energy
USDARD	United States Department of Agriculture Rural Development

NOTES

indicates that the funding source prioritizes projects that ***directly relate*** to energy efficiency improvements

indicates that the funding source prioritizes projects that may ***somewhat relate*** to energy efficiency improvements

indicates that the funding source prioritizes projects that may ***loosely relate*** to energy efficiency improvements

GRANTS

	AK - DOL	DOE - OIE	HUD	RASMUSON FOUNDATION
	Workforce Innovation and Opportunity Act (WIOA) Incumbent Worker Training Program	Energy Infrastructure Deployment on Tribal Lands	Indian Community Development Block Grant Program	Tier I Grant Program
Disbursement Amount	Project Dependent	TBD	Project Dependent	Up to $25,000
Eligible Uses of Funding	□ Workforce Training	□ Energy Efficiency Measures □ Energy System Installation	□ Community Facility/ Housing Improvements □ Economic Development	□ Light Community Facility Improvements
Special Terms of Eligibility	Funding is intended to assist existing employees only.	None Listed	None Listed	Tribal Governments are eligible to request support for short-term capital projects.
Application Deadline	Rolling	None listed; generally in spring	2020 Deadline TBA	Rolling
Tips for Applying	Have a training opportunity in mind prior to applying	Join the DOE Office of Indian Energy email list to receive an official Notice of Funding Availability	Contact area ONEP representative to discuss project competitiveness prior to applying	**Evaluation based on:** □ Complete budget, scope of work, and expected outcomes □ Project benefits □ Organizational capacity
Contact Information	Department of Labor & Workforce Development 907-465-2712; *dol.iwt@alaska.gov*	Department of Energy; *TribalGrants@hq.doe.gov*	Office of Native American Programs - Alaska (907) 677-9800	Rasmuson Foundation (907) 297-2700

GRANTS

	RASMUSON FOUNDATION	USDA - RD	USDA - RD	USDA - RD
	Tier II Grant Program	Economic Impact Initiative	Community Facilities Technical Assistance and Training	Rural Community Development Initiative Grant
Disbursement Amount	Greater than $25,000	Project Dependent	Up to $150,000	$50,000 - $250,000
Eligible Uses of Funding	□ Large-scale Community Facility Improvements	□ Essential Community Facility Improvements	□ Identification of Community Facility needs □ Preparation of assistive resources	□ Training for Community Facility/ Housing Improvements □ Training in Economic Development
Special Terms of Eligibility	Tribal Governments are eligible to request support for projects that provide broad community benefits.	Project must serve an eligible rural area, with median household income (MHI) below 90% of state non-metropolitan MHI	An organization must form a partnership with the Tribe to apply and then provide the technical assistance	Matching funds required (may not include in-kind donations)
Application Deadline	Rolling	Rolling	TBA	TBA
Tips for Applying	**Evaluations based on:** □ Strong cash match □ Committed project staff □ Complete project plan and budget	**Evaluations based on:** □ Population □ Median Household Income □ Total project costs □ Financial need	Preference is given to applicants with cash matching funds. In-kind contributions cannot be used as a match. Partnerships are required.	Grant is nationally competitive. Contact grant representative to discuss and determine project compatibility.
Contact Information	Rasmuson Foundation (907) 297-2700	Jessie Huff (907) 761-7768 *jessie.huff@ak.usda.gov*	Jessie Huff (907) 761-7768 *jessie.huff@ak.usda.gov*	Jessie Huff (907) 761-7768 *jessie.huff@ak.usda.gov*

GRANTS

	BIA	HUD	USDA - RD
	Tribal Energy Development Capacity	Indian Housing Block Grant	Housing Preservation Grant
Disbursement Amount	Up to $300,000	Project Dependent	Project Dependent
Eligible Uses of Funding	□ Resource Development □ Business Management	□ Housing Development □ Housing Services	□ Low Income household repair/ improvements
Special Terms of Eligibility	None Listed	None Listed	None Listed
Application Deadline	TBA	Rolling (with discrete submission dates)	Rolling
Tips for Applying	Grant is nationally competitive. Contact grant representative to discuss and determine project compatibility.	None Listed	Need to have a contractor identified before applying
Contact Information	Amy Wilson W: (720) 692-7508 C: (720) 407-0623 *amy.wilson@bia.gov*	Office of Native American Programs - Alaska (907) 677-9800	Jessie Huff (907) 761-7768 *jessie.huff@ak.usda.gov*

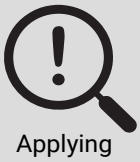
LOANS

	USDA - RD	USDA-RD	AHFC
	Community Facilities Loans and Grants	Rural Energy for America Program Renewable Energy & Energy Efficiency	Energy Efficiency Revolving Loan Fund for Public Facilities
Disbursement Amount	Project Dependent	**GRANTS** $1,500 - $500,000 **LOANS** $5,000 - $25million	Project Dependent
Eligible Uses of Funding	□ Community Facility Improvements	□ Energy Efficiency Measures □ Renewable Energy System Upgraes	□ Energy Efficiency Improvement Measures
Special Terms of Eligibility	For communities of under 5,000 people, and Median Household Income (MHI) under 60% of the state non-metropolitan MHI, grants are limited to 75% of project costs.	Applicants must be a small business or agricultural producer in an eligible rural area. Energy Efficiency projects require an energy audit.	Applicants must obtain an Investment Grade Audit prior to applying.
Application Deadline	TBA	**Grants:** □ Jan 31, 2019 □ Apr. 1, 2019 **Loans:** Rolling	Rolling
Tips for Applying	**Priority given to:** □ Population □ Median Household Income □ Total project costs □ Financial need	Keep in mind that this grant may only constitute 25% of project costs. Loan guarantees up to 75% of project costs.	None Listed
Contact Information	Jessie Huff (907) 761-7768 *jessie.huff@ak.usda.gov*	Jessie Huff (907) 761-7768 *jessie.huff@ak.usda.gov*	Michael Spencer Energy Program Manager (907) 330-8197

LOANS

	USDA	DOE	USDA - RD
	Business Industry Loan Guarantee	Tribal Energy Loan Guarantee Program	Intermediary Relending Program
Disbursement Amount	Project Dependent	Project Dependent	Up to $2,000,000
Eligible Uses of Funding	□Community Facility Improvements □ Economic Development	□ Energy - Related Development Projects	□ Community Facility Improvements □ Community Services □ Economic Development
Special Terms of Eligibility	Applicants must have legal authority, sufficient experience, and financial strength required for operating loans.	Applicants must have legal authority to operate loan guarantees, and must demonstrate experience in originating and servicing loans of a similar size.	Applicants must have the legal authority to operate a Revolving Loan Fund.
Application Deadline	Rolling	**Discrete Rolling Deadlines** *Jan. 16, 2019* *Mar. 13, 2019* *July 7, 2019* *Sept. 18, 2019* *Nov. 1, 2019*	Rolling
Tips for Applying	Applicants are encouraged to discuss project options with local representative prior to applying.	□ Preference is given to projects which cataylze the use of comercially available technologies. □ Applicants should submit a letter of intent to TELGP@hq.doe.gov as soon as possible.	None Listed
Contact Information	Jerry Ward State Director (907) 761-7705	Loan Origination Division US Department of Energy (202) 586-1262 *TELGP@hq.doe.gov*	Jerry Ward State Director (907) 761-7705

ADDITIONAL RESOURCES

	AVEC Vocational, Technical, Academic Scholarship	DOE - IEPP Technical Assistance
Disbursement  Amount	$100 - $5,000	N/A *(FREE SERVICE)*
Eligible Uses  of Funding	☐ Workforce Training	☐ Energy Planning ☐ Energy Efficiency ☐ Project Development ☐ Resilience ☐ Village Power ☐ Policy and Regulatory
Special Terms of  Eligibility	**Applicants must:** ☐ *Live in a household of an active AVEC member* ☐ *Hold a high school diploma or GED* ☐ *Have a min. 2.0 GPA* ☐ *Be enrolled in post-secondary school*	Projects currently funded by DOE receive priority.
Application  Deadline	**Fall Semester Deadline:** Apr. 15 **Spring Semester Deadline:** Aug. 15	Rolling
Tips for  Applying	Have a vocational, technical, or academic program in mind prior to applying.	**Reviewers ask that applicants:** ☐ Designate an easily-accessible Tribal contact ☐ Respond to requests for additional information in a timely manner
Contact  Information	AVEC Member Services: (800) 478-1818	Office of Indian Energy US Department of Energy (240) 562-1352 *indianenergy@hq.doe.gov*

OUTREACH

The tribal buildings of Aniak are a key part of the region. Collectively, they provide benefits to the community every day, including mail service, facilitation of public safety, medical benefits, and serving as the host of community events. This project, with its objective of planning to improve the safety, comfort, and energy efficiency of these buildings, directly benefits both the Tribe and the occupants and visitors of the buildings. The outreach component of the project is meant to extend these benefits further into the community, by promoting the project to educate local citizens about energy efficiency planning. The hope is that not only would Aniak residents see improvements to their community buildings, but also learn about energy efficiency and conservation, and gain the knowledge on how to implement similar sustainable practices in their own homes.

In Aniak, tribal office staff frequently updated and worked with the Aniak Tribal Council on project activities throughout the course of the energy audit and planning process. After the energy auditor prepared a compilation of initial results for each building, project staff made a formal flyer for both the council and interested tribal members. This flyer, along with other outreach materials mentioned in this chapter, can be found in Appendix C. Project and tribal office staff also promoted the project via two community events – a tribal member meeting in August 2018 and the Aniak Energy Fair in September 2018. Project staff also made flyers of energy conservation strategies, such as how to use setback thermostats, for the tribal building occupants.

Representatives from the Aniak tribal office attended two D.O.E. Office of Indian Energy Program Reviews during the project. In 2017, Daisy Philips presented on the objectives and future plans for the project. Her presentation can be found at the link listed below. In 2018, Leonard Morgan presented on the project procedure, conclusions, and lessons learned.

Finally, project staff created a final project flyer and video. The flyer can serve either as a poster or handout, and is meant to provide an overview of the project to Aniak residents. Similarly, the video reviews the project procedure, and shows viewers the community of Aniak.

Links to online outreach materials

2017 Program Review presentation:

https://www.energy.gov/indianenergy/2017-office-indian-energy-program-review-meeting-presentations

2018 Program Review presentation:

https://www.energy.gov/indianenergy/2018-office-indian-energy-program-review-meeting-presentations

Project video:

http://www.cchrc.org/doe-energy-efficiency-and-renewable-energy-projects

Aniak's rivers serve as both a source of subsistence for residents and a "roadway" for travelling to nearby villages.

CONCLUSION

The objective of the Aniak Energy Efficiency Project was to reduce and stabilize energy costs in tribal buildings by setting energy efficiency improvement goals to provide direction for future retrofit projects. Goals that lead to a retrofit project that improves the safety, comfort, and energy efficiency of a future retrofit project have many advantages for the community. Better buildings have multiple benefits for the Tribe and the community at large, including warmer, more comfortable spaces for community needs and events. Increased efficiency will also decrease dependence on outside shipments of fuel oil while lowering energy costs so that the Tribe will be able to use extra money on other programs. Finally, showcasing sustainable practices, projects, and behaviors in community buildings will demonstrate them to citizens who wish to implement similar strategies in their own homes.

Through this project, the Aniak Traditional Council wrote goals for each of their buildings. Project staff, with the help of the Tribal office staff, established each building's baseline condition, including both its energy use and comfort level, along with making a data monitoring plan to continue tracking the buildings in the future. An energy auditor used the baseline data, information from building surveys, and AkWarm-C energy modeling software to produce a comprehensive energy audit for each building. These reports document information about the building, including the floor plan, mechanical systems, energy use, and electrical appliances. They then list recommendations for energy efficiency improvements, energy conservation measures, and safety concerns – all with the goal of addressing safety issues, reducing energy use, and improving occupant comfort. Project staff also created a maintenance plan for each building and listed potential funding and training opportunities for a retrofit project that would act on the energy audit recommendations. As the project came to a conclusion, project staff traveled to Aniak to review the energy audit recommendations, maintenance plans, and potential for future projects with the Tribe. The energy auditor and a report author met and reviewed project progress and results with the Aniak Tribal Council. They walked through each building, speaking with the maintenance director, Tribal Administrator, and building occupants about each recommendation. In some buildings, the maintenance director and occupants were able to immediately implement some of the audit recommendations, such as programming setback thermostats, adjusting heating appliance controls, and making a plan to replace light bulbs with more efficient LEDs. Project staff worked with members of the Tribal office and Tribal Council to promote the project to the community of Aniak. The outreach component of the project included flyers, updates to the community, and a video about the project activities. In Aniak, project staff also spoke about the project at the Aniak Energy Fair, held in September 2018.

This project identified the strengths and weaknesses of the seven tribal buildings in the project and their management. Two buildings use a large amount of energy – the tribal office and the community hall. However, these buildings can realize a combined $25,000 in annual energy savings should the Tribe implement all the audit recommendations, which would pay back the cost of a retrofit project in less than five years. Other buildings can also realize savings, ranging from a few hundred dollars per year to over $5,000. Two of the buildings are currently unoccupied, and could provide additional benefits to the Tribe, such as rental space or warm storage, if renovated in conjunction with a retrofit project. The tribal office already has a dedicated and motivated tribal office staff, including a maintenance director. They have started to track energy and baseline conditions of the buildings. The staff frequently collaborates with the Council members to discuss the best next step for each building. Overall the Tribe could save over $40,000 per year if they implement all of the audit recommendations for the buildings.

The tribal office staff identified a few lessons learned for Tribes that might embark on a similar project. First, tribes should know that energy use and costs can be greatly reduced! The first step is a planning project such as this one, where the Tribe gains knowledge about their buildings and how they work, as well as specific steps they can take to reduce energy usage. Second, in addition to improving the buildings themselves, it is important to also improve local workforce capacity to take care of building maintenance and oversee energy efficiency improvements. Finally, as with any energy project, an organized and careful approach will ensure success.

As this project concludes in 2019, the Native Village of Aniak is looking toward next steps. The maintenance

director has implemented some of the audit recommendations alreasdy, including building monitoring, maintenance walk-throughs, and building occupant energy education. The Aniak Traditional Council and office staff are pursuing funding for a comprehensive retrofit project with the objective of taking the next steps toward fulfilling their goal for safe, comfortable, energy efficient tribal buildings.

WORKS CITED

ISER / UAA. (2010). Community Data Summary: Aniak. (This database is supported under the U.S. Department of Energy Office of Science EPSCoR Award # DE-SC0004903.) Retrieved March 22, 2018, from Alaska Energy Data Gateway: https://akenergygateway.alaska.edu/

United States Census Bureau. (2010). American Fact Finder: Aniak City, Alaska. Retrieved January 25, 2018, from United States Census Bureau: https://www.census.gov/

APPENDIX A: KICK-OFF MEETING FLYER

The Aniak Traditional Council and project staff held a kick-off meeting for the project in January 2018. This flyer guided the meeting's agenda. Council members and project staff discussed the goals of the project, and outlined the rough procedure of project activities. They also addressed specific questions, found on the flyer's second page, to provide context for the project in general, and give specific direction to project activities.

COLD CLIMATE HOUSING RESEARCH CENTER
CCHRC

Aniak Energy Efficiency Project

Project goal

The goal of this project is to create an **Energy Action Plan** for Tribal buildings. The Energy Action Plan will give details on making buildings safer, more comfortable, and more energy efficient.

Energy action plan

The energy action plan will contain many parts to help start an energy retrofit project.

1. Information on each building, including a description of the building and its current use, and the Tribe's goals for the future of the building.
2. Baseline energy, occupancy, comfort, and maintenance data for each building.
3. A data monitoring plan for each building to track the progress of the retrofit.
4. Energy audit for each building, which includes information about the building from an on-site building assessment and recommendations for improvements.
5. Timeline for the implementation of the energy retrofit for the buildings.
6. Funding opportunities for the building retrofits.
*7. A maintenance plan for each building.
*8. Training opportunities for building owners and/or staff.
*9. Potential training for building occupants on energy efficient habits.
*10. Scope of work and contractor bids.

*if applicable

Project steps

The project will follow these steps to complete the Energy Action Plan.

1. CCHRC, Energy Audits of Alaska, and the Tribe meet to talk about the project, the Tribe's goals, and the buildings to be audited.

2. CCHRC and Energy Audits of Alaska will collect information and interview building staff to find the baseline data for each building.

3. CCHRC will work with building staff and the Tribe to write a data monitoring plan for each building to track building improvements.

4. Energy Audits of Alaska will complete an on-site assessment of each building.

5. CCHRC and Energy Audits of Alaska will prepare a draft Energy Action Plan.

6. CCHRC and Energy Audits of Alaska will present the draft Energy Action Plan to the Tribe and listen to feedback.

7.CCHRC and Energy Audits of Alaska will revise and finalize the plan.

8. CCHRC and Energy Audits of Alaska will provide the final plan to the Tribe.

Throughout the project, CCHRC can help with meeting the grant requirements, such as writing quarterly progress reports, preparing the final report, and creating outreach materials.

Questions for the Aniak Traditional Council

CCHRC and Energy Audits of Alaska are grateful for this opportunity to work together and want to listen to the Tribe's past experiences and goals for this project.

1. Have there been any energy efficiency or renewable energy projects in Aniak in the past? How did they go? What did the community like (or dislike) about the projects?

2. Which buildings would the Aniak Traditional Council like us to audit? The project can audit 4-8 buildings and the following six buildings were named in the proposal to DOE.
Tribal office building
Community hall
Public safety building
Three KNA buildings

On this trip, ANTHC will also pay for an audit of the Fire House, and there are two YKHC residences that will receive building surveys.

3. What is the purpose of each building? Will this remain the same in the future?

4. Have any of the buildings been retrofitted in the past? Any planned retrofits for the future?

5. Do you have an idea of how much you think building retrofits should cost? What is a reasonable payback time for you?

6. Who staffs each building? Who maintains the buildings? When are the buildings used?

7. Who would you like to perform the retrofits? Are there local contractors or maintenance staff that can perform retrofits?

8. This project does not include financing for the retrofits. How would you prefer to finance them? How have projects been financed in the past? Do you want us to search for grant or loan programs? Do you have savings or maintenance funds that could be used?

9. How can we obtain the building energy use for 2016 and 2017? This includes the fuel oil use and electricity consumption for each building.

10. How would you like to monitor the building during and after this project? This is important to see results of the retrofits and report them. We can track energy bills, do occupant surveys, or install simple monitoring devices.

Project contacts

CCHRC - Haley Nelson (907-450-1728, haley@cchrc.org)
Vanessa Stevens, Project manager (907-450-1762, vanessa@cchrc.org)
Michele Doyle-Brewer, Chief Operations Officer (907-450-1764, michele@cchrc.org)
Energy Audits of Alaska - Jim Fowler (907-269-4350, jim@jim-fowler.com)

APPENDIX B:
ADDITIONAL ENERGY AUDIT SUMMARIES

In addition to the tribal buildings that received energy audits through this project, there are four other buildings in Aniak with existing energy audits, shown in the table below.

Building	Audit date
Aniak Fire Station	January 2018
Kuspuk School District Office	December 2012
Aniak Junior/Senior High School	July 2012
Auntie Mary Nicoli Elementary	July 2012

Table 1: There are existing energy audits for four other buildings in Aniak that could potentially be addressed in a retrofit project.

Should the Tribe and community wish to begin a retrofit project, it would be useful to contact these building owners and occupants as well. A comprehensive retrofit project that addresses the audit recommendations for all buildings with audits in Aniak would have several potential advantages – higher energy savings for the community, the possibility to leverage the cost of contractor travel, and the potential to collaborate on the match funding and proposal development for a grant opportunity.

The audits for these buildings, summarized individually in this appendix, have several overlapping recommendations. All four buildings would benefit from a lighting retrofit to replace the current bulbs with LEDs, and the school buildings could all save energy by installing programmable thermostats and lighting occupancy sensors, more efficient heating appliances, and insulating the crawlspace walls. If a retrofit project were to address the recommendations of all four audits, the building owners could collectively save over $50,000 in energy costs each year.

Aniak fire station

- Energy audit performed Jan 17, 2018 by Energy Audits of Alaska.
- 3,500 square foot facility.
- Annual energy use per square foot: 105,400 BTUs/ft$^{2.}$
- Predicted annual energy use per square foot if recommendations are implemented: 96,900 BTUs/ft$^{2.}$

The fire station could reduce energy costs by employing its waste oil and cordwood boilers instead of the fuel-oil-fired boiler.

Building description

The fire station was originally built in the year 2000 and used as a volunteer fire station. It is normally unoccupied except for occasional training or community activities. This fabricated steel structure building is constructed on a concrete slab poured on grade. Eight inches of fiberglass batt with an estimated insulation value of R-25 likely fills the

cavities between girters, and between the interior and exterior metal sidings. A waste oil burner and oil-fired unit heater are the building's two heating sources. There is no mechanical ventilation or windows in the building. The greatest portion of energy cost is for space heating, and the Aniak fire station consumes more energy for space heating than similar fire stations in Nome, St. Paul, and Amaknak.

Recommendations

The energy audit includes a list of priorities that are cost-effective and have a fast payback period. The number one priority is space heating. That includes eliminating the use of the oil-fired unit heater by using the waste oil burner for 40% of the building's heating needs and a cord wood boiler to heat the remaining 60%. This measure would cost $25,000 and save approximately $11,000 per year, paying back in 2.3 years.

Air tightening was the next priority. Performing air sealing on the fire station could cut the building's air leakage in half. Completing this measure would cost $4,000 and save $1,300 per year.

Replacing manual switches with clock timers or other scheduling controls on the destratification fans is another easy upgrade with a high return on investment. Completing this action costs $500 and pay off after just 2.7 years.

Another priority is to replace the lighting in the high bay with LED lights. This would save only $42 per year but due to its payback time of seven years, it is still recommended.

Energy efficiency measures that are recommended but not cost-effective

Replacing lighting in the mezzanine was not determined to be cost-effective by the energy model. While it isn't cost effective, it still recommended because it would improve the building in other ways. For example, having LED lights would need to be replaced less frequently and would be easier to maintain.

Energy conservation measures

Energy conservation measures (ECMs), or operations & maintenance (O&M), is an opportunity to save money without capital investment. A well-implemented O&M plan is often the driving force behind energy savings. The audit listed several ECMs for the building owner to consider, including ongoing energy monitoring, designating a building "energy champion" to perform a monthly walk-through and check energy usage, turning off plug loads, and maintaining the HVAC systems. another examples of ECMs are to upgrade all lights at the same time as a preventative maintenance activity, ensure the lamp inventory for the entire building is limited to a single version of an LED or fluorescent tube if at all possible, and program all appropriate rooms with similar occupancy controls and setback thermostats.

Post-retrofit expectations

The existing fire station spends $16,080 per year on energy costs. If the proposed retrofits are implemented, the annual cost is expected to drop to $3,575, a savings of over $12,000 annually. Completing all of the proposed retrofits would cost roughly $30,988, resulting ina pay back of 2.5 years.

Improvement description	Predicted annual energy and maintenance savings	Estimated installation cost	Simple payback (years)
Use waste oil burner for 40% of the building's heating needs	$5,350	$1	0
Use cordwood boiler for remaining 60% of space heating needs	$5,619	$25,000	4.3

Air tightening building envelope	$1,296	$4,000	3.1
Add clock timer to destratification fans	$185	$500	2.7
Replace lighting in the high bay with LED bulbs	$42	$295	7
The following measure is not cost-effective from a financial perspective but is still recommended.			
Replace remaining lighting with LED bulbs	$84	$1,192	14.2
TOTAL, all measures	$12,576	$30,988	2.5

Table 2: If building owners implement all recommendations, energy and maintenance costs would decrease by over $12,000 per year.

Kuspuk School District office

Energy audit performed Dec 26, 2012 by Nortech

12,576 square foot facility

Annual energy use per square foot: 64,000 BTUs/ft^2

Building description

The Kuspuk School District office is a two-story wood-framed building with an insulated crawlspace and wood foundation. It was built in 1987. The building serves as office space for the school district administrative staff and is occupied by ten personnel during the school year and five full-time staff in the summer. The building envelope is made up of 2x10 studs with R-30 fiberglass batts. An oil-fired boiler supplies heat to the building through the hydronic baseboards and the crawlspace is heated with two hydronic unit heaters. The Kuspuk School District office is primarily lit by fluorescent fixtures. In addition, daylighting in approximately 75% of the building reduces the lighting demand. The building uses 64,000 BTU per square foot annually, which is similar to the energy use intensity for a typical Fairbanks school.

If the school district implements all audit recommendations, the resulting energy savings would pay back the retrofit costs in around five years

Recommendations

The energy audit includes a list of priorities that are cost-effective and have a fast payback period. The number 1 priority is temperature control. That includes implementing an unoccupied heating temperature setback of 50 °F in the crawlspace. This measure would cost roughly $200 and save approximately $1,868 a

year, paying back in a little more than one month. Implementing an unoccupied heating temperature setback of 58°F in the office spaces would cost $400 and save $461 annually.

Removing the refrigerator was the next priority. The building currently has one full-size refrigerator on each floor, although based upon occupancy, one should be sufficient. Removing one of the refrigerators would save $270 annually based on 2012 energy prices. Turning off the remaining refrigerator during the summer would save $47 annually.

Switching to more efficient lighting was another easy upgrade with a high return on investment. In many locations throughout the school, switching to LED bulbs can pay back in less than five years.

Another recommendation was to replace the current, 25 year old boiler with a more efficient and higher capacity boiler. The new boiler would save $3,149 annually and pay back after 7.9 years. Other recommendations included to insulate the portion of the crawlspace wall without batt insulation and to add a clock timer on the parking lot electrical outlets.

Energy efficiency measures that are NOT recommended

A number of measures were identified in the audit that were not determined to be cost-effective by the energy model. While they may improve the building, these measures are not recommended because they may save only a small amount of energy or be too expensive to install. For example, installing extra insulation on the walls would make the building more comfortable but would not yield enough energy savings to justify the upfront cost. Additionally, replacing windows would reduce drafts but in many cases would take 40 years to recoup the investment.

Energy conservation measures

Energy conservation measures (ECMs), or operations & maintenance (O&M) is an opportunity to save money without capital investment. A well-implemented O&M plan is often the driving force behind energy savings. The audit suggested several ECMs, including preserving institutional knowledge, routine and preventative maintenance, and scheduling regular inspections of each piece of HVAC equipment within the building. The building maintenance staff should implement an O&M plan to track repairs, utility bills, and system performance as well as seek out training and continuing education.

Specific ECM recommendations for the district office included conducting an Indoor Air Quality assessment to determine if the ventilation system, currently shut down, should be repaired and activated, repairing the elevator so the building is in compliance with the Americans with Disabilities Act, and clearing items away from baseboards, hallways, and exits.

Post-retrofit expectations

At the time of the audit, the annual energy costs totaled $33,665. If all of the recommended EEMs are completed, the annual utility costs can be reduced by approximately 24%. These measures are estimated to cost $39,061 for an overall simple payback of 4.8 years.

Improvement description	Predicted annual energy savings	Estimated installation cost	Simple payback (years)
Implement a heating temperature setback during unoccupied periods in the crawlspace and office	$2,329	$600	0.3

Remove unused refrigerator, and shut down other refrigerator seasonally	$317	$80	0.3
Replace lighting in classrooms and building exterior with LED bulbs	$1,740	$12,425	7.1
Implement clock timer on the parking lot electric circuit	$434	$300	0.7
Install fiberglass batts on the uninsulated portion of the crawlspace wall	$110	$656	6.0
Replace the boiler with a HE 3-pass boiler with modulating aquastat	$3,149	$25,000	7.9
TOTAL, all measures	$8,078	$39,061	4.8

Table3: If the building owner implements all the recommendations, the energy savings would be over $8,000 per year.

Aniak Junior/Senior High School

- Energy audit completed July 13, 2012 by Nortech.
- 20,916 square foot facility.
- Annual energy use per square foot: 75,000 BTUs/ft^2

Building description

The school was originally built in 1983. During the school year, the building is occupied by 50 students and staff. The building envelope is made up of 2x8 studs with R-30 fiberglass batt. Heat is provided by an oil-fired furnace in the Air Handling Unit (AHU) and an oil-fired boiler. The AHU is the sole source of heat for the gym, and provides tempered air throughout the building. There are no occupancy sensors or control systems that help reduce energy use. The building uses 75,000 BTU per square foot annually, slightly higher than the energy use intensity for the typical Fairbanks school.

The school could reduce its energy costs by $15,000 through an energy retrofit.

Recommendations

The energy audit includes a list of priorities that are cost-effective and have a fast payback period. The number 1 priority is temperature control, which includes setting the temperature for the gym and school space to 60 F when unoccupied. This measure would cost $400 and save approximately $4,000 per year, paying back in a little more than one month.

Lighting was another priority. The building currently uses fluorescent lighting. Converting to more efficient lighting provides a significant increase in

efficiency. For example, changing to more efficient lighting in the media room would cost about $25 and save $112 per year.

Ventilation is another improvement that pays back in under a year. Reducing the minimum outside air to current ASHRAE standards of 15 cfm/person would cost $1,000 and save nearly $1,233 a year.

Other recommendations included adding an insulating blanket to the garage door, insulating the crawlspace wall, replacing the furnace, water heater, and boiler with more efficient boilers, and replacing the exterior door with an insulated model.

Energy efficiency measures that are NOT recommended

A number of measures were identified in the audit that were not determined to be cost-effective by the energy model. While they may improve the building, these measures are not recommended because they may save only a small amount of energy or be too expensive to install. For example, installing extra insulation on the walls would make the building more comfortable but would not yield enough energy savings to justify the upfront cost.

Energy conservation measures

Energy conservation measures (ECMs), or operations & maintenance (O&M) is an opportunity to save money without capital investment. A well-implemented O & M plan is often the driving force behind energy savings. The audit suggested several ECMs, including preserving institutional knowledge, routine and preventative maintenance, and scheduling regular inspections of each piece of HVAC equipment within the building. The building maintenance staff should implement an O&M plan to track repairs, utility bills, and system performance as well as seek out training and continuing education.

Specific ECM recommendations for the school included enforcing a policy to clear space around heating vents, which can be blocked by teaching materials; repairing any water leaks; providing an outdoor receptacle for the propane tank shed extension cord which was currently causing an exterior door to remain partially open; and repairing the motors on the locker room cabinet heater motors.

Post-retrofit expectations

If all of the Energy Efficiency Measures recommended in the audit are completed, the annual utility costs can be reduced by $15,911, or approximately 21%. These measures are estimated to cost $113,378 for an overall simple payback of 7.1 years.

Improvement description	Predicted annual energy savings	Estimated installation cost	Simple payback (years)
Setback thermostats: gym and school	$4,024	$400	0.1
Replace lighting in media room with CFL bulbs	$112	$25	0.2

Adjust ventilation system to current ASHRAE minimum standards of 15 cfm/person	$1,233	$1,000	0.8
Add insulating blanket to metal garage door	$42	$148	3.5
Replace lighting in kitchen with fluorescent bulbs	$57	$104	1.8
Insulate empty portion of crawlspace wall with fiberglass batt	$315	$2,767	8.8
Replace lighting in room 104 with LED bulbs	$35	$200	5.8
Replace space heating equipment with HE triple-pass boilers	$9,317	$100,000	11
Replace hallway lighting with LED bulbs	$623	$5,320	8.5
Replace exterior door with insulated model	$146	$3,373	23
Replace lighting in boys' restroom with fluorescent bulbs	$6	$40	6.2
TOTAL, all measures	$15,911	$113,378	7.1

Table 4: If the building owner implements all the recommendations, the energy costs would decrease by over $15,000 per year.

Auntie Mary Nicoli Elementary

- Energy audit completed July 9, 2012 by Nortech.
- 19,471 square foot facility.
- Annual energy use per square foot: 108,000 BTUs/ft$^{2.}$

Building description

The school was originally built in 1930 and an addition was constructed in 1993. During the school year, the building is occupied by 75 students and five teachers. The building envelope is made up of 2x8 studs with R-24 fiberglass batts. Seven oil-fired furnaces provide heat and ventilation to the building. They are controlled by non-programmable thermostats. There are no occupancy sensors or control systems that help reduce energy use. The building uses 108,000 BTU per square foot annually, 73% higher than the energy use intensity for the typical Fairbanks school.

The number one recommendation for the elementary school is to implement temperature setbacks.

The greatest portions of energy cost are envelope air losses, lighting, wall/door and other electrical heat losses, which indicate that the greatest savings can be found in air tightening and potentially reducing the amount of outside air provided to the building using Demand Control Ventilation, more efficient lighting, and reducing school plug-loads.

Recommendations

The energy audit includes a list of priorities that are cost-effective and have a fast payback period. The number 1 priority is temperature control. That includes replacing existing nonprogrammable thermostats with programmable thermostats to save energy when the building is not in use. Reducing the nighttime set point from 70 F to 60 F at night and on weekends would significantly decrease the energy usage. This measure would cost $1,400 and save approximately $11,000 a year, paying back in a little more than one month.

Lighting was the next priority. The building currently uses fluorescent lighting. Converting to more efficient lighting provides a significant increase in efficiency. LED bulbs can be directly placed in existing fixtures. For example, changing CFLs for LEDs in the hallways and vestibules would cost $660 and save $919 a year.

Occupancy sensors are another easy upgrade with a high return on investment. For example, occupancy sensors could be installed in all classrooms and offices for $1,000 and save nearly $2,000 a year.

Another recommendation was to replace two furnaces that are both thirty years old and heavily used. Upgrading to a high-efficiency furnace would save an estimated $2,200 a year in energy costs while also reducing maintenance costs. Both installing the furnace supply, return, and outside air vents and dampers in compliance with ASHRAE best practices, and eliminating a stack will offer further savings by reducing heat stratification near the ceiling, controlling outside air, and reducing stack losses.

Other recommendations included installing R-21 batt insulation on the interior of the basement wall, installing insulated doors, and replacing the freezers with more efficient models.

Energy efficiency measures that are NOT recommended

A number of measures were identified in the audit that were not determined to be cost-effective by the energy model. While they may improve the building, these measures are not recommended because they may save only a small amount of energy or be too expensive to install. For example, installing extra insulation on the walls would make the building more comfortable but would not yield enough energy savings to justify the upfront cost. Additionally, replacing windows would reduce drafts but in many cases would take 30 years to recoup the investment.

Energy conservation measures

Energy conservation measures (ECMs), or operations & maintenance (O&M), is an opportunity to save money without capital investment. A well-implemented O&M plan is often the driving force behind energy savings. The audit listed several ECMs for the building owner to consider, including preserving institutional knowledge, routine and preventative maintenance, and scheduling regular inspections of each piece of HVAC equipment within the building. The building maintenance staff should implement an O&M plan to track repairs, utility bills, and system performance as well as seek out training and continuing education. Specific ECM recommendations for the school included replacing the ceiling-mounted fan in the gym with a quieter, more efficient model that reduces heat stratification, and keeping heat vents clear of obstruction in classrooms.

Post-retrofit expectations

In 2010, the school used 2,100 MBTU of energy, which cost $93,304. Completing all of the recommended energy efficiency measures would reduce energy costs by $26,711 per year and, at an estimated retrofit cost of $97,294, pay back in 3.6 years.

Improvement description	Predicted annual energy savings	Estimated installation cost	Simple payback (years)
Setback thermostats in the building	$10,953	$1,400	0.1
Install occupancy sensors for lighting	$3,771	$2,900	0.8
Replace lighting with LED bulbs	$3,796	$20,549	5.4
Insulate the portion of the basement wall with no insulation	$3,070	$21,915	7.1
Replace freezers with more efficient models	$1,283	$2,000	1.6
Replace exterior doors with insulated models	$509	$4,498	8.8
Replace every other column of classroom windows with insulated wall	$1,071	$12,000	11.2
Replace furnaces 4 and 5 with more efficient models	$2,258	$40,000	17.7
TOTAL, all measures	$26,711	$97,294	3.6

Table 5: If the building owner implements all recommendations, energy costs would decrease by over $25,000 per year.

APPENDIX C: OUTREACH MATERIALS

While the main goal of the Aniak Energy Efficiency Project was to create an Energy Action Plan to improve the safety, comfort, and energy efficiency of tribal buildings in the community, the project also included an outreach component. The purpose of general outreach about the project to the community was twofold: first to publicize the project and Tribe's goals and second to showcase sustainable practices so that Aniak residents could replicate them in their own homes.

Outreach materials created through this project appear in this appendix in the following order:

1) Aniak Tribal Council update flyer
2) Aniak Tribal member meeting flyer
3) Aniak Energy Fair flyers
4) Setback thermostat instruction poster
5) Final project flyer

May 2018

CCHRC

Aniak Energy Efficiency Project

PROJECT GOAL

The goal of this project is to create an Energy Action Plan for tribal buildings, which will give details on making buildings safer, more comfortable, and more energy efficient.

PROJECT STEPS

The project is following these steps to complete the Energy Action Plan. Below, the finished steps appear in italics.

1. CCHRC, Energy Audits of Alaska, and the Tribe met to talk about the project, the Tribe's goals, and the buildings to be audited.

2. CCHRC and Energy Audits of Alaska collected information and interviewed building staff to find the baseline data for each building.

3. CCHRC, building staff, and the Tribe created a data monitoring plan for each building to track building improvements.

4. Energy Audits of Alaska completed an on-site assessment of each building.

5. CCHRC and Energy Audits of Alaska will prepare a draft Energy Action Plan.

6. CCHRC and Energy Audits of Alaska will present the draft Energy Action Plan to the Tribe and listen to feedback.

7.CCHRC and Energy Audits of Alaska will revise and finalize the plan.

8. CCHRC and Energy Audits of Alaska will provide the final plan to the Tribe.

MAY 2018 UPDATE

This project is approximately halfway complete. After the visit to Aniak in January 2018, CCHRC and Energy Audits of Alaska have been working on a draft of the Energy Action Plan. We anticipate completing a draft of this Plan near the end of summer and are hoping to visit to present it to the Council in late summer or early fall.

- Daisy Phillips gave a presentation about the project to the Department of Energy at a conference in Denver, Colorado in November 2017.

- Haley Nelson and Daisy Phillips collected baseline energy data on the buildings in the project and wrote plans to continue to track the data.

- We submitted two quarterly reports to the Department of Energy on the project progress, one for October - December 2017 and one for January - March 2018. Both of these reports are in this packet.

- Energy Audits of Alaska completed an initial assessment of the tribal buildings in the project. This is summarized on the back page of this flyer and there is a copy of the full version in this packet.

- We are communicating with the Energy Program Coordinator at Nuvista Electric Light & Power / CEMAI, Bertha Prince, so that we can coordinate with other energy projects in the region.

Preliminary Findings from Tribal Building Surveys

Jim Fowler (energy auditor from Energy Audits of Alaska) completed a short report on preliminary findings after conducting building surveys in January 2018. These findings focus on ways to reduce energy costs in tribal buildings. The report is included in this packet, and a summary of the findings is below.

There are 7 tribal buildings that are participating in the project:

- Community hall
- Public safety building
- Farm building #1
- Farm building #2
- Tribal office building
- KNA duplex
- KNA building #5

In addition to recommendations specific to each building, there are six primary community needs:

1. There is a need for an individual to perform energy efficiency checks each month, completing tasks such as checking programmable thermostats, monitoring fuel consumption, and addressing occupant comfort complaints.
2. Consider a district heating loop powered by a combined heat and power (CHP) unit or a biomass boiler for the five main tribal buildings. They are in close proximity to each other, making them physically well-suited to consider a district heating loop.
3. Renovate the envelope and heating system in the community hall.
4. Replace the electric clothes dryers in the community center with hydronic units.
5. Replace all lighting with LED bulbs.
6. Provide additional training for the maintenance person on topics such as preventative maintenance, continual commissioning, and how to address energy efficiency through routine maintenance.

Mr. Fowler will also enter individual energy efficiency retrofits for each building into an energy modeling software, AkWarm, to determine if the retrofits will be cost effective. Examples of potential retrofits including the following:

1. Recommissioning control systems to make sure they address the current occupancy schedules.
2. Adding insulation to attics and walls.
3. Air-sealing the floors, walls, and ceilings.
4. Replacing lighting with LED bulbs.
5. Turning off or replacing electrical appliances.
6. Installing programmable thermostats.

PROJECT CONTACTS

CCHRC - Haley Nelson (907-450-1728, haley@cchrc.org)
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Michele Doyle-Brewer, Chief Operations Officer (907-450-1764, michele@cchrc.org)
Energy Audits of Alaska - Jim Fowler (907-269-4350, jim@jim-fowler.com)

Aniak Energy Efficiency Project

Project Goal:

The Aniak Traditional Council is working with the Cold Climate Housing Research Center and Energy Audits of Alaska to create an Energy Action Plan for the tribal buildings in Aniak. The Energy Action Plan will detail the conditions of the buildings and suggest recommendations on how to make the buildings safer, more comfortable, and more energy efficient.

August 2018 Update:

The project kicked off 2017 when Daisy Philips gave a presentation about Aniak at the DOE Program Review in Denver, Colorado. In January 2018, the Traditional Council met with the project team to review the project plan. Afterwards, the project's energy auditor surveyed the seven tribal buildings in the project: the Community Hall, the Public Safety building, the Tribal Office building, the duplex, and three empty buildings to be used in the future. Currently, the project team is working on the energy plan for each building. The project should wrap up this fall, and preliminary results will be available at the Aniak Energy Fair on September 26th.

This project is funded by: U.S. DEPARTMENT OF ENERGY | Office of Indian Energy

ANIAK ENERGY FAIR

Wednesday, September 26th
4 PM

Aniak Community Hall

Free energy workshops from 4 to 8 pm.

Community potluck at 5 pm - bring a dish!

Door prizes and informational booths all evening.

Sponsored by:

CALISTA ENERGY MANAGEMENT ASSISTANCE INITIATIVE

ALASKA ENERGY AUTHORITY

NUVISTA

REAP Renewable Energy Alaska Project

COLD CLIMATE HOUSING RESEARCH CENTER CCHRC

Alaska Housing FINANCE CORPORATION

TOYO SET BACK INSTRUCTIONS

* IF CLOCK IS FLASHING, TOYO NEEDS TO BE RESET

5 Auto Mode

Push AUTO button to activate Set Back mode

4 Set Back

Adjust temperature to 63 (this is the temp when no one is in the building)

1 Reset Clock

Turn switch to Clock Set. Use Hour & Minute buttons to adjust time

2 Start Set

Use Hour & Minute buttons to set the time you **leave** building

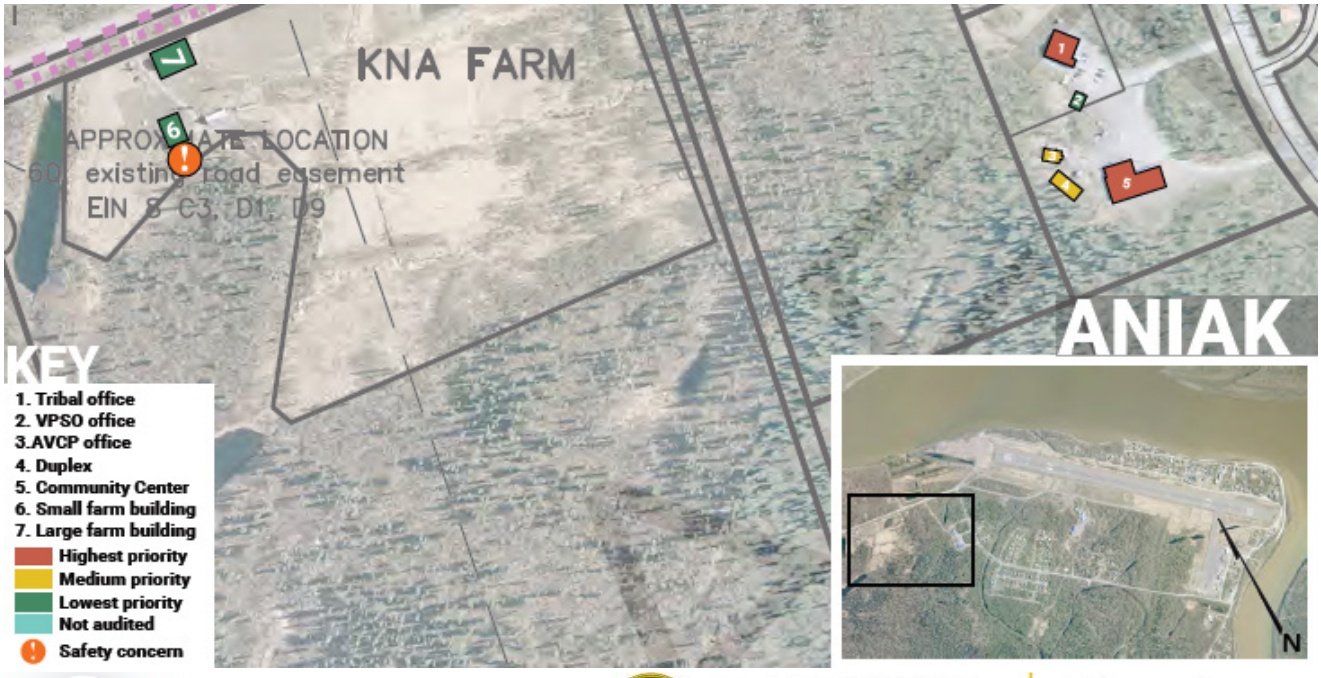
3 Stop Set

Use Hour & Minute buttons to set the time you **arrive** at building

Aniak Energy Efficiency Project

In 2017, the Aniak Native Community partnered with the Cold Climate Housing Research Center and Energy Audits of Alaska to make a plan to improve tribal buildings in the village. Funded by the U.S. Department of Energy Office of Indian Energy, the 2-year project resulted in an Energy Action Plan for tribal buildings. The plan contains baseline data on the condition and energy use of seven tribal buildings. From this information, a set of recommendations were formulated to improve each building's energy efficiency and safety. A maintenance plan and funding opportunities were also included in the final Energy Action Plan.

Two of the buildings in the project have energy costs of over $30,000 per year, and a third has annual energy costs of almost $10,000. Following all the recommendations in the Energy Action Plan for each building can result in nearly $40,000 in savings annually for the Tribe. The tribal maintenance manager and building occupants have already begun to act on these recommendations, and the dedicated tribal staff and Tribal Council are now looking towards the next steps to realizing safe, comfortable, and energy efficient tribal buildings.



Cold Climate Housing Research Center
CCHRC

U.S. Department of Energy
Office of Indian Energy

Cold Climate Housing Research Center | 907 - 457 - 3454 | www.cchrc.org

SCOPES OF WORK

For energy efficiency upgrades recommended for
The Native Village of Aniak

Prepared For

Native Village of Aniak
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Energy Audits of Alaska

Table of Contents

May 19, 2019

The table below summarizes the Energy Efficiency Measures (EEMs) recommended for the buildings in Aniak. The scope of work for each EEM is described in paragraphs 1 through 3 below the summary table. Contractor is required to field-verify all quantities.

An energy audit report is available for each building. The audit report contains each individual EEM with additional detail as well as lighting and HVAC schematics.

No scopes of work are included for the large and small farm buildings as their eventual use is still unknown.

Table – Summary of all EEMs

	HVAC & DHW			Lighting			Envelope			
Building	Other	Controls	Hot water heating	Interior	Exterior	Controls	Air Sealing	Doors	Insulation & other	Windows
AVCP Office	Modify fintube heat piping in crawl space to connect to zone valve controlling unit heater	2 programmable thermostats installed September 2018		Retrofit 4 T12 fixtures & 8 lamps with LED	Retrofit 1 entry wall pack with LED					
				replace 2 A-type bulbs with LED						
				Retrofit 7 T12 fixtures & 14 lamps with LED						
				Retrofit 2 24" T12 fixtures & 4 lamps with LED						
Community Center		Program 5 Toyo Stove setback thermostats	replace oil fired storage HWH with Toyotomi on-demand	replace 2 A-type bulbs with LED	replace 2 A-type bulbs with LED	Install 2 occupancy sensors	preform air sealing on envelope	replace 2 existing metal doors with new, pre-hung units, min. U-0.16	Add min. R-11 to existing auditorium roof or replace with R-60	replace 3 existing windows with min. U-0.28 units
				Retrofit 69 T12 fixtures & 162 lamps with LED	replace 2 wall packs with LED				Frame up 4 missing windows, add min. R-30 insulation, re-side	
				retrofit 27 T8 fixtures & 98 lamps with LED (2 fixtures with 8 lamps were retrofitted in September 2018 and subtracted from these figures)						
				retrofit 3 T12-Utube fixtures & 6 lamps with LED						

Building	HVAC & DHW			Lighting			Envelope			
	Other	Controls	Hot water heating	Interior	Exterior	Controls	Air Sealing	Doors	Insulation & other	Windows
Duplex (Bunkhouse & State Trooper Office)	Replace 2 bath exhaust fans with units with integral humidistat and occupancy sensor	1 each programmable thermostats installed in East and West wing September 2018		replace 18 A-type bulbs with LED	replace 2 A-type bulbs with LED	Install 1 occupancy sensor				
		Install 7-day programmable thermostat in west wing		Retrofit 9 T12 fixtures & 24 lamps with LED						
Tribal Office	Replace 2 constant speed, oversized circulation pumps with VFD units	Install (19) 7-day programmable thermostats (1 was installed September 2018)		Retrofit 90 T8 fixtures & 245 lamps with LED (3 fixtures with 6 lamps were retrofitted in September 2018 and subtracted from these figures)	replace 5 wall packs with LED					
	Retro-commission all zone valves, control valves and thermostats, re-balance water side	Install Tekmar House Control 400 or equivalent HVAC control system		Retrofit 1 24" T8 fixture & 2 lamps with LED						
	Replace boiler with 87% AFUE model									
		Implement CO2 based modulation of OSA dampers on AHU								
	Replace AHU fan motor with VFD unit									
	Retro-commission AHU controls and re-balance air side									
VPSO Office		Program 1 Toyo Stove setback thermostat		replace 4 A-type bulbs with LED	replace 2 BR reflector bulbs with LED					
				retrofit 2 T8 fixtures & 4 lamps						
Large Farm Building										
Small Farm Building										

May 19, 2019

1. HVAC & DHW

a. CONTROLS

i. Programmable setback thermostat

- Contractor shall identify the zone valve, wall convector, electric baseboard of heating coil valve controlled by existing thermostat.
- Field verify control voltage.
- Field verify proper operation of controlled component (zone valve, control valve, damper actuator, baseboard convector, etc.)
- If new thermostat requires 3 or more signal wires, field verify that sufficient conductors exist and there are no shorts or breaks in conductors.
- If insufficient conductors exist, run new signal wire, verify no shorts or break.
- New thermostat to have the following minimum requirements:
  1. 7-day programmable.
  2. Simple up and down arrow temperature over-ride.
  3. Revert back to program at next event (wake, leave, return or sleep).
  4. Does not allow (or installer can disable) permanent hold over-ride of program.
  5. Non-volatile memory to preserve program in event of power outage.
- Install thermostat and program to match occupant daily use.
- Install thermostat per manufacturer's recommendation.
- Confirm that thermostat properly operates controlled component
- If thermostat is Wi-Fi compatible, and occupants select this option:
  1. Program thermostat to communicate with local Wi-Fi.
  2. Help at least 2 occupants download and create log in credentials to appropriate App on their communication devices.
  3. Sync thermostats to App.
  4. Confirm control from communication device is operable.
  5. Confirm monitoring is active.
- Provide minimum of 15 minutes of training to at least 2 occupants on premises.

ii. Boiler and Building Controls

Existing boiler controls:

Tekmar 262 Boiler Control
Standard Weil McLain temperature controller

Contractor to install boiler and building controls using Tekmar House Control 400 or equivalent, per manufacturer's recommendations, with the following minimum capabilities:

- Outside air (OSA) temperature sensing, reset and lockout
- DHW temperature sensing (if boiler provided heat for DHW)

- Programmable room setbacks
- Control of circulation pumps based on calls for heat

Install Tekmar 552 and 532 thermostats or equivalent with the capabilities listed in paragraph 1.a.i. above, per manufacturer's recommendations.

Program the system as follows:

- Lock out boiler when outside air temperature is 65F or higher unless boiler is also used for DHW heating
- Reset boiler water temperature based on outside air temperature, space heating demand and DHW heating demand

iii. Install CO2 based demand controlled ventilation

Contractor to implement modulating control of OSA dampers based on CO2 content in the return air (RA) duct of the air handling unit (AHU) as follows:

- Install CO2 sensor in RA duct of AHU per manufacturer's recommendation.
- Provide display of CO2 level in accessible location based on occupant's preference.
- Field verify existing OSA damper actuator has modulating capability.
- Match RA sensor output and OSA damper actuator input control to provide 0% to 100% open dampers based on CO2 content .
- Program OSA dampers closed if CO2 <800 PPM and proportionately modulate open as CO2 level rises.
- Confirm proper operation.

b. HOT WATER HEATING

Existing unit: Bock 32E, 104 MBH, 112 gph recovery, 32 gallon storage

Contractor shall demo existing oil fired, storage hot water heater as follows:

- Safely disconnect electric power and turn off at breaker
- Temporarily cap off oil supply
- Disconnect exhaust flue
- Empty storage tank
- Disconnect plumbing
- Remove storage tank and properly dispose

Contractor shall install new oil fired, on-demand hot water heater with the following minimum capacities, per manufacturer's recommendations:

- Toyotomi OM series, or equivalent
- Size to be calculated by licensed engineer or by the contractor based on current use and occupancy of the building
- Minimum 87% AFUE

Reconnect flue and confirm proper installation with no leaks.
Reconnect oil supply, confirm proper installation and no leaks.
Confirm oil supply is properly filtered and oil meets manufacturer's requirements.
Reconnect electric supply.
Reconnect plumbing, confirm no leaks.
Confirm water hardness, PH and chlorination are within manufacturer's recommended range.
Set water temperature to occupant preference.
Confirm proper operation of unit and proper water temperature is produced.

c. OTHER

i. Boiler Replacement

Existing equipment: Weil McLain A/B-WTGO-B, 274 MBH gross input, 238 MBH net water IBR

Contractor shall demo existing oil fired boiler as follows:

- Safely disconnect electric power and turn off at breaker.
- Temporarily cap off oil supply.
- Disconnect exhaust flue.
- Drain down the heating system and disconnect heat piping, drains, and fresh water make-up .
- Remove boiler and properly dispose.

Contractor shall install new oil fired boiler with the following minimum capacities, per manufacturer's recommendations:

- 3-pass, cast iron, hydronic, oil fired boiler, similar or equivalent to:
  1. Weil McLain WGTO or WGO series
  2. Burnham V8H or MPO-IQ series
- Size to be calculated by licensed engineer or by the contractor based on current model and current heat requirements of the building.
- Minimum 87% AFUE.

Reconnect flue and confirm proper installation with no leaks.
Reconnect oil supply, confirm proper installation and no leaks.
Confirm oil supply is properly filtered and oil meets manufacturer's requirements.
Reconnect electric supply.
Reconnect plumbing and piping, confirm no leaks.
Refill system with proper glycol mixture.
Confirm proper operation of unit.

ii. Install VFDs

Contractor shall replace existing 2 HP AHU supply fan motor and (2) heating water circulation pumps with VFD units. Existing motors, sizes and mounting patterns must be field verified.

Existing Units

AHU fan motor: 2 HP, 115-230V, 60Hz, 1 phase, 1750 rpm
(2) Circulation pumps: Grundfos UPC-50-160, 230V, 60 Hz, 1 phase

The existing circulation pumps are over-sized, are over-pressurizing the heating system and causing multiple failures of zone valves. They must be re-sized by a licensed engineer or contractor.

Circulation Pumps

- Safely disconnect electric power and turn off at breaker.
- Valve off heating water.
- Remove existing pumps and properly dispose.
- Install new pumps with integral VFDs similar or equivalent to:
    a. Grundfos Magna series
    b. Taco 00e series
- Reconnect piping, check for leaks.
- Reconnect electric supply.
- Install and connect sensors as applicable.
- Program for 20F delta T operation.

AHU fan motor

- Safely disconnect electric power and turn off at breaker.
- Disconnect belt and remove motor.
- Dispose properly.
- Install new motor with VFD – note that this is a single phase motor, so new motor and VFD must be single phase compatible.
- Reconnect electric supply.
- Reconnect belt.
- Program VFD for run at constant speed of 52 Hz.

iii. Retro-commission HVAC System

Contractor shall retro-commission all of the zone valves, control valves, thermostats and damper actuators in this building and re-balance the air and water sides of the HVAC system.

Existing equipment:

19 thermostats
19 zone valves
3 damper actuators
1 AHU timer

Boiler controller

- Trouble shoot existing thermostats and zone valves including hot water generator zone valve, for proper operation (If the thermostats have been replaced with new, no thermostat troubleshooting is required); identify and replace non-functional units.

AHU
- Trouble shoot damper actuators, identify and replace non-functional units.
- Assure free and unrestricted operation of all dampers.
- Clean all duct interiors and heating coils.
- Replace AHU filters.
- Confirm AHU timer is programmed properly for current building use and occupancy and operates correctly.
- Confirm that all supply diffusers and return air ducts are open and unblocked.
- Rebalance the system to provide adequate ventilation and heat to all spaces served.

Boiler
- Confirm that boiler controller is programmed for current building use and occupancy and operates correctly (if new boiler controller has been installed, no troubleshooting is required).
- Confirm that circulation pumps are enabled and disabled based on calls for heat.
- Confirm that boiler operates at correct set points, and turns on and off according to aquastat settings.
- Confirm that high limit aquastat functions properly.
- Exercise all valves, check for leakage.
- Confirm no air blockages exist when zone valves are open (an IR camera may be required).
- Rebalance the system to provide adequate flow and heat to all spaces served.

2. LIGHTING

a. INTERIOR

i. Linear Florescent Fixtures

Contractor to replace 24” and 48” linear florescent T8 and T12 tubes with direct wire LED tubes. The 48” tubes shall consume a maximum of 15w and output a minimum of 1800 lumens. Building owner to select color temperature; in absence of owner’s selection, a color temperature of 4000K will be used. 48” LED tubes must manufactured by one of the following brand name manufacturers and have a minimum rated life of 50,000 hours and 5 year warrantee:

Philips
Lithonia
GE Lighting
Topaz

LED tubes shall be retrofitted as follows:
- Turn electric power off at breaker.
- Open fixture, remove ballast cover.
- Sever wires exiting ballast, abandon ballast in place.
- Remove old end caps and discard.
- Re-wire line voltage to new end caps per LED tube wiring instructions (may require shunted end cap).
- Install new end caps.
- Install ballast cover, adhere warning label to ballast cover indicating wiring pattern and that new lamp is an LED.
- Install new LED.
- Measure amperage, confirm it is correct for the LED lamp.
- Clean inside of fixture and lens, reinstall lens.
- Test fixture for proper operation.

ii. A-type bulb replacements
- Remove existing fixture cover and existing screw-in bulb.
- LED shall have a color temperature between 2700K and 3500K based on owner preference.
- LED shall have a rated life of 20,000 hours minimum.
- Replace with new LED, clean fixture cover, replace cover.

iii. BR reflector bulb replacements
- Remove existing fixture cover and existing screw-in bulb.
- LED shall have a color temperature between 2700K and 3500K based on owners preference.
- LED shall have a rated life of 20,000 hours minimum.
- Replace with new LED, clean fixture cover, replace cover.

b. EXTERIOR

i. 50w to 100w Wall Packs

Contractor to replace small HID wall packs up to 100w with new LED wall packs with the following requirements:
- Maximum 20w LED wall pack with minimum 1500 lumen output to replace 50w HID wall packs.
- Maximum 30w LED wall pack with minimum 2200 lumen output to replace up to 70w-100w HID wall packs.
- LED wall packs to have integral photocell sensor.

- LED wall packs to have a minimum rated life of 50,000 hours and a 5 year warrantee.
- Color temperature shall be between 4000K-5000K.

Contractor to install as follows:
- Turn off electric power at breaker.
- Remove fixture from building, disconnect and temporarily cap off electric wires.
- Reconnect electric supply to new fixture; mount in same location as old fixture.
- Test for proper operation, including photocell sensor.

i. Wall Packs larger than 100w

Contractor to retrofit large HID wall packs, greater than 100w by re-wiring the fixture and using a “corncob” bulb with the following requirements:
- Maximum 50w LED bulb with minimum 5000 lumen output to replace 175w to 200w HID wall packs.
- Maximum 60w LED wall pack with minimum 8000 lumen output to replace 250w to 400w HID wall packs.
- LED wall packs to have a minimum rated life of 50,000 hours and a 5 year warrantee.
- Color temperature shall be between 4000K-5000K.

Contractor to install as follows:
- Turn off electric power at breaker.
- Open fixture, disconnect and temporarily cap off electric wires.
- Bypass existing ballast per lamp manufacturer’s recommendations, abandon ballast in place if possible, otherwise dispose of properly.
- Replace socket as necessary.
- Connect electric supply to new socket.
- Clean fixture and lens.
- Close fixture, turn electric service on, test for proper operation.

c. LIGHTING CONTROLS

Occupancy Sensors

Contractor shall install new occupancy sensors with the following requirements:
- Sensor shall be utilize passive infra-red, ultrasonic or dual technology and shall mounted in existing switch location or ceiling.
- Sensor shall have a programmable “lights off” delay.
- Sensor shall control all lights in the room.

Sensors will be installed in the following spaces:
Community Center – Kitchen (ceiling mounted), Laundry room (ceiling mounted)
Duplex (Bunkhouse) - Kitchen (ceiling mounted)

3. ENVELOPE UPGRADES

a. *AIR SEALING*

Contractor shall perform air sealing on the Community Center.

A blower door test shall be conducted on the building before starting any work and the results recorded.

Contractor shall perform air sealing on the buildings listed above as follows:
- Seal all floor, wall and ceiling penetrations.
- Assure that bathroom, laundry, kitchen and all other exhaust fan and dryer outlets have a damper that closes when no air is being exhausted.
- Caulk around all doors and windows.
- Repair any windows, door seals and sweeps.

A second blower door test shall be performed after the air sealing is complete; a minimum 50% reduction is acceptable.

b. *DOOR REPLACEMENT*

Contractor shall replace the following doors in the Community Center:
- West wall, main entry, 3’0’ x 6’7”, metal exit.
- Furnace room, 3’0’ x 6’7”, metal exit.
- Auditorium, broken and boarded up, 3’0’ x 6’7”, metal ½ lite.

New doors shall be pre-hung, metal exit, (1 with security window), with a maximum U=0.16, new weather stripping, sill and sweep, with panic bar
- Demolish and properly dispose old door.
- Remove any remaining sheathing, shimming, etc.
- Install new door, assure it is square and plumb.
- Re-install facia, trim, exterior siding and repaint to match existing.
- Repair any damaged interior walls and finish and paint to match existing.
- Final caulk and seal.

c. *INSULATION AND OTHER ENVELOPE RETROFITS*

i. **Auditorium window openings** - 4 windows have been removed at some time in the past, batt insulation has been installed and covered on the exterior with plywood and on the interior with plastic. The insulation has slipped down and no longer covers the opening.

Contractor shall repair 4 windows as follows:
- Frame up the window openings with dimensional lumber matching existing wall and on-center distance.
- Onstall fiberglass batt (R-21 if the walls are 2” x 6”, R-25 if the walls are 2” x 8”) between studs.
- Cover exterior with sheathing and siding to match existing.
- Repair and paint interior finishes to match existing .

ii. **Roof Insulation** - the existing auditorium roof has numerous areas of missing or damaged insulation. Owner will determine which alternate to implement, contractor shall implement.

1. Alternate 1 - New roof
   Contractor shall demo existing roof, or evaluate feasibility of application of new roof surface over old roof surface. New roof shall be installed with a minimum insulation value of R-60 and a minimum warranty of 20 years.

2. Alternate 2 – added insulation
   If it is feasible to add insulation to the existing roof, a minimum of R-11 shall be added.

d. WINDOW REPLACEMENT

The following windows shall be replaced in the Community Building:

East wall, near main entry, quantity 1, 2'11" x 2'9", fixed
South wall – quantity 2, 6'10' x 4'10", fixed/casement

Contractor shall replace existing windows with double glazed, vinyl frame units with a maximum U=0.28, with the same operating type as existing.

- Demo existing windows and properly dispose.
- Remove any remaining sheathing, shimming, etc.
- Install new windows, assure square, plumb and freely operates.
- Re-install facia, trim, exterior siding and repaint to match existing.
- Repair any damaged interior walls and finish and paint to match existing.
- Final caulk and seal.