

Akiachak

Energy Action Plan

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Akiachak Energy Efficiency Project

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LIST OF ACRONYMS

AK	Alaska
AVCP	Association of Village Council Presidents
BTU	British Thermal Unit
CCHRC	Cold Climate Housing Research Center
CFL	Compact Fluorescent Light
CO	Carbon Monoxide
ECM	Energy Conservation Measure
EEM	Energy Efficiency Measure
EOL	End Of Life
Ft	Foot
HPS	High Pressure Sodium
HVAC	Heating, Ventilation, and Air-Conditioning
IRA	Indian Reorganization Act
ISER	Institute of Social and Economic Research
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
PCE	Power Cost Equalization
TANF	Temporary Assistance for Needy Families
TBA	To Be Announced
UAA	University of Alaska Anchorage
W	Watt



ABSTRACT

In 2017, the Akiachak Native Community received a grant for the Akiachak Energy Efficiency Project from the United States Department of Energy Office of Indian Energy. 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 Akiachak and the project procedure. Chapters follow on each component of the project. The project team began by recording information about the nine project buildings as well as the I.R.A. Council's goal 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 Akiachak 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 Akiachak for many years to come.



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INTRODUCTION

The Akiachak Native Community received a grant from the United States Department of Energy Office of Indian Energy in 2017 to promote energy efficiency in their tribal buildings. This Energy Action Plan is the product of the resulting project, and 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 Akiachak Native Community.

Community information

Akiachak is a remote and traditional Yup'ik Alaska Native Village. It is located on the shores of the Kuskokwim River, and rests roughly 60 miles from the Bering Sea, which strongly influences the climate, often making the weather windy and unpredictable. The Kuskokwim River similarly influences daily life, providing fish for a subsistence lifestyle for residents. In the summer, the river provides Chinook salmon and in the winter, people set nets underneath the ice. Also, the people of Akiachak travel on the river to the sea to hunt seal and walrus.

Akiachak was the first community in Alaska to dissolve the city for a Tribal Government. The I.R.A. Council has five members and leads the governance of the community. The Yupiit School District Headquarters are located in Akiachak and major employers are the school district and tribal government. There is also a church and two small stores in the village. Due to the remote location, costs are very high in Akiachak. There are no roads leading to Akiachak, so goods reach the community via small plane year round, or come on a barge in the summer. The cost of a gallon of fuel oil is \$5.08 and the electricity price is \$0.60 per kilowatt-hour for residents exceeding the limits set out by Alaska's power cost equalization (PCE) program (ISER / UAA 2018).



The Kuskokwim River provides fish for the residents of Akiachak year-round.

The Tribe is very motivated to protect their land and natural resources through conservation and promotes sustainability throughout the community. They abide by an Energy Efficiency and Conservation Strategy that consists of four goals:

1. Create and maintain functionally appropriate, sustainable, accessible, high quality tribal infrastructure and facilities.
2. Protect and optimize the Tribe's natural resources and built environment, leading by example through sustainable practices and behaviors.
3. Decrease overall community consumption of non-renewable and non-recycled materials.
4. Promote, implement, and integrate sustainable practices throughout the community in our homes, businesses, and everyday lives.

Prior to this project, Akiachak participated in Alaska's Village Energy Efficiency Program and obtained audits on 11 buildings in 2010. Since then, they have implemented \$150,000 of energy upgrades and are saving approximately \$44,000 per year in energy costs. However, the tribal government still faces issues due to high energy costs, including the need to leave buildings unoccupied, and comfort issues for staff.

The housing infrastructure in the community is limited, but the I.R.A. Council is working diligently to try to improve this. Currently, about half of the homes lack access to piped water and sewer, although a project is in progress to connect the remaining homes. Additionally, more than half of the homes are estimated to be overcrowded



or severely overcrowded (United States Census Bureau 2016). The community is pursuing options to increase available housing.

There are 627 people in Akiachak, 95% of whom are Alaska Native (United States Census Bureau 2010). Most people speak the Yup'ik language and teach it to their children. The community is invested in the future of their land, subsistence lifestyle, and traditional arts and crafts.

Project objective

The objective of the Akiachak 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 Akiachak community by providing warm, comfortable spaces for community needs and 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 Akiachak Energy Efficiency Project followed a comprehensive procedure so that the Akiachak I.R.A. 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 Akiachak I.R.A. Council met to decide which buildings would participate. They chose nine tribal buildings to receive energy audits as a part of the project and set goals for each building.

Project kickoff meeting: In October 2017, the Akiachak I.R.A. Council met with project staff. They discussed the overall goal of the project, the procedure, and reviewed the list of buildings participating in the project and their goals for each. The Council members provided information on the specific purpose of each building as well as broader knowledge on past retrofit projects in Akiachak and the Council's overall energy goals. Finally, 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 from 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 17, 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 the tribal office staff and building occupants to benchmark the current condition and energy use of each building in the project. 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 is useful because it provides a snapshot of the building at the beginning of the project and provides a comparison of the building's energy use and condition to similarly-sized buildings. The energy auditor used baseline data to calibrate energy models of each building. Finally, the I.R.A. 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 started on page 28, 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 interviewed experts throughout Alaska to identify training and financing opportunities, regional resources, and best practices for retrofit projects.

Final project team meeting: In November 2018, the Akiachak I.R.A. Council reviewed a draft of the Energy Action Plan with project staff. They revisited project goals to ensure that the Energy Action Plan addressed them adequately and suggested revisions where appropriate. Then, the Council considered next steps for after the conclusion of the project.

Final Energy Action Plan: Project staff incorporated the suggestions of the I.R.A. Council and other reviewers to create a final Energy Action Plan from the Akiachak 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 to the community.

Document overview

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

This introductory chapter explained the project objective and procedure. Readers can find basic information on the buildings participating in the project in *Tribal buildings*, and information on their baseline condition and data monitoring in the *Data monitoring plan* and *Baseline data* sections. The energy audits are summarized starting on page 25. The *Maintenance plan* section suggests a monthly checklist that maintenance personnel can use each month to help reduce energy costs and improve building safety and comfort. Information on where to look for financing options for future retrofit projects and on how to fund and schedule training for maintenance personnel and work with building occupants on how to save energy through daily actions appears in the *Funding and training opportunities* chapter. The *Outreach* chapter explains the project activities that served to showcase the objective and results of the project to community members, Alaskans, and others. Finally, the appendices contain documents produced throughout the project, such as 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 project.



TRIBAL BUILDINGS

The Akiachak I.R.A. Council chose a total of nine tribal buildings to participate in this project. All of the buildings are single story, wood-framed buildings and are located centrally in the community. Each building, with the exception of the Youth and Elder building, is used daily during the week, and together the buildings serve approximately 90 people each day. The Youth and Elder building is used seasonally. The I.R.A. Council wants to reduce electrical and fuel use in all nine buildings in a future energy retrofit project and has additional goals to improve comfort and address maintenance issues in some of the buildings.

Bingo hall

Building goal: Reduce electrical and fuel oil use.

The recreation hall serves as a community hub for activities, and hosts bingo four nights a week year round. The staff consists of four people working each afternoon in preparation for the nightly bingo, which is usually attended by 15-20 community members. In the future, the building may also host youth activities.

The 1,440 square foot building sits on an elevated pier foundation. The building shell is in poor condition as the siding has suffered extensive weather damage, the insulation in the attic has been damaged, and most of the windows are broken. There is no domestic water plumbing. An oil-fired direct-vent Toyotomi heats the building and the lighting is mostly provided by fluorescent fixtures. Other than a refrigerator and bingo display board, there are very few electrical appliances.



The bingo hall hosts bingo four nights a week despite the building's poor condition.

Clinic

Building goal: Reduce electrical and fuel oil use.

The clinic provides an essential health resource for Akiachak. The staff of seven people provides health care for an average of 10 to 15 daily patients. The clinic's services are rendered every day throughout the year.

The 1,820 square foot building is one of the oldest buildings in the community **and was built in the early 1990s**. The building shell is in adequate condition. An oil-fired System 2000 Energy Kinetics boiler provides heat. Heating zones are controlled by zone valves and manual thermostats. There is domestic water plumbing for this building. Exterior lighting is provided by high pressure sodium (HPS) wall packs and interior lighting is mostly fluorescent fixtures. There are many electrical appliances in this building including medical equipment and a prescription refrigerator in addition to the traditional electric appliances found in an office setting.



The clinic, open every day, is an essential building in Akiachak.



Daycare

Building goal: Reduce electrical and fuel oil use and improve comfort issues caused by overheating.

The daycare is the primary childcare facility for Akiachak. The day care facility employs 2 community members and provides childcare services for an average of 3-4 children per day throughout the year.

The 1,876 square foot building is on an elevated pier foundation. The building shell is in primarily good condition, except for the north side which has experienced significant frost heaving. Attic insulation has been removed in many locations throughout the building. An oil-fired, hydronic System 2000 Energy Kinetics boiler with an integral, on-board controller provides heat. The on-board controller relays to motorized zone valves and manual thermostats. The interior lighting consists of fluorescent fixtures.



The daycare building frequently experienced overheating at the time of the building surveys.

Laundry

Building goal: Reduce electrical and fuel oil use.

The laundry building provides a place for community members in Akiachak to gather and utilize the laundry and water services. The facility is staffed by one person and receives an average of 8 – 10 customers per day. The laundry building is open Monday through Saturday from around noon until late evening.

The 1,344 square-foot building is a repurposed temporary construction housing camp and has a skid foundation. The structure is comprised of three shipping containers that were joined along their long sides in 1998. The building shell is in average condition. There are two oil-fired, forced air furnaces that provide heating for the outside containers with a supplemental electric wall convector in the central container. Heating is controlled by manual thermostats. Hot water is created by an oil-fired, on-demand Toyotomi water heater. The laundry services consist of four clothes washers that run off cold water only and four electric clothes dryers. Plug loads are low besides the laundry appliances. There is no exterior lighting and interior lighting is mostly fluorescent fixtures.



The laundry building is composed of three shipping containers from a former construction housing camp.



Old jail

Building goal: Reduce electrical and fuel oil use.

While the police station is the primary incarceration facility for Akiachak, the old jail is still used as a supplementary holding facility for offenders. The jail employs 2 community members that intermittently occupy the building when there is a cell mate present.

The 1,280 square foot building is built upon an elevated pier foundation. The L-shaped building contains the jail and a small office area. The building shell is in poor condition with heavily weathered siding and windows in disrepair. There is no plumbing in the building. Heating is provided by an oil-fired Toyotomi heater. There is no exterior lighting for the facility. The interior lighting consists of fluorescent fixtures.



The jail is in poor condition and has no plumbing or exterior lighting.

Police station

Building goal: Reduce electrical and fuel oil use and improve comfort issues due to malfunctioning boiler.

The police station is the main public safety facility in Akiachak. The station employs five officers that serve the needs of the community on a daily basis throughout the year. There is an average of 2-3 daily visitors to the police station.

The 2,520 square foot building has a crawlspace foundation. The building shell ranges from poor to average condition. There is no domestic water plumbing in this building. An oil-fired, hydronic Weil Mclain boiler provides heat. The heating is controlled by electronic zone valves, manual thermostats, and other control valves. Exterior lighting is provided by high pressure sodium (HPS) wall packs and interior lighting is mostly fluorescent fixtures.



The police station is the hub for the community's law enforcement and court personnel.

TANF office

Building goal: Reduce electrical and fuel oil use and improve comfort issues caused by poor lighting and cold drafts.

The Temporary Assistance for Needy Families (TANF) building is run by the local native non-profit organization AVCP (Association of Village Council Presidents) and provides assistance to local families in need. The facility employs two local workers and has approximately 10 community members visit daily.

The 768 square-foot building is on an elevated pier foundation. The building shell is in poor condition with a majority of the windows in disrepair. There is no domestic water plumbing in this building. Heating is provided by an oil-fired, Toyotomi Laser 56 heater with two electric resistance heaters providing



Despite comfort issues caused by poor lighting and cold drafts, the TANF building hosts around ten visitors each day.



supplemental heat during colder months. There is a screw-in fixture for exterior lighting. The interior lighting is mostly fluorescent lighting fixtures. The plug loads for this building are very low, except when the electric heaters are in use.

Tribal I.R.A. office

Building goal: Reduce electrical and fuel oil use.

The I.R.A. office is the central administrative hub for the village of Akiachak. The eleven staff members employed at the office serve the community every weekday throughout the year.

The 2,184 square-foot building sits on an elevated pier foundation. The building shell is in good condition. An oil-fired, hydronic Burnham boiler with electronically controlled zones provides heat. Heating zones are controlled electronically. There is domestic water plumbing in the building. Exterior lighting is provided by high pressure sodium (HPS) wall packs and interior lighting is mostly fluorescent fixtures. Electrical use in the building is high due to the concentration of office equipment. The I.R.A. Council is hoping to reduce the energy use of this building in a future energy retrofit project.



The Tribal I.R.A. office houses the 11 tribal staff members and is the central administrative hub for Akiachak.

Youth & Elder building

Building goal: Reduce electrical use, repair the foundation, and rehabilitate the building for increased use.

The youth and elder building provides a space for activities and large community gatherings during warmer months in the year. It is open in the evenings for occupancy.

The 2,940 square foot building is built upon an elevated pier foundation. The building shell is in average condition, although several windows are in disrepair. **The foundation has significant damage due to frost heaving and the building is potentially structurally unfit for occupancy.** There is no functioning heat or plumbing in the building. Interior lighting is comprised of linear fluorescent fixtures. There are a few appliances to keep food fresh and snacks available in use at the building.



The Youth and Elder building needs rehabilitation so it will be safe to host more activities.



DATA MONITORING PLAN

At the kickoff meeting for this project, the Akiachak I.R.A. 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 building 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 it helps those outside the project quickly review what data the team is tracking. Thus, the plan contains building-specific information as to which metrics will be collected and why. It also documents how the data on the buildings will be collected, stored, accessed, and analyzed.

Data management overview

In Akiachak, all data monitoring activities, including the collection and storage of data, will be overseen by the tribal finance director.

Data collection

There are four basic types of data for the tribal buildings in Akiachak:

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 to heat the building.
2. Monthly electrical energy use: Monitoring electric usage shows the amount of energy used to operate the building.
3. Occupant comfort levels and building condition reports: Occupant comfort and building conditions are established through regular interviews with the 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.
4. 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. The tribal finance director 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 and occupant comfort data for the period just prior to the energy audit. This data, shown in the *Baseline Data* section 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: <http://www.cchrc.org/doe-energy-efficiency-and-renewable-energy-projects>



Building data:

Data requirements for each building, shown in the table below, differ slightly for each building depending on the current and anticipated future use.

	Building	Data	Notes
1	Bingo Hall	☐ Annual fuel oil use ☐ Monthly electrical energy use ☐ Occupant comfort levels and building condition report	This building is primarily heated with fuel oil using a Toyotomi stove.
2	Clinic	☐ Annual fuel oil use ☐ Monthly electrical energy use ☐ Occupant comfort levels and building condition report	This building is primarily heated with fuel oil using an Energy Kinetics boiler.
3	Daycare	☐ Annual fuel oil use ☐ Monthly electrical energy use ☐ Occupant comfort levels and building condition report	This building is primarily heated with fuel oil using an Energy Kinetics boiler.
4	Laundry	☐ Annual fuel oil use ☐ Monthly electrical energy use ☐ Occupant comfort levels and building condition report	This building is primarily heated with fuel oil using a Lennox forced-air furnace.
5	Old jail	☐ Annual fuel oil use ☐ Monthly electrical energy use ☐ Occupant comfort levels and building condition report	This building is currently unoccupied and unheated, but is equipped to use fuel oil for heat using a Toyotomi stove.
6	Police station	☐ Annual fuel oil use ☐ Monthly electrical energy use ☐ Occupant comfort levels and building condition report	This building is primarily heated with fuel oil using a Weil McLain boiler.



7	TANF Office	☐ Annual fuel oil use ☐ Monthly electrical energy use ☐ Occupant comfort levels and building condition report	This building is primarily heated with fuel oil using a Toyotomi heater, and secondarily heated by electric resistance heaters.
8	Tribal I.R.A. Office	☐ Annual fuel oil use ☐ Monthly electrical energy use ☐ Occupant comfort levels and building condition report	This building is primarily heated with fuel oil using a Burnham boiler.
9	Youth and Elder Building	☐ Annual fuel oil use ☐ Monthly electrical energy use ☐ Occupant comfort levels and building condition report	This building is currently experiencing low occupancy due to the lack of a heating system. The building is also experiencing structural issues with the foundation, making it arguably unsafe for occupation.

Accessibility

The tribal finance director updates and is able to access the fuel and electrical energy data for each building via hardcopies kept in the tribal office.

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> . It is also documented in the *Baseline data* section of this report.

Analysis

The tribal finance director is 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 tribal finance director to consolidate energy use, building condition, and occupant comfort data for each building.



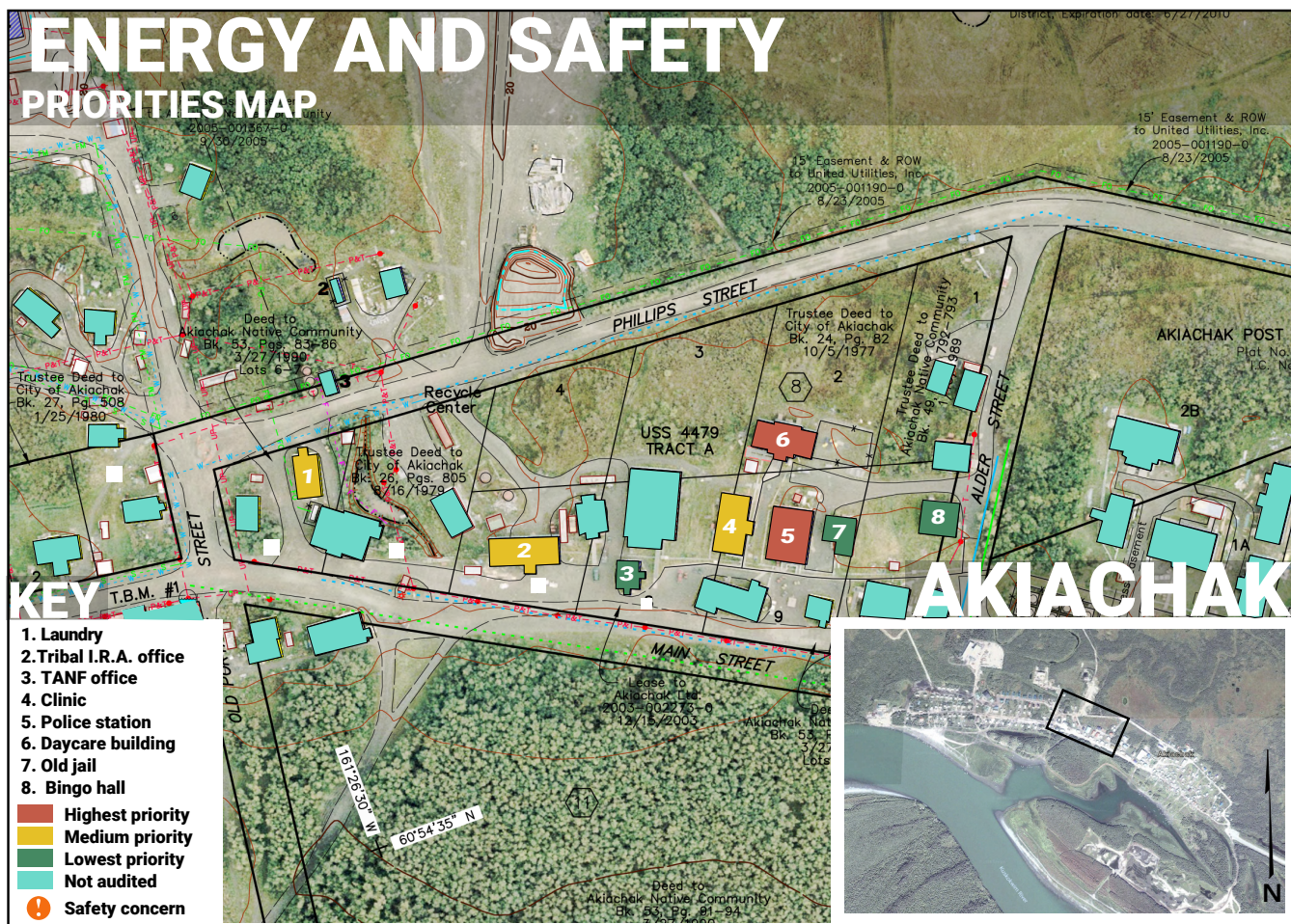
BASELINE DATA

In 2017, project staff worked with the tribal office 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, 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 the nine buildings that participated in this energy audit project. Two of them are at a high priority for a retrofit, because of high energy costs. The police station and the daycare building have the largest energy consumption of all the tribal buildings, and thus have good potential to realize energy savings from a building retrofit. The building conditions chart following the maps provide more details on the buildings, highlighting any safety, maintenance, and occupant comfort concerns in the buildings. **One building, the Youth & Elder building, has several potential safety issues that should be a priority of any future retrofit project.**



Akiachak is located on the banks of the Kuskokwim River in Southwest Alaska.



KEY

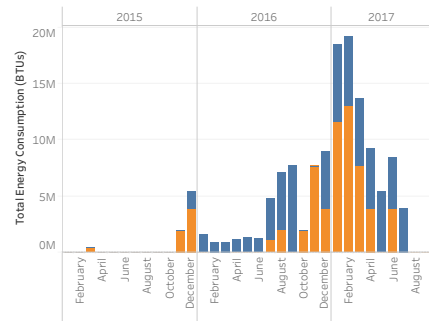
- Fuel Consumption
- Electrical Consumption
- 1K** One Thousand BTUs
- 1M** One Million BTUs

NOTES

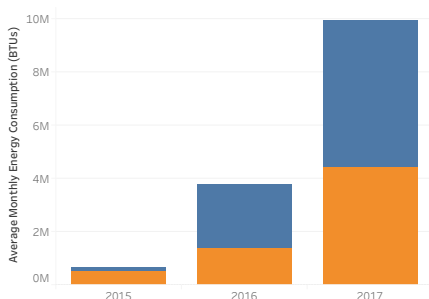
Because fuel is purchased when holding tanks are low or empty, fuel records reflect sporadic fuel consumption. Several buildings had periods when they were not occupied, thus reducing demand for fuel. Additionally, consistent fuel records were not available for all buildings, as evidenced by the lack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

LAUNDRY

Laundry Total Energy Consumption



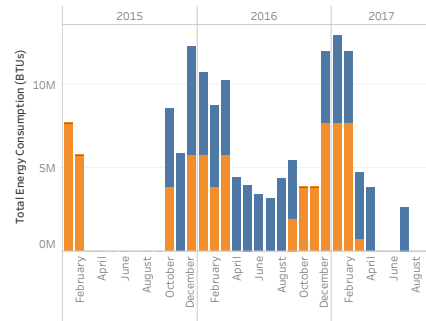
Laundry Monthly Energy Consumption Average per Year



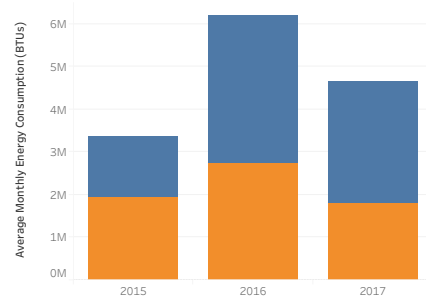
1

TRIBAL I.R.A. OFFICE

Tribal Office Total Energy Consumption



Tribal Office Monthly Energy Consumption Average per Year

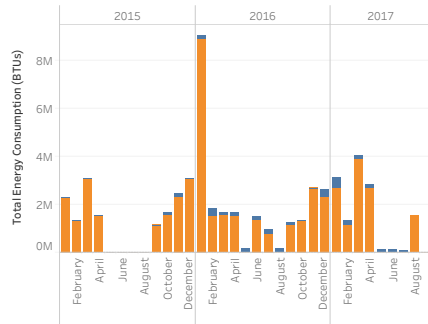


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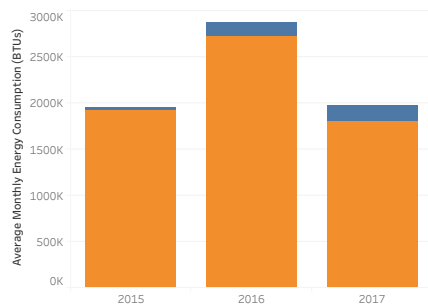


TANF OFFICE

TANF Building Total Energy Consumption

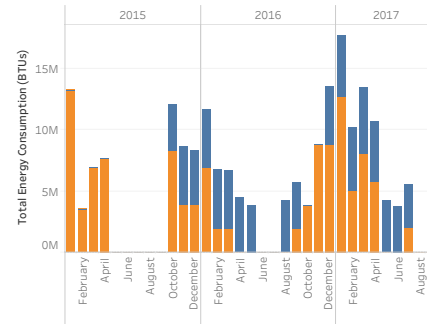


TANF Building Monthly Energy Consumption Average per Year

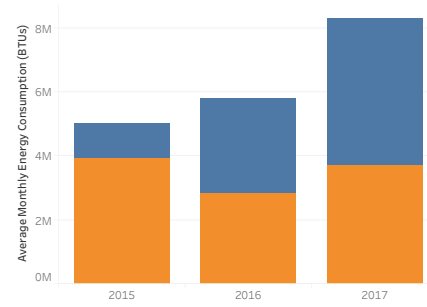


CLINIC

Clinic Total Energy Consumption

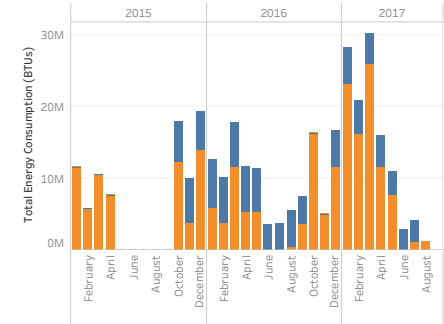


Clinic Monthly Energy Consumption Average per Year

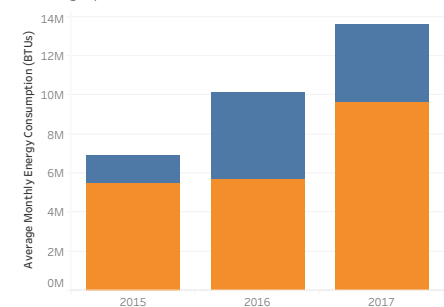


POLICE STATION

Police Station Total Energy Consumption

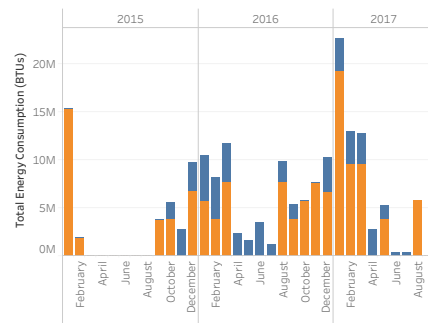


Police Station Monthly Energy Consumption Average per Year

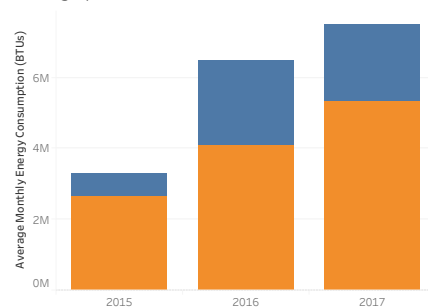


DAYCARE BUILDING

Day Care Building Total Energy Consumption

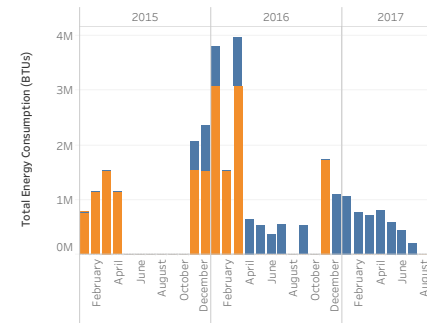


Day Care Building Monthly Energy Consumption Average per Year

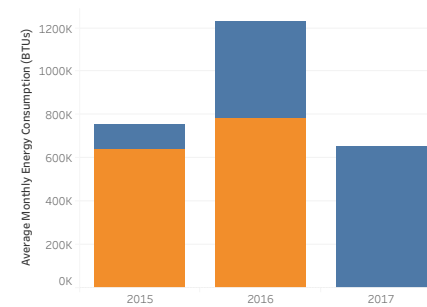


OLD JAIL

Old Jail Total Energy Consumption

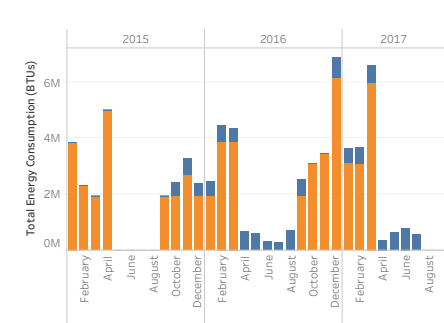


Old Jail Monthly Energy Consumption Average per Year

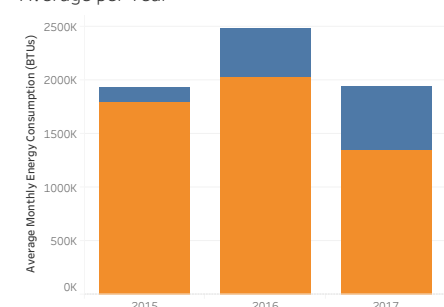


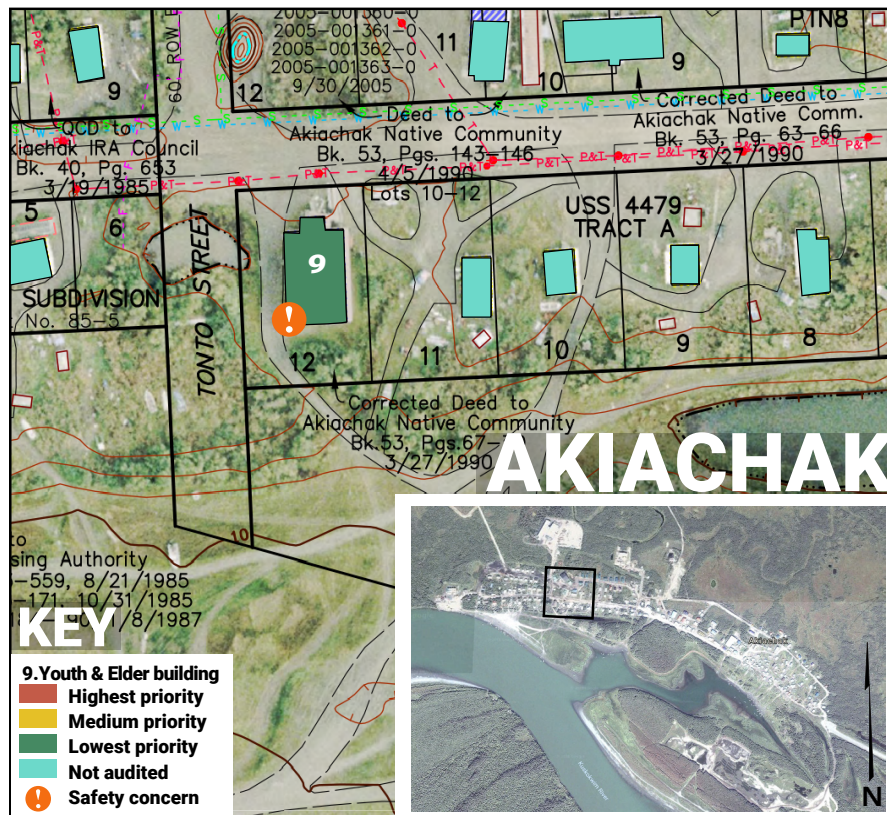
BINGO HALL

Bingo Total Energy Consumption



Bingo Monthly Energy Consumption Average per Year

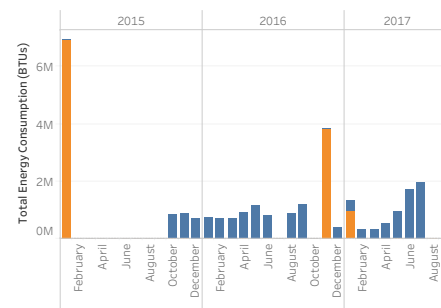




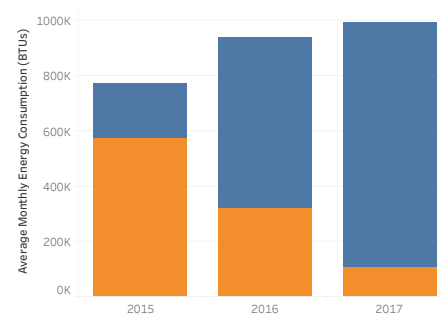
YOUTH AND ELDER BUILDING

9

Youth and Elder Building Total Energy Consumption



Youth and Elder Building 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
Bingo hall	Reported draftiness from windows (all are cracked, some are missing a pane of glass). There is no plumbing in the building. The shell is generally in poor condition and the entry door has large gaps allowing cold air and heat loss.
Clinic	Some occupants reported sometimes being too warm. Others reported being satisfied with warmth. The heating system controls are currently not functioning properly, resulting in excessive energy use.
Daycare building	The north side of the building has experienced significant frost-heaving and is in need of structural, siding, and other repairs. The heating controls are not functioning properly leading to building occupants complaining of sometimes being too warm. Room temperatures measured from 75°F to 80°F.
Laundry	Several portions of the building were unheated and essentially unused. The 2 perimeter areas are heated but the ductwork and registers are in such poor condition that there is little or no heat and no control. Occupants reported comfort only in the main area of the building, which has no direct heat. Occupants control heat to the core area by closing off portions of the perimeter with broken windows and by leaving the doors open to the dryer rooms. All windows are either broken or boarded up.
Old jail	The shell of this building is in very poor condition and all windows are broken or boarded up. Building plumbing is non-functional; a honey-bucket was in use. The heat was not on during audit.
Police station	Malfunctioning boiler causes overheating, leading people to open doors and windows to cool off. Bathrooms are non-functioning. Only 2 rooms are in use and one is a core room with no heat.
TANF office	Occupant complaints of poor lighting, the building is drafty and cold, and windows are cracked and in some cases covered with plastic. There is no plumbing in the building. The occupants are currently using electric plug-in heaters to supplement the Toyotomi stove.
Tribal I.R.A. office	Warm building with functioning bathrooms. People from the community regularly spent time in the lobby to warm up. Staff reported that one thermostat was non-functional and there was no control over the heat; it was determined that both heating control valves were manually forced open and the boiler controller was not functioning properly.
Youth & Elder building	This building is leaning precariously on frost-heaved pilings, and may be unsafe for occupancy. It currently has no functioning heating system as the furnace is broken and the bathrooms are also non-functional. Many windows are also broken or missing.



ENERGY AUDIT SUMMARIES

Nine 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 section, each energy audit is summarized; 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 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 envelope upgrades, including replacing broken windows and treating and painting T1-11 siding to extend its lifetime. Further, several buildings would have lower energy use if they had more attic insulation and if a technician could replace or repair zone valves in the space heating distribution systems.

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.

Bingo hall

The bingo hall is a 1,440 square foot building. It was constructed in the 1980s and is currently occupied four days a week by a staff of four and 10-20 visitors. In 2018, the predicted annual energy costs were approximately \$4,000. This is mostly due to the fuel oil used for space heating, with electricity accounting for the remainder.

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

1. Programming the existing setback feature on the Toyotomi stoves will immediately reduce heating energy use for no upfront cost. Building occupants will need to re-program the Toyotomi stoves after power outages as well, to maintain the energy savings from the setback temperatures. This action has an immediate simple payback, and can save over \$500 per year.



Top recommendations for the bingo hall include programming the setback feature on the Toyotomi stove, and adding more insulation in the attic.



2. Remove the stored items in the attic and add more insulation. The attic should not be used for storage as items compress the insulation and reduce its ability to slow heat transfer. This action will result in approximately \$250 in annual savings.
3. Replace the broken windows to improve safety and comfort. It will result in \$70 in annual energy savings.
4. Treat and paint the T1-11 siding on the building exterior to preserve it and extend its lifetime.

Other recommendations include replacing the lighting fixtures with more efficient LEDs, and air sealing the building envelope. The lighting retrofit is not cost effective from a strict financial perspective, but will save on maintenance and inventory costs. Air sealing, at a cost of \$605, would pay back in a little over 3 years.

If the Tribe is able to implement all recommendations, the annual energy use would decrease by 37.4 MMBTU, resulting in an energy and maintenance savings of **\$1,765**. At an approximate installation cost of \$14,803, the simple payback of a retrofit project would be **8.4 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 bingo hall, the Tribe should be sure to maintain the air sealing on the envelope, use electronic timers for large electronic equipment, and replace appliances with Energy Star versions at their end of life.

Clinic

The clinic is a 1,840 square foot building. It was constructed in the early 1990s and is typically occupied by a staff of seven and between 10-15 patients seen weekdays from 9 am to 5 pm. In 2018, the predicted annual energy costs were upwards of \$10,000, which is split fairly evenly between the cost of fuel oil used for space heating and electricity.

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

1. Address zone valves that are manually forced open and develop a temperature setback program for thermostats. Resolving the zone valve issue alone would save up to \$1000 annually. Installing 14 setback thermostats will save roughly \$1000 per year with a payback of less than a year in most cases.
2. Evaluate whether the toilet in the restroom is plumbed with hot water, if so re-plumb with cold water.
3. Treat and paint the T1-11 siding on the building exterior to preserve it and extend its lifetime.
4. The server load was estimated to account for 29% of the entire building electrical load. Investigate whether the system is using 2000 watts, if it is consider finding newer computer technology that requires less power consumption.



The top recommendation for the clinic, to repair and maintain zone valves in the heat distribution system, would save over \$1,000 per year.



Other recommendations include replacing lighting fixtures with more efficient LEDs with a 0.2 to 6 year payback, replacing bath fans, and adding R-12 blown cellulose insulation to the attic.

If the Tribe is able to implement all recommendations, the annual energy use would decrease by 53.8 MBTU, resulting in an energy and maintenance savings of **\$3,353**. At an approximate installation cost of \$12,345, the simple payback of a retrofit project would be **3.7 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 clinic, the Tribe should be sure to maintain the air sealing on the envelope, use electronic timers for large electronic equipment, and replace appliances with Energy Star versions at their end of life.

Daycare building

The daycare is a 1,953 square foot building. It was built in 2002 and is typically occupied by 2-3 staff members and 3 to 8 children per day, weekdays from 9 am to 3 pm. In 2018, the predicted annual energy costs were upwards of \$11,000 for fuel oil and electricity.

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

1. Replace damaged and missing siding on north side of the building.
2. Repair the broken window.
3. Replace disturbed insulation in the attic to reduce heat loss.
4. Investigate the zone valves, controller, and existing thermostats to determine the cause of overheating and take appropriate action, including developing an unoccupied setback temperature plan.

Other recommendations include installing setback thermostats, air sealing to reduce leakage by 50%, replacing bath fans with ones that include occupancy and humidity sensors, and replacing lighting fixtures with more efficient LEDs.

If the Tribe is able to implement all recommendations, the annual energy use would decrease by 40 MMBTU, resulting in an energy and maintenance savings of **\$2,735**. At an approximate installation cost of \$14,169, the simple payback of a retrofit project would be **5.2 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, 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 their useful life with Energy Star versions, and keep heating coils in air handlers, unit heaters, and fan coil units clean.

Laundry

The washeteria is a 1,344 square foot assembly of modular ATCO buildings. It is staffed by one employee and sees 10 to 20 laundry customers daily from 12:30 pm to 10 pm Monday through Saturday with occasional Sunday openings, and those seeking shower facilities 3 to 4 times per week. In 2018, the predicted annual energy costs were upwards of \$18,500. Electricity accounts for roughly two thirds of this total, with fuel oil for space heating making up the remainder.

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

1. Service the Toyotomi hot water heater and operative furnace and perform a combustion analysis to



assure optimum performance.

2. Move the thermostat in the southwest storage area to the kitchen where it would be sensing temperatures in rooms that are in use.
3. Move the thermostat in the east dryer room to an occupied office.

Other recommendations include installing a number of setback thermostats, replacing lighting fixtures with more efficient LEDs, and replacing the two furnaces with newer models with minimum 80% thermal efficiency. A financially non-cost effective item on the list was to replace the four clothes dryers with hydronic models and adding a second Toyotomi boiler – while the cost savings per year are indicated to be \$2,733, the installed cost is \$23,000 with a payback of 8.4 years.



If all audit recommendations are implemented, the laundry could reduce its annual energy costs of \$18,000 by approximately \$5,000.

If the Tribe is able to implement all recommendations, with the exception of the non-cost effective dryer replacement and Toyotomi addition, the annual energy use would decrease by 77.6 MMBTU, resulting in an energy and maintenance savings of **\$4,882**. At an approximate installation cost of \$22,770, the simple payback of a retrofit project would be **6.2 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, 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 their useful life with Energy Star versions, and keep heating coils in air handlers, unit heaters, and fan coil units clean.

Old jail

The old jail is a 1,024 square foot building constructed in or around 1978. The analysis assumed that the building was occupied once per week for 24 hours, year round, by one prisoner and two staff members when in use. In 2018, the predicted annual energy costs were over \$6,700. This is mostly due to the fuel oil for space heating, with electricity making up the remainder.

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

1. Program the Toyotomi stove's clock and setback feature and set temperatures back when building is unoccupied.
2. Treat and paint the T1-11 siding on the building exterior to preserve it and extend its lifetime.
3. Replace broken window panes.
4. Add weather stripping to the entry door.
5. An unknown electric load of 1,258 kWh/yr was discovered during the analysis – this is more than 50% of the building's entire annual consumption. This unknown load should be investigated further and eliminated.

Other recommendations include air sealing to reduce air leakage by 50%, adding R-42 blown cellulose insulation



in the attic, upgrading existing lighting to LED, and replacing the existing south window with a U-0.22 vinyl window.

If the Tribe is able to implement all recommendations, the annual energy use would decrease by 59.4 MBTU, resulting in an energy and maintenance savings of **\$3,255**. At an approximate installation cost of \$11,222, the simple payback of a retrofit project would be **3.4 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 old jail, the Tribe should be sure to maintain the air sealing on the envelope, use electronic timers for large electronic equipment, at the end of useful life (EOL) replace appliances with Energy Star versions, and keep heating coils in air handlers, unit heaters, and fan coil units clean.

Police station

The police station is a 2,651 square foot building constructed in 1996. Operating hours and occupancy of the building were difficult to determine as there were no staff members on hand during the analysis. In 2018, the predicted annual energy costs were nearly \$22,000. The costs are split between the cost of fuel oil \$13,890 used for space heating, and electricity \$8,036.

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

1. Investigate issues with thermostats, zone valves, and boiler controller causing the south end of the building to be 7 degrees warmer than the rear portion of the building.
2. Treat and paint the T1-11 siding on the building exterior to preserve it and extend its lifetime.
3. An unknown electric load of 1,433 kWh/yr was discovered during the analysis – this is more than 11% of the building's entire annual consumption. This unknown load should be investigated further and eliminated.



Like many tribal buildings in Akiachak, the police station has issues with malfunctioning thermostats and zone valves in its heating system.

Other recommendations include installing setback thermostats with unoccupied setbacks of 62 degrees Fahrenheit building wide, upgrading lighting to LEDs, and replacing bath fans with ones that include occupancy and humidity sensors.

If the Tribe is able to implement all recommendations, the annual energy use would decrease by 124.2 MMBTU, resulting in an energy and maintenance savings of **\$8,089**. At an approximate installation cost of \$13,556, the simple payback of a retrofit project would be **1.7 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, 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 their useful life with Energy Star versions, and keep heating coils in air handlers, unit heaters, and fan coil units clean.



TANF office

The TANF office is a 692 square foot building constructed in 1970. The building is occupied by two staff members along with an estimated 10 daily visitors Monday through Friday from 9 am to 5 pm. In 2018, the predicted annual energy costs were nearly \$4,083. This cost is mostly due to the cost of fuel oil for space heating; the remainder is for electricity.

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

1. Install a second Toyotomi heater to eliminate the need for costly electrical heaters compensating for inadequate temperatures.
2. Program the Toyotomi's clock and setback feature and set temperatures back when building is unoccupied.
3. Treat and paint the T1-11 siding on the building exterior to preserve it and extend its lifetime.
4. Remove items stored in the attic and replace or add to the compressed insulation. In its current state, the compressed insulation is only providing half of its insulative value.



The TANF office could reduce energy costs by replacing supplementary electric heaters with another Toyotomi stove.

Other recommendations include air sealing to reduce leakage by 60%, replace existing windows with energy efficient vinyl windows, and replace existing lights with LEDs.

If the Tribe is able to implement all recommendations, the annual energy use would decrease by 30.7 MMBTU, resulting in an energy and maintenance savings of **\$7,902**. At an approximate installation cost of \$13,556, the simple payback of a retrofit project would be **6.1 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, 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 their useful life with Energy Star versions, and keep heating coils in air handlers, unit heaters, and fan coil units clean.

Tribal I.R.A. building

The Tribal I.R.A. building is a 2,232 square foot building constructed in 2007. The building is occupied by eleven staff members and averages 8-10 visitors per day from 8 am to 5 pm Monday through Friday. In 2018, the predicted annual energy costs exceeded \$13,500. Almost two thirds of this cost is for electricity, with the remainder going toward the purchase of fuel oil for space heating.

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

1. Purchase and install 6-8 plug management devices – power strips with occupancy sensors that will turn items off when the occupant is out.



2. Investigate why the HVAC control system is not functioning properly and repair.
3. Evaluate whether the toilet in the restroom is plumbed with hot water, if so re-plumb with cold water.
4. Replace or add additional insulation to the attic where disturbances in the insulation have created a reduced insulative value.

Other recommendations include replacing existing lighting with LED, installing setback thermostats in each room, add an occupancy sensor in bathroom, troubleshoot Taco zone valve that is manually forced open and not operating correctly, and replace damaged fin tube baseboard radiators.

If the Tribe is able to implement all recommendations, the annual energy use would decrease by 51.2 MMBTU relative to modeled costs for full occupancy, resulting in an energy and maintenance savings of **\$6,189**. At an approximate installation cost of \$12,369, the simple payback of a retrofit project would be **2 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, 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 their useful life with Energy Star versions, and keep heating coils in air handlers, unit heaters, and fan coil units clean.



Energy retrofits for the Tribal I.R.A. building have a short payback, of approximately 2 years, if each recommendation is implemented.

Youth & Elder building

The youth and elder building is 2,752 square feet and was constructed in 1997. The building, due to lack of heat, is used only during the warmer months. Should heating be installed, the predicted annual energy costs would be slightly more than \$9,000. This is mostly due to the purchase of fuel oil for space heating, with the remainder going toward electricity.

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

1. **The foundation is in serious need of immediate repair and may be considered unsafe.** It is recommended that before any energy efficiency upgrades be considered, the foundation issues be addressed (and windows be repaired or replaced).
2. Treat and paint the T1-11 siding on the



The top recommendation for the youth and elder building is to repair the failing foundation; this should be addressed prior to energy efficiency upgrades.



building exterior to preserve it and extend its lifetime.

Other recommendations include installing setback thermostats in each room, turning off the refrigerator and refrigerant (cooling) system when not in use, replace existing lighting with LEDs, perform air sealing to reduce leakage by 50%, and replacing broken windows.

If the Tribe is able to implement all recommendations, the annual energy use would decrease by 82.4 MBTU, resulting in an energy and maintenance savings of **\$4,027**. At an approximate installation cost of \$34,458, the simple payback of a retrofit project would be **8.6 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, 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 their useful life with Energy Star versions, and keep heating coils in air handlers, unit heaters, and fan coil units clean.



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 section, 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 fix a problem. If changes to the building occur, it is a good idea to ask the contractor if any maintenance tasks should be added or removed from the maintenance checklist.

A three-ring binder makes an ideal maintenance notebook. Sections can 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 you notice excessively high bills, ask building occupants if the building use has changed, and do a thorough walk-through of the building to investigate.

Monthly maintenance checklist

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

Bingo hall

- Heating: Check that the internal programmable thermostat of the Toyotomi stove is configured. If it is not, it will need to be reprogrammed to run at lower temperatures when there is no one in the building.
- Lighting: Ensure all lighting fixtures are operating and document any failed fixtures. Ensure replacements are LED.
- Appliances: Check to ensure that the refrigerator and the bingo display board are operating properly.
- Envelope/Structure: Walk around the exterior of the building and document



The programmable thermostat feature on the Toyotomi stove helps reduce energy costs when in use.



any damage, such as cracked windows or a shifted foundation.

- 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.

Clinic

- Heating: Ensure that the boiler is providing heat to the building during winter. Check the on-board thermostat for temperature. Document and follow up any issues with the boiler controls as noticed.
- Lighting: Ensure all lighting fixtures are operating and document any failed fixtures. Ensure replacements are LED.
- Appliances: Check that all non-medical equipment is operating properly.
- Envelope/Structure: Walk around the exterior of the building and document any damage, such as cracked windows, missing weather-stripping, and wall and ceiling penetrations. Repair as needed.
- 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.



Check the refrigerator each month to ensure it is operating properly.



Replace any burned out bulbs with LED bulbs to save energy.

Daycare building

- Heating: Check that the boiler is not operating in summer months. When it is operating, check to make sure that manually controlled thermostats have reasonable temperature settings. Check that the zone valves are not in 'manual' position to allow the thermostat to control them.
- 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, such as cracked windows, shifting foundation, missing weather-stripping, and gaps in doors and windows. Repair as needed.
- Health and safety: Check the smoke alarm and CO detector



It is important to periodically check the thermostat so the building is not heated more than necessary.



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.

Laundry

- Heating: Check that the furnace and wall heater are not running during summer months.
- Lighting: Ensure all lighting fixtures are operating and document failed fixtures. Ensure replacements are LED.
- Appliances: Check to ensure that laundry equipment is working properly. Document any failed machines, and 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, such as cracked windows, shifting foundation, missing weather-stripping, and gaps in doors and windows. Repair as needed.
- 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.



The washers should be replaced with ENERGY STAR versions if they fail.

Old jail

- Heating: Check that the internal programmable thermostat of the Toyotomi stove is configured. If it is not, 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 failed fixtures. Ensure replacements are LED.
- Envelope/Structure: Walk around the exterior of the building and document any damage, such as cracked windows, shifting foundation, missing weather-stripping, and gaps in doors and windows. Repair as needed.
- Health and safety: Check the smoke alarm and CO detector to make sure they have power and



Cracked windows should be replaced when possible. This increases safety and comfort and decreases energy use.



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.

Police station

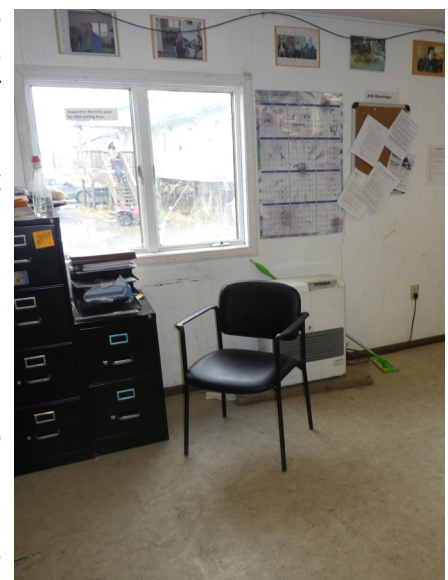
- Heating: Check that the boiler is not operating during the summer months.
- Lighting: Ensure all lighting fixtures are operating and document any failed fixtures. Ensure replacements are LED.
- Appliances: Check to ensure office equipment is not running during off hours and that staff is utilizing plug load management devices.
- Envelope/Structure: Walk around the exterior of the building and document any damage, such as cracked windows, shifting foundation, missing weather-stripping, and gaps in doors and windows. Repair as needed.
- 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.



The boiler for the police station should be turned off during the summer to reduce energy costs.

TANF office

- Heating: Check that the internal programmable thermostat of the Toyotomi stove is configured. If it is not, 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.
- Envelope/Structure: Walk around the exterior of the building and document any damage, such as cracked windows, shifting foundation, missing weather-stripping, and gaps in doors and windows. Repair as needed.
- 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.



Talk with the people who work in the TANF office every day. What concerns do they have about the building?



Tribal I.R.A. office

- Heating: Check that the boiler is not providing heat during the summer months. Ensure that the controls are in 'auto' and not 'manual' mode.
- 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, such as cracked windows, missing weather-stripping, gaps in doors and windows, and shifts in the foundation.
- 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.



The monthly maintenance check should include a walk-around of the building exterior.

Youth & Elder building

- Lighting: Ensure all lighting fixtures are operating and document any failed fixtures. Ensure replacements are LED.
- Appliances: Check to ensure that the refrigerator in the kitchen and the small chest freezer in the front room are not running when there are no plans to put anything in them for storage.
- Envelope/Structure: Walk around the exterior of the building and document any damage, such as cracked windows, shifting foundation, or damage to the siding. Keep track of the continuing shifting of 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.



Unplug the chest freezer when it is empty in order to save energy.



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 section 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* section. 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 section 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 Upgrades	☐ 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 catalyze the use of commercially 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 TELG@hq.doe.gov	Jerry Ward State Director (907) 761-7705



ADDITIONAL RESOURCES		
	AVEC	DOE - IEPP
	Vocational, Technical, Academic Scholarship	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 Akiachak are a key part of the region. Collectively, they provide benefits to the community every day, including health services, facilitation of public safety, childcare, 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 will Akiachak 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 Akiachak, tribal office staff frequently updated and worked with the 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 Tribal Council and interested tribal members. This flyer, along with other outreach materials mentioned in this section, can be found in Appendix C. Project staff also made flyers of energy conservation strategies, such as how to use setback thermostats, for the tribal building occupants.

Representatives from the Akiachak Tribal Office attended two D.O.E. Office of Indian Energy Program Reviews during the project. In 2017, Mildred Evan presented on the objectives and future plans for the project. Her presentation can be found at the link listed below. In 2018, she 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 Akiachak residents. Similarly, the video reviews the project procedure, and shows viewers the community of Akiachak.

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>



Sled dogs are an important part of many Alaska communities, including Akiachak.



CONCLUSION

The objective of the Akiachak 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 community buildings 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 Akiachak I.R.A. 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 Akiachak 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 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 I.R.A. Council to publicize the project to the community of Akiachak. The outreach component of the project included flyers, updates to the community, and a video about the project activities.

This project identified the strengths and weaknesses of the nine tribal buildings in the project and their management. Many of the buildings have energy costs over \$10,000 per year, including the daycare building, laundry, police station, and the Tribal I.R.A. office. However, the Tribe can realize nearly a \$40,000 savings in combined annual energy costs should they implement all the audit recommendations, which would pay back the cost of the retrofit project in less than 5 years. 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 steps for each building.

The tribal office staff identified a few lessons learned for Tribes that might embark on a similar project. First, tribes should know that energy planning projects are about awareness and options. This project made the Tribal Council and office staff aware of where their energy costs came from, and how they could be reduced. Also, there are many options for reducing energy costs, including retrofits, better maintenance practices, and energy conservation. Finally, any Tribe working on a federal project should stay organized and flexible. The paperwork is not always easy or straightforward, so staff should be ready to ask questions and be prepared to learn how to use new websites and forms.

As this project concludes in 2019, the Akiachak Native Community is looking toward next steps. The maintenance director has already implemented some of the audit recommendations, including building monitoring, maintenance walk-throughs, and building occupant energy education. The I.R.A. 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. (2018). Community Data Summary: Akiachak. (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: Akiachak CDP, Alaska. Retrieved January 25, 2018, from United States Census Bureau: <https://www.census.gov/>

United States Census Bureau. (2016). 2012-2016 American Community Survey. Retrieved January 30, 2018 from DP04: Selected Housing Characteristics: <http://factfinder2.census.gov>.



APPENDIX A: KICK-OFF MEETING FLYER

The Akiachak I.R.A. Council and project staff held a kick-off meeting for the project in October 2017. 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

Akiachak 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 off 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 Akiachak Native Community

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 Akiachak in the past? How did they go? What did the community like (or dislike) about the projects?
2. Which buildings would the Akiachak Native Community like us to audit? The project can audit 4-8 buildings.
Tribal office
Daycare
Clinic
Police office
Laundry
Recreation
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 2015 and 2016? 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 - Dustin Madden (907-304-2142, dustin@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: AUDIT SUMMARIES OF OTHER BUILDINGS

In addition to the tribal buildings that have received energy audits through this project, there are four other audits for potential energy savings projects in Akiachak, shown in the table below.

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

Building	Audit date
Akiachak CHP study	November 2018
Akiachak Head Start building	May 2018
Moravian church	May 2018
Yupit school buildings (3)	October 2017

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 Akiachak 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 five buildings would benefit from a lighting retrofit to replace the current bulbs with LEDs. Installing programmable thermostats and implementing an unoccupied heating temperature setback is cost-effective for all buildings except the Moravian church. If a retrofit project were to address the recommendations of all 5 buildings, the building owners could collectively save over \$13,000 in energy costs each year. Additionally, the findings from the CHP study could save the Akiachak School District \$300,000 if implemented.

Tuluksak School CHP feasibility study

Current annual operating cost: \$473,200

Predicted annual operating cost if proposed CHP is implemented: \$171,600

Project description

The Tuluksak School currently generates power with two 175kW generators and purchases electricity from the Tuluksak utility provider. Both of the generators are nearing their end of life and the maintenance costs have been skyrocketing. The objective of this study was to investigate the potential cost savings for replacing the old generators with oil fired Co-generation with Heat and Power (CHP) units. The Capstone 200kW (C200) and Capstone 65kW (C65) CHP's were compared in the study. It was determined that replacing the existing 175kW generators with two Capstone 65kW CHPs is the most promising option, saving the school district an estimated \$301,537.

CHP comparisons

Generator logs between the years of 2014 and 2017 were provided by Mr. Hartz and served as the baseline for this study. The C65 CHP would meet the school's electrical load for every month except November and February



and the C200 CHP would meet every month's electrical load requirement. More accurate baseline data would be needed to determine if peak demand loads would be met.

Neither CHP was able to meet the school's full heating load during the winter months. For this reason, it is recommended that the existing boilers be maintained and used to supply additional heat when necessary. The C65 CHP actually produces more heat than the C200 CHP at a given electrical load because the C65 CHP has a higher efficiency heat exchanger.

Recommendations

It is recommended that the school gather a baseline of the school's electrical consumption for 12 months with specific data recorded for kWh consumed, peak demand loads, and monthly oil consumption. An energy audit should be conducted to determine whether implementing energy efficiency measures are cost-effective and determine how this might affect the peak electrical and heating demands for the school. An engineering study should be conducted to specify hardware, piping, and controls, and contractor bids should be obtained prior to implementing this system. After the new system is in place, energy consumption should be monitored to compare with the predicted savings.

Akiachak Head Start building

Energy audit performed May 18, 2018 by Energy Audits of Alaska

2,204 square foot facility

Annual energy use per square foot: 74,000 BTUs/SF

Predicted annual energy use per square foot if recommendations are implemented: 59,100 BTUs/SF

Building description

The Akiachak Head Start building was built in 2009 and is used by the local Head Start program, Monday through Friday during the school year. It is regularly occupied by 15 individuals – one wing (HS) houses 10 children enrolled in the program, along with 2 staff members; the other (HE) is used by home-based educators and is typically occupied by 2-3 individuals. The building envelope is made up of 2x6 studs with R-21 fiberglass batt insulation plus an exterior 1 ½ inch layer of rigid foam. An oil-fired boiler supplies heat to the building by a hydronic system utilizing fin tube baseboard radiators in perimeter rooms, radiant ceiling panels in the restrooms, and a cabinet unit heater in the entryway. The Akiachak Head Start Building is primarily lit by florescent fixtures. The building uses 74,000 BTUs per square foot annually, which is more efficient than other Head Start and daycare buildings in the area.



The head start building is relatively new but could benefit from lighting upgrade and setback thermostats.



Recommendations

The energy audit includes a list of priorities that are cost-effective and have a fast payback period. The top priority is facilities management which includes powering off the boiler during the unoccupied summer months. This measure is effectively free, requiring only that an individual familiar with the heating system powers it down at the end of the school year and powers it back on when school commences. It would save approximately \$121 a year, with the reduction in cost occurring while the boiler is powered down. Additionally, installing a setback thermostat in each wing is estimated to save \$375 (HS) and \$303 (HE) in annually, resulting in paybacks of 2 and 3 years, respectively.

Switching to more efficient lighting was another easy upgrade with a high return on investment. In many locations throughout the interior and exterior of the building, switching to LED bulbs and replacing or removing ballasts can pay back in less than five years.

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 and training an organizational “energy champion”, turning off plug loads, performing HVAC maintenance, and more. Specific ECM recommendations for the Head Start Building included maintaining air sealing on the building, using an electronic timer for large equipment with sleep cycles, replacing kitchen equipment with Energy Star versions at their end of life, and keeping refrigerator coils clean.

Post-retrofit expectations

If all of the Energy Efficiency Measures recommended in the audit are completed, the annual utility costs can be reduced by \$1,759, or approximately 21%. These measures are estimated to cost \$8,481 for an overall simple payback of 4.4 years.

Table 3: If the building owner implements all the recommendations, the energy costs would decrease by nearly \$2,000 per year.

Improvement description	Predicted annual energy and maintenance savings	Estimated installation cost	Simple payback (years)
Turn off Boiler in Summer	\$121	\$1	0
Setback Thermostats	\$678	\$1,800	3
Install Potable water recirculating pump	\$135	\$400	3
Replace Exterior HPS Lighting with LED	\$222	\$600	2.7
Replace Interior Lighting with LED (remove ballasts)	\$169	\$770	4.5
Replace Perimeter Lighting with LED (remove ballasts)	\$513	\$3,690	7.2
Replace Bathroom Lighting with LED	\$29	\$269	9.2



Replace Broken Window	\$62	\$951	15.4
TOTAL, all measures	\$1,929	\$8,481	4.4

Moravian church

Energy audit performed May 10, 2018 by Energy Audits of Alaska

2,285 square foot facility

Annual energy use per square foot: 88,200 BTUs/SF

Predicted annual energy use per square foot if recommendations are implemented: 26,800 BTUs/SF

Building description

The Moravian Church was built around 1980 and is used to provide church services to 10 occupants once per week on Sundays. The building envelope is made up of 2x4 studs, it was indicated that the appearance of insulation in the stud cavity is questionable so R-11 fiberglass batt is assumed. Heating is provided by an oil-fired boiler, a wood stove, and electric baseboard. The boiler supplies heat to the building utilizing fin tube baseboard radiators along the perimeter. The wood stove and electric baseboard heaters provide supplemental heat. The Moravian Church is lit by a combination of T12 fluorescent, incandescent, and CFL A-type fixtures. The building uses 88,200 BTUs per square foot annually.



The Moravian Church, which is open on Sundays, could save energy by rerofting its lighting to LED bulbs.

Recommendations

The energy audit includes a list of priorities that are cost-effective and have a fast payback period. The item with the fastest payback period is replacing existing incandescent lights with LEDs with an installed cost of \$15 and an annual savings of \$9, the payback would be less than 2 years.

Larger undertakings with longer payback periods and greater installed costs were recommended for heating and insulation. Replacing the existing boiler with two monitor stoves would cost \$8000, save \$2220 annually, and would take 3.6 years to pay back. Adding R-30 fiberglass batt insulation in the floor cavity would cost \$10,042 and save \$1,318 per year with a 7.6 year pay back.

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 in the attic would make the building more comfortable but would not yield enough energy savings to justify the upfront cost. Replacing some of the existing T12 florescent lighting, as indicated in the report, would cost roughly \$2000 to implement while only saving \$74 annually. Additionally, replacing windows would reduce drafts but in many cases would take over 70 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 ongoing energy monitoring, designating and training an organizational “energy champion”, turning off plug loads, performing HVAC maintenance, and more. Specific ECM recommendations for the Church included air sealing the wall and ceiling penetrations in the building and installing programmable thermostats.

Post-retrofit expectations

With all of these energy efficiency measures in place, the annual utility cost can be reduced by \$4,079 per year, or 72.5% of the buildings’ total energy costs. These measures are estimated to cost \$46,886, for an overall simple payback period of 10.1 years. If only the cost-effective measures are implemented, the annual utility cost can be reduced by \$3,703 per year, or 65.8% of the buildings’ total energy costs. These measures are estimated to cost \$23,292, for an overall simple payback period of 5.5 years.

Table 4: If the building owner implements all the recommendations, the energy costs would decrease by over \$3,500 per year.

Improvement description	Predicted annual energy and maintenance savings	Estimated installation cost	Simple payback (years)
Replace Incandescent lights with LED	\$9	\$15	1.7
Replace Boiler with (2) Monitor Heaters	\$2,220	\$8,000	3.6
Insulate floor with R-30 Fiberglass Batt	\$1,318	\$10,042	7.6
Air Sealing	\$585	\$4,000	6.8
Insulate Ceiling Attic with R-38 Fiberglass Batt	\$72	\$1,235	17.3
TOTAL, all measures	\$4,203	\$23,292	5.5

Yupiiit School office

Energy audit performed October 2 & 3 2017 by Energy Audits of Alaska

Office: 2,600 square foot facility

Annual energy use per square foot: 76,100 BTUs/FT

Predicted annual energy use per square foot if recommendations are implemented: 67,400 BTUs/FT

Building description

The Yupiiit School Office Building was built in the 1980s and is used as offices for the 10 Yupiiit School district personnel. The building is occupied 7 days per week, 5 hours per day. The building envelope is made up of 2x6 studs with R-19 fiberglass batt insulation. The building is heated by a Toyotomi Hydronic Heater delivered via fin tube baseboard radiators with supplemental heat provided by an electric baseboard heater. Of all the Akiachak



buildings that received energy audits, the Yupiit School Office building is unique in that it includes a portable air conditioning unit used to cool the district's server room. The building is lit with CFL and T8 florescent lighting. The building uses 76,100 BTUs per square foot annually, which is more than similar office buildings in the region.

Recommendations

The energy audit includes a list of priorities that are cost-effective and have a fast payback period. The item with the fastest payback period is to implement an unoccupied setback heating temperature to 63°F in the mechanical room, bathroom, conference room, and kitchen. The building already includes thermostats with setback capabilities, which if programmed would save \$272 annually with a near instantaneous payback. Offices 1-6 would also benefit from a setback thermostat with unoccupied space set to 63° F. In this case the new thermostat would cost \$900 and would save \$413 annually with a 2.2 year payback.



The number one retrofit for the school office is to implement a setback temperature.

Switching to more efficient lighting was another easy upgrade with a high return on investment. In many locations throughout the interior and exterior of the building, switching to LED bulbs can pay back in as little as six months.

Energy efficiency measures that are NOT recommended

All of the measures identified in the audit were determined to be cost effective, and therefore are recommended.

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 and training an "energy champion," turning off plug loads, performing HVAC maintenance, and more. Specific ECM recommendations for the Yupiit School Office Building included implementing maintenance of air sealing measures, using an electronic timer to reduce plug loads of large office appliance, replacing kitchen equipment with Energy Star models at their useful end of life, keeping appliance coils clean, using programmable thermostats, and turning gas valves off if the appliance will be out of use for an extended period of time.

Post-retrofit expectations

With all of these energy efficiency measures in place, the annual utility cost can be reduced by \$4,779 per year, or 19.0% of the buildings' total energy costs. These measures are estimated to cost \$11,888, for an overall simple payback period of 2.4 years.



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

Improvement description	Predicted annual energy and maintenance savings	Estimated installation cost	Simple payback (years)
Unoccupied Temperature Setback to 63°F	\$272	\$1	0.0
Replace Exterior HPS Lighting with LED	\$597	\$135	0.2
Replace Outdoor CFL Lighting with LED	\$105	\$50	0.5
Install Setback Thermostat in Offices set to 63°F when Unoccupied	\$413	\$900	2.2
Retrofit Headbolt Heaters	\$356	\$600	1.7
Replace Interior Lighting with LED	\$1,815	\$4,107	2.3
Install DHW storage water tank insulated blanket and reduce use of electric heat (through possible install of Toyo stove)	\$1,371	\$5,595	
Install Potable water recirculating pump	\$125	\$500	4
TOTAL, all measures	\$5,054	\$11,888	2.4

Yupit School teacher building 4

Teacher Building 4: 2,360 square foot facility

Annual energy use per square foot: 74,100 BTUs/SF

Predicted annual energy use per square foot if recommendations are implemented: 69,000 BTUs/SF

Building description

The Teacher Building number 4 was built in the 1980s and has a regular occupancy of 4 people during the school year and is vacant for two months in the summer. It is configured as a duplex. The building envelope is made up of 2x4 studs with R-11 fiberglass batt insulation. Heat is provided by an oil-fired boiler distributed via baseboard fin tube radiators. The building is lit using florescent, CFL, and incandescent fixtures. The building uses 74,100 BTUs per square foot annually.

Recommendations

The energy audit includes a list of priorities that are cost-effective and have a fast payback period. The area with



the fastest payback period is to replace incandescent and CFL lighting with LEDs. The upgrade would cost \$125 and would save \$513 annually with a payback ranging from a few months to one year.

Another cost effective measure recommended was to install storage tank hot water heater insulation blankets on the two storage tanks. This would cost \$145 to install, save \$79 a year, and pay back in 1.8 years.

Additional recommendations include installing a setback thermostat and setting the unoccupied temperature to 63°F. A setback thermostat would cost \$600, save \$236 per year, and pay back in 2.5 years. Replacing the two exhaust fans with more advanced occupancy and humidity sensing capabilities would cost \$680, save \$151, and pay back in 4.5 years. Finally, replacing the lighting in the bedrooms and kitchen was recommended, with a payback of 1.5 to 7 years, respectively.

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, replacing the existing T8 florescent lighting in the laundry room, the CFLs in the bathroom, and the CFLs outdoors with LEDs, as indicated in the report, would cost roughly \$318 to implement while only saving \$14 annually.

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 and training an “energy champion,” turning off plug loads, performing HVAC maintenance, and more.

Post-retrofit expectations

With all of these energy efficiency measures in place, the annual utility cost can be reduced by \$1,108 per year, or 10.1% of the buildings’ total energy costs. These measures are estimated to cost \$2,484, for an overall simple payback period of 2.2 years. If only the cost-effective measures are implemented, the annual utility cost can be reduced by \$1,093 per year, or 9.9% of the buildings’ total energy costs. These measures are estimated to cost \$2,166, for an overall simple payback period of 1.9 years.

Table 6: If the building owner implements all the recommendations, the energy costs would decrease by over \$1,000 per year.

Improvement description	Predicted annual energy and maintenance savings	Estimated installation cost	Simple payback (years)
Replace Bedroom and Hall Incandescent lights with LEDs	\$396	\$90	0.2
Replace Exterior CFL lights with LEDs	\$108	\$25	0.2
Replace CFL lights in utility room with LEDs	\$9	\$10	1.1
Install (2) Hot Water Heater Blankets	\$79	\$145	1.8
Replace CFL lights in bedrooms with LEDs	\$59	\$80	1.4
Install setback thermostat in all rooms, setback to 63°F	\$236	\$600	2.5



Replace (2) Exhaust Fans	\$151	\$680	4.5
Replace fluorescent lights in kitchen with LEDs	\$76	\$536	7.1
TOTAL, all measures	\$1,113	\$2,166	1.9

Yupiit School teacher building 13

Teacher Building 13: 2,516 square foot facility

Annual energy use per square foot: 60,900 BTUs/SF

Predicted annual energy use per square foot if recommendations are implemented: 56,900 BTUs/SF

Building description

The Teacher Building number 13 was built in the 1990's and has a regular occupancy of 6 people. It is configured as a duplex. The building envelope is made up of 2x6 studs with R-19 fiberglass batt insulation. Heat is provided by an oil-fired boiler distributed via baseboard fin tube radiators. The building is lit using florescent, CFL, and incandescent fixtures. The building uses 60,900 BTUs per square foot annually.

Recommendations

The energy audit includes a list of priorities that are cost-effective and have a fast payback period. The area with the fastest payback period is to replace incandescent and CFL lighting in the bedrooms and kitchen with LEDs. The upgrade would cost \$448 and would save \$114 per year with a pay back of between 1.7 and 5.2 years.

Additional recommendations include installing a setback thermostat and setting the unoccupied temperature to 63°F. A setback thermostat would cost \$600, save \$149 per year, and pay back in 4 years. Replacing the two exhaust fans with more advanced occupancy and humidity sensing capabilities would cost \$680, save \$165 per year, and pay back in 4.1 years.

Energy efficiency measures that are NOT recommended

None of the measures identified in the audit were determined to be cost prohibitive, and therefore not recommended, by the energy model.

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 and training an "energy champion," turning off plug loads, performing HVAC maintenance, and more.



Post-retrofit expectations

With all of these energy efficiency measures in place, the annual utility cost can be reduced by \$428 per year, or 5.7% of the buildings' total energy costs. These measures are estimated to cost \$1,728, for an overall simple payback period of 3.9 years.

Table 7: If the building owner implements all the recommendations, the energy costs would decrease by nearly \$500 per year.

Improvement description	Predicted annual energy and maintenance savings	Estimated installation cost	Simple payback (years)
Replace CFL lights in the bedroom with LED	\$57	\$100	1.7
Install setback thermostat in all rooms, setback to 63°F	\$149	\$600	4
Replace (2) Exhaust Fans	\$165	\$680	4.1
Replace fluorescent lights in kitchen with LEDs	\$67	\$348	5.2
TOTAL, all measures	\$438	\$1,728	3.1



APPENDIX C: OUTREACH MATERIALS

While the main goal of the Akiachak 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 Akiachak residents could replicate them in their own homes.

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

- 1) Tribal Council update flyer
- 2) Setback thermostat instruction poster
- 3) Final project flyer



May 2018



COLD CLIMATE HOUSING RESEARCH CENTER

CCHRC

Akiachak 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 Akiachak in October 2017, 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.

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

- Dustin Madden and Mildred Evan 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, 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 October 2017. 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 9 tribal buildings that are participating in the project:

Recreation hall	Daycare building
Clinic	Youth and elder building
Tribal office	Jail
Laundry	TANF building
Police station	

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

1. A well-trained HVAC technician needs to service the boilers and control systems in the tribal buildings on an annual, ongoing basis. Currently, the control systems in the four buildings that use boilers for heat are not operating correctly, causing the buildings to be uncomfortably hot or cold and costing more than \$2,000 per year in excess fuel consumption. **We are working with the Alaska Association of Housing Authorities to organize a boiler technician training in Bethel later this year.**
2. The boiler systems should be retrofitted to utilize common parts and components so that they are easier to work on and Akiachak can create an inventory of spare parts.
3. An individual should perform general building maintenance in all buildings, addressing deferred issues such as broken windows and also start the process of energy-saving tasks, such as replacing lighting and monitoring thermostats.

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. Replacing windows
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

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Energy Audits of Alaska - Jim Fowler (907-269-4350, jim@jim-fowler.com)



TOYO SET BACK INSTRUCTIONS



IF CLOCK IS FLASHING,
TOYO NEEDS TO BE
RESET

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

Auto Mode 5

Push AUTO button to activate
Set Back mode

Start Set 2

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

Stop Set 3

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

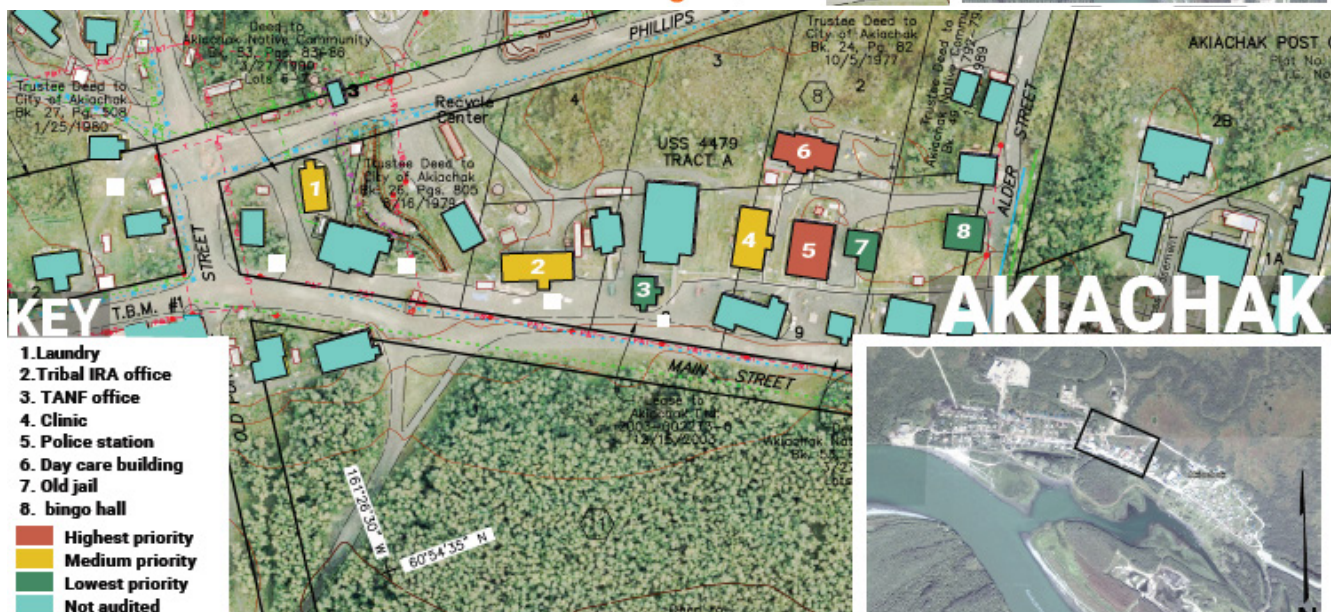
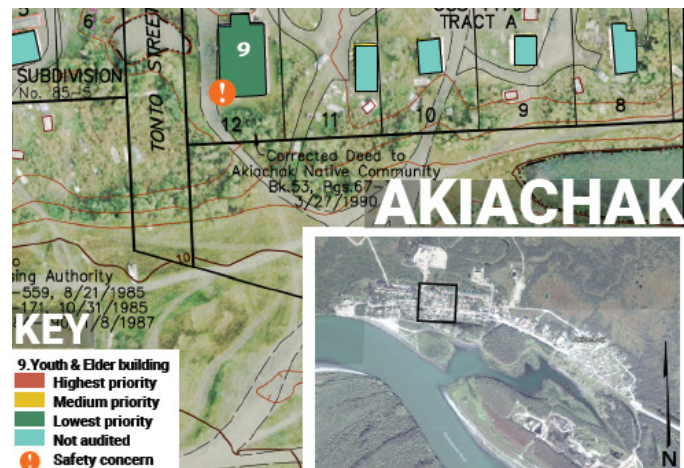


Akiachak Energy Efficiency Project

In 2017, the Akiachak 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 nine 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.

Many of the buildings in the project have energy costs of over \$10,000 per year, and following all the recommendations in the Energy Action

Plan can result in nearly \$40,000 in savings annually. 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



SCOPES OF WORK

For energy efficiency upgrades recommended for
The Akiachak Native Community

Prepared For
Akiachak Native Community
Edward George, Tribal Administrator
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May 18, 2019

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Energy Audits of Alaska 



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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.

Table - Summary of all EEMs

Building	HVAC & DHW			Lighting			Envelope			
	Other	Controls	Hot water heating	Interior	Exterior	Controls	Air Sealing	Doors	Insulation & other	Windows
Bingo Hall (aka Recreation Hall)		Program 2 Toyo Stove setback thermostats		replace 3 Incandescent or CFL A-type bulbs with LED	replace 1 CFL-A type bulb with LED		Seal all floor, wall and ceiling penetrations		Blow in R-33 attic insulation	Replace 2 existing windows with U-0.22 units
				retrofit 13 T8 fixtures & 34 lamps with LED						
Clinic	Add remote bulb thermostat and controls to turn off potable water re-circ pump when OSA > 38F	Program Toyo Stove setback thermostat	Add R-9 insulation blanket to hot water heater	retrofit 30 T8 fixtures & 65 lamps with LED	replace 2 HID wall packs with LED				Add R-12 attic insulation	
	Replace 2 bathroom exhaust fans with units with integral humidistat and occupancy sensor	Retro-commission all zone valves, control valves and thermostats, re-balance water side		replace 8 Incandescent or CFL A-type bulbs with LED						
		Add thermostat and zone valve to under-floor heating zone (waste water heat trace?)								
		Replace 1 constant speed circulation pump with VFD unit								
		Install (2) 7-day programmable thermostats								
Daycare Building		Install (7) 7-day programmable thermostats	Add R-9 insulation blanket to hot water heater	retrofit 28 T8 fixtures & 94 lamps with LED	replace 7 HID wall packs with LED		Seal all floor, wall and ceiling penetrations			Replace 3 existing windows with U-0.22 units

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ENERGY AUDITS OF ALASKA

AKIACHACK

Building	HVAC & DHW			Lighting			Envelope			
	Other	Controls	Hot water heating	Interior	Exterior	Controls	Air Sealing	Doors	Insulation & other	Windows
	Replace 1 bathroom exhaust fans with units with integral humidistat and occupancy sensor	Replace 1 constant speed circulation pump with VFD unit								
Laundry Facility	Replace 2 existing furnaces with 85% efficient units with ECM fan motors	Install (2) 7-day programmable thermostats		replace 3 Incandescent or CFL A-type bulbs with LED	replace 2 Incandescent or CFL A-type bulbs with LED					Replace 9 existing windows with U-0.22 units
	Replace 4 electric clothes dryers with hydronic models		Add second Toyotomi hot water heater piping and pumps to supply hydronic heating to new clothes dryers	retrofit 9 T8 fixtures & 22 lamps with LED						
Old Jail		Program 1 Toyo Stove setback thermostat		replace 3 Incandescent or CFL A-type bulbs with LED			Seal all floor, wall and ceiling penetrations		Blow in R-42 attic insulation	Replace 2 existing windows with U-0.22 units
				retrofit 6 T12 fixtures & 12 lamps with LED						
Police Station	Replace 1 bathroom exhaust fans with units with integral humidistat and occupancy sensor	Install (3) 7-day programmable thermostats			replace 7 HID wall packs with LED					
		Retro-commission all zone valves, control valves and thermostats, re-balance water side								
		Replace 1 constant speed circulation pump with VFD unit								
TANF Building		Program 1 Toyo Stove setback thermostat		replace 6 Incandescent or CFL A-type bulbs with LED			Seal all floor, wall and ceiling penetrations		Blow in R-30 attic insulation	Replace 3 existing windows with U-0.22 units
				retrofit 4 T8 and T12 fixtures & 8 lamps with						

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Building	HVAC & DHW			Lighting			Envelope			
	Other	Controls	Hot water heating	Interior	Exterior	Controls	Air Sealing	Doors	Insulation & other	Windows
				LED						
IRA Office	Add 1 occupancy sensor to bathroom lights and fan	Install (2) 7-day programmable thermostats	Add R-9 insulation blanket to hot water heater	replace 4 Incandescent or CFL A-type bulbs with LED	replace 9 HID wall packs with LED					
	Replace damaged fin tube baseboard radiators	Retro-commission all zone valves, control valves and thermostats, re-balance water side		retrofit 40 T8 fixtures & 111 lamps with LED						
		Replace 1 constant speed circulation pump with VFD unit								
		Troubleshoot and repair thermostat and zone valve in under building lift station zone								
Youth and Elder Building	Install 2 new direct vent Toyo-type stoves	program set back thermostats on 2 new Toyo stoves		replace 1 Incandescent or CFL A-type bulb with LED	replace 2 HID wall packs with LED		Seal all floor, wall and ceiling penetrations			Replace 10 existing windows with U-0.22 units
				retrofit 40 T8 fixtures & 113 lamps with LED						

1. HVAC & DHW

a. CONTROLS

i. Programmable setback thermostat

- Contractor shall identify the zone valve, wall convector, electric baseboard or 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.

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- If insufficient conductors exist, run new signal wire, verify no shorts or break or install transformer of correct voltage and amperage nearby new thermostat.
- 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. Program Toyo Stoves

- Contractor to program Toyo stove clock and set back feature and adhere to stove or on nearby wall, programming instructions provided by CCHRC.
- Provide minimum of 15 minutes of training to at least 2 occupants on premises.

iii. Install Potable water re-circulation controls in Clinic

This scope covers the installation of temperature based controls on the potable water re-circulation pump.

Contractor shall install a remote bulb thermostat sensing outside air temperature (OSAT).

Contractor shall install controller with the following minimum capabilities and features:

- Uses remote air temperature sensor
- Turns pump off when OSAT >38F
- Turns pump on when OSAT = 37F or below



- Has sufficient capacity to handle the existing pump amperage and voltage
- Maximum throttling range of 2F

Contractor shall confirm proper operation of unit after installation

iv. Install VFDs

VFD circulation pumps to be installed in the following buildings, replacing the existing equipment listed:

Clinic: 1 pump, Grundfos UPS 26-99 FC, 20 gpm
Daycare building: 1 pump, Taco 0010-BF3-J, 12 gpm
Police Station: 1 pump, Grundfos UPS 26-99 FC, 20 gpm
IRA Office: 1 pump, Grundfos UPS 26-64, 12 gpm

Contractor shall replace existing heating water circulation pumps with VFD units. Existing motors, sizes and mounting patterns must be field verified.

Circulation Pump demo and installation

- 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.
- Confirm proper operation.

v. 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 in the following buildings:

Clinic: 2 heating zones, 1 DHW zone
Police Station: 4 heating zones

Existing equipment:

Clinic

- System 2000 Boiler & controller
- Side-arm heat exchanger and DHW storage tank
- 2 manual thermostats
- Honeywell zone valves (photo at right)



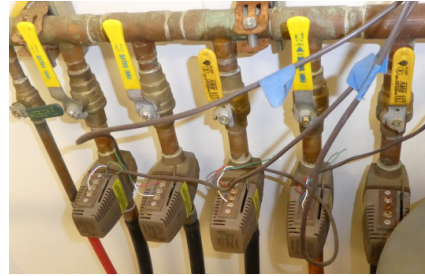
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located in boiler room

Police Station

- Weil McLain WGO boiler & Taco ZVC 404 zone valve controller
- No DHW
- 4 manual thermostats
- Taco zone valves located in boiler room (photo at right)



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

vi. Retro-commission under-building waste water heating controls in IRA Office

This scope covers the troubleshooting and repair of controls on the waste water heating zone located under the IRA Office building.

Existing equipment: 1 manual thermostat, 1 zone valve, 1 run of fintube heat

Contractor shall trouble shoot existing thermostat and zone valve for proper operation (If the thermostats have been replaced with new, no thermostat troubleshooting is required); identify and repair or replace non-functional units. Adjust thermostat set point to turn heating on at OSAT below 40F.

b. HEAT PLANTS

i. Laundry Facility Furnace Replacement

Existing equipment: Lennox OHR23Q3-105, 103 MBH capacity, oil fired

Contractor shall demo 2 existing oil fired furnaces as follows:

- Safely disconnect electric power and turn off at breaker.
- Disconnect signal wires.
- Temporarily cap off oil supply.
- Disconnect exhaust flue.
- Remove furnace and properly dispose.

Contractor shall install 2 new oil fired furnaces with the following minimum capacities, per manufacturer's recommendations:

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- Size to be calculated by licensed engineer or by the contractor based on current model and current heat requirements of the building.
- Minimum 85% AFUE, 2-stage if available.
- ECM fan motor.

Install per manufacturer's recommendations.

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 control signal wires

Reconnect ductwork including combustion air supply if appropriate, confirm no leaks.

Confirm proper operation of unit.

ii. Install new direct vent heating stove – Youth and Elder Building

Existing heat plant: Non-functional furnaces

Contractor shall install 2 new direct vent heating stoves with the capacities and features as follows:

- Minimum 40 MBH heating capacity ea.
- Maximum 80w power at steady state.
- Direct vent.
- Programmable setback feature.
- Locate appropriate exterior wall for venting accessible to fuel line and electrical outlet.
- Plumb fuel oil line to new location, test and confirm no leaks.
- Install stove per manufacturer's recommendations.
- Mount thermostat.
- Contractor to program Toyo stove clock and set back feature and adhere to stove or on nearby wall, programming instructions provided by CCHRC.
- Provide minimum of 15 minutes of training to at least 2 occupants on premises.
- Confirm proper operation of unit.

c. HOT WATER HEATING

i. Laundry Hot Water Heater (HWH) installation for hydronic clothes dryers

Existing unit: none, existing dryers are electric.

Owner to confirm with qualified engineer that recommended Toyotomi hot water heater will supply sufficient temperature and flow to serve 4 clothes dryers.

Owner to commission qualified engineer to design new system configuration and provided design drawings.



Contractor shall demo and properly dispose existing electric clothes dryers.
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 per design drawings.
- Minimum 87% AFUE.

Contractor to:

Plumb oil supply from existing tank to new hot water heater.

Connect oil supply, confirm proper installation and no leaks.

Confirm oil supply is properly filtered and oil meets manufacturer's requirements.

Connect flue and confirm proper installation with no leaks.

Provide and connect electric supply.

Install new hydronic clothes dryers per manufacturer's recommendations.

Install and connect hydronic piping from new HWH to dryers per design drawings including circulation pumps, expansion tank, valves and controls.

Test and confirm no leaks.

ii. Hot water heater insulation blanket

Contractor shall install an insulation blanket with minimum insulation value of R-9 per manufacturer's instructions.

d. OTHER

i. Bath fan replacement

Contractor shall demo existing bath fan as follows:

- Safely disconnect electric power and turn off at breaker.
- Disconnect exhaust duct.
- Remove and properly dispose existing fan.

Contractor shall install new exhaust fan with the following minimum capacities and features:

- Minimum 60 cfm air flow, maximum 18w power consumption, Energy Star rated.
- Integral humidistat.
- Integral occupancy sensor.
- If existing unit had integral light, new unit shall have same.
- If existing unit with light had separate switches for light and fan, new unit shall have same.

Install per manufacturer's recommendations.

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If ceiling or wall opening required modification, contractor shall re-finish wall and ceiling surfaces to original condition.

Reconnect electric supply.

Reconnect ductwork.

Program delay timers and sensor levels per owner instructions.

Confirm proper operation of unit.

ii. Bath fan occupancy sensor

Contractor to confirm switch is in proper location for correct operation of occupancy sensor for this room. If switch is not in proper location (e.g. is outside room) then ceiling mounted occupancy sensor shall be used.

Contractor shall install sensor as follows:

- Safely disconnect electric power and turn off at breaker.
- Remove existing switch as appropriate.
- Install sensor per manufacturers recommendations.
- If sensor is ceiling mounted, contractor shall re-finish ceiling surface per original condition.
- Reconnect electric power.
- Confirm proper operation.

2. LIGHTING

a. INTERIOR

i. Linear Florescent Fixtures

Contractor to field verify quantities.

Contractor to replace 24" and 48" linear florescent T8 and T12 tubes with direct wire, line voltage 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.
- If existing fixture has dimming capability, new bulb shall be dimmable.
- LED shall have a color temperature between 2700K and 3500K based on owner preference and a minimum of 800 lumens (60w incandescent equivalent).
- 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.
- If existing fixture has dimming capability, new bulb shall be dimmable.
- LED shall have a color temperature between 2700K and 3500K based on owner preference and a minimum of 700 lumens (65 w incandescent BR30 equivalent).
- 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 warranty.
- 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.

ii. 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, and 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.

3. ENVELOPE UPGRADES

a. AIR SEALING

Contractor shall seal all wall, floor and ceiling penetrations in the following buildings:

Bingo Hall
Daycare Building
Old Jail
TANF Building
Youth and Elder Building

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.
- Replace weather stripping as needed.

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

b. INSULATION AND OTHER ENVELOPE RETROFITS

Attic Insulation

Bingo Hall:	add R-33 minimum
Clinic:	add R-11 minimum
Old Jail:	add R-42 minimum
TANF Building:	add R-30 minimum

All storage items to be removed from attic.

If existing insulation is water damaged or otherwise compromised it is to be removed.

Seal all ceiling penetrations.

Confirm attic is vented properly, add or repair venting as needed.

Install baffles as required.

If there is water encroachment due to roof leakage, leaks are to be repaired by others, prior to implementing this retrofit.

If there is a vapor barrier, confirm there are no penetrations and repair as needed to maintain barrier integrity.

Install minimum insulation as listed above per manufacturer's recommendation.

Insulate attic access hatch with minimum R-42.

c. WINDOW REPLACEMENTS

Bingo Hall

All 4 windows in the Bingo Hall shall be replaced:

- 2'10" x 2'10", casement

Clinic

The following windows shall be replaced in the Clinic:

- North and south sides of kitchenette, 1'10" x 2'10" fixed
- North side of east playroom, 4'10" x 4'10" fixed

Laundry Facility

- 7 windows, size 3'10" x 3'2" slider
- 2 windows, size 2'5" x 2'2" casement

Old Jail

- 2 windows, size 3'3" x 3'3" slider



TANF Building

- 2 windows, size 3'9" x 3'2" casement/fixed
- 1 window, size 4'8" x 3'8" fixed

Youth and Elder Building

- 7 windows, size 3'10" x 3'10" casement
- 1 window, size 3'3" x 2'11" casement
- 1 window, 8'0" x 9'8", arched, fixed
- 1 window, 8'0" x 5'10" casement/fixed

Scope of work

Contractor shall replace existing window with double glazed, vinyl frame unit with a maximum $U=0.28$, with the same operating type and opening size 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 fascia, trim, exterior siding and repaint to match existing.
- Repair any damaged interior walls and finish and paint to match existing.
- Final caulk and seal.

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