Kwigillingok
Energy Action Plan

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Prepared for:
Village of Kwigillingok
PO Box 90
Kwigillingok, AK 99622

Prepared by:
Cold Climate Housing Research Center
955 Draanjik Drive, Fairbanks, AK 99775

Sponsored by:
Office of Indian Energy
U.S. Department of Energy
Indian Energy Policy and Programs
1000 Independence Avenue, S.W.
Washington, D.C. 20585

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Recipient:
Village of Kwigillingok
PO Box 90
Kwigillingok, AK 99622

Project title:
Kwigillingok Energy Efficiency Project

Project director:
Darrel John, Tribal Administrator, Native Village of Kwigillingok
John F. Lewis, KPC Manager, Native Village of Kwigillingok
Richard John, Finance Director, Native Village of Kwigillingok

Project team:
Fred K. Phillip, President, Kwigillingok I.R.A. Council
Willie Atti, Vice President, Kwigillingok I.R.A. Council
Ethel Phillip, Secretary/Treasurer,Kwigillingok I.R.A. Council
Noah Andrew Sr, member,Kwigillingok I.R.A. Council
Ray Kiunya, member, Kwigillingok I.R.A. Council

Jim Fowler, Energy Audits of Alaska

Vanessa Stevens, Cold Climate Housing Research Center
Conor Sosebee, Cold Climate Housing Research Center
Aaron Cooke, Cold Climate Housing Research Center
Anne Rittgers, Cold Climate Housing Research Center
Molly Rettig, Cold Climate Housing Research Center
Haley Nelson, Cold Climate Housing Research Center
Shane Ohms, Cold Climate Housing Research Center
Audrey Freeman, Cold Climate Housing Research Center

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LIST OF ACRONYMS

AK	Alaska
ANTHC	Alaska Native Tribal Health Consortium
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
HID	High Intensity Discharge
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
RV	Recreational Vehicle
TBA	To Be Announced
UAA	University of Alaska Anchorage
VPSO	Village Public Safety Officer
W	Watt

ABSTRACT

In 2017, the Native Village of Kwigillingok received a grant for the Kwigillingok 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 Kwigillingok and the project procedure. Chapters follow on each component of the project. The project team began by recording information about the six 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 Kwigillingok 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 Kwigillingok for many years to come.

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INTRODUCTION

The Native Village of Kwigillingok 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 Native Village of Kwigillingok.

Community information

The Native Village of Kwigillingok is located near the mouth of the Kuskokwim River in southwest Alaska. The remote community is located just a quarter mile from the Bering Sea, which provides subsistance foods such as walrus, seal, salmon, and sea bird eggs. Kwigillingok's weather is extreme and unpredictable. It is often windy, and storms that form over the sea bring heavy rain, snow, and gale-force winds.

There are no roads to Kwigillingok, so all travel is via small plane. In the summer, a barge brings fuel, large equipment, and supplies. Energy costs are high with a gallon of fuel costing $4.50 and residential electricity at $0.61 per kilowatt-hour for residents exceeding the limits set out by Alaska's power cost equalization program (ISER / UAA, 2018). Homes do not have plumbing, so residents use rainwater catchment in the summer or haul water from a watering point.

The I.R.A. Traditional Council governs the community, and they have a goal to reduce the cost of energy for its residents. Kwigillingok is one of four villages in the Chaninik Wind Group, a project that uses an innovative wind system with wind turbines, diesel generators, and energy storage systems. Currently, wind provides 16% of their power, and they hope to increase that amount in the future. The Tribal Council is also looking to make buildings more energy efficient, and has already obtained an energy audit of the Water Treatment Plant. They are hoping that with the additional audits from this project they can plan a comprehensive retrofit project.

There are 321 people in Kwigillingok and 95% are Alaska Native (United States Census Bureau, 2010). The isolated nature of the community has helped to preserve the culture and traditions of the residents. Many people speak Yup'ik, live a subsistance lifestyle, and practice traditional dance and arts.

Project objective

The objective of the Kwigillingok Energy Efficiency Project is to reduce and stabilize energy costs in tribal buildings by setting energy efficiency improvement goals to provide direction for future retrofit projects. Energy efficient and safe buildings will empower the Native Village of Kwigillingok 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.

Kwigillingok, located in Southwest Alaska, has many boardwalks to provide pathways through the tundra to the various buildings in the commuity of over 300 residents.

Project activities

The Kwigillingok Energy Efficiency Project followed a comprehensive procedure so that the Kwigillingok 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 Kwigillingok I.R.A. Council met to decide which buildings would participate. They chose six tribal buildings to receive energy audits as a part of the project and set goals for each building.

Project kickoff meeting: In December 2017, the Kwigillingok 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 Kwigillingok and the Council's overall energy goals. Finally, the Council members and project staff participated in a discussion about how to act on the recommendations from the Energy Action Plan when this project concludes, such as how retrofits might be financed, local staff and contractors that can perform retrofits or maintenance tasks, and how to utilize other local resources. The flyer 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 16, also includes details such as how the chosen metrics will be collected, stored, accessed, and analyzed. Monitoring building metrics is important because it shows how the buildings are changing over time and if an investment into energy efficiency retrofits results in improvements such as increased safety, reduced energy use, better occupant comfort, and less maintenance.

Collect baseline data: Project staff worked with tribal office staff and building occupants to benchmark the current condition and energy use of each 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 on page 22, 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 October 2018, the Kwigillingok 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. The Council then 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 for the Kwigillingok 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 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 Kwigillingok Energy Efficiency Project. In addition, the later chapters supplement the audit recommendations in order to help facilitate future energy reduction projects.

The introductory chapter explains 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 energy data* sections. The energy audits are summarized on page 22. The *Maintenance plan* section suggests a monthly checklist that maintenance personnel can follow 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 how to fund and schedule training for maintenance personnel 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 might participate in a community energy project.

Wind turbines provide electricity and heat to buildings in Kwigillingok.

TRIBAL BUILDINGS

The Kwigillingok I.R.A. Council chose six buildings to participate in this project. The buildings are all single story, wood-framed structures.

The ANTHC bunkhouse is currently not in use due to its poor condition.

ANTHC bunkhouse

Building goal: To reduce electrical and fuel oil use.

The bunkhouse is a single story, wood framed structure. It is not currently used and is in poor condition. It has several broken windows and its foundation has detached from the structure in multiple places.

The clinic is in relatively good condition, and its four employees provide health services to the community on weekdays and during emergencies.

Clinic

Building goal: To reduce electrical and fuel oil energy use.

The clinic employs 4 community members. It is open Monday through Friday from 9:00 a.m. until 4:00 p.m. throughout the year and for emergencies on an as-needed basis.

The clinic is a 1, 400 square-foot, single story, elevated pier foundation, wood-framed structure. The building shell is in good condition. Heating is provided by a single zone, oil fired, forced air furnace. Heating distribution is provided by ductwork with penetrations in the ceiling. A manual thermostat provides controls for the system. There is plumbing in the facility. Hot water for lavatory sinks is created by a 32 gallon oil fired, storage water heater. A recirculating pump has been valved and switched off. Exterior lighting consists of HID wall packs and interior lighting consists primarily of 48" linear fluorescent, 32 watt, 2, 3 and 4-lamp T8 fixtures. With the exception of one fixture, all of the 4-lamp fixtures have had 2 lamps removed. There are also 2-lamp CFL plug-in fixtures and a single 2-lamp, 24" T12 fixture. Plug loads for the office are high but expected for this type of facility. Those include various medical equipment, computers, a prescription refrigerator, and a residential refrigerator.

The fisheries building is open on Wednesdays to provide the community with support for the fishing industry.

Fisheries building

Building goal: To reduce electrical and fuel oil use.

The fisheries building employs 2 community members in the office. There is an intermittent staff of 3 that works in the shop portion of the facility. There are computers that are available for public use, which are utilized by 6-8 daily visitors. The office staff and visitors occupy the building from 8:00 a.m. until 5:00 p.m. on weekdays.

The fisheries building is a 1,292 square-foot, single story, triodetic foundation, wood framed, wood sided structure. The building shell has remained in good condition since

its 2005 construction. Heating is provided to the offices by an 87 MBH, oil-fired, forced air, single zone furnace that is located in the southwest office. The high bay shop area has heat provided by 2 Toyotomi Laser 73 stoves with internal programmable thermostats, although they appear to be manually overridden on a daily basis. There is plumbing in the facility, but there are not municipalital potable and waste water connections. Domestic hot water for the lavatory sink is provided by a 1.5 kW tankless electric water heater that is located in the shop. An electric incinerating toilet is in use for handling waste. Exterior lighting consists of what appear to be LED wall packs with integral photocell sensors and interior lighting consists primarily of 48" linear fluorescent, 14 watt, 2-lamp LED T8 fixtures and a couple surface mount fixtures with 11watt and 23watt CFL screw-in bulbs. There are no interior lighting controls in use.

I.R.A. Council office

Building goal: Reduce electrical and fuel oil use.

The I.R.A.Council office is the central administrative hub of Kwigillingok, despite its poor condition. Its 14 employees help up to 20 visitors each day.

The I.R.A. council office employs 14 community members and receives a high volume of local traffic with 10 – 20 daily visitors. The office is open Monday through Friday from 9:00 a.m. until 5:00 p.m. throughout the year.

The I.R.A. office building is a 2,400 square-foot, single story, elevated pier foundation, wood framed, wood sided structure. The building shell is in poor condition. The windows on the west side of the building are in very poor condition and the building shows signs of deferred maintenance. Heating is provided by a Toyotomi Laser 73 and a Toyotomi Laser 72 stove with onboard thermostatic controls for programs. An oil-fired, forced air furnace previously distributed heat through the building but has since been removed. The ductwork penetrations through the attic still exist. There is no domestic hot water or other plumbing in the building, although, there is an RV-style, tankless flush toilet with a lavatory sink. Lighting consists of 48" linear fluorescent, 32 watt, 2-lamp, electronic ballast, T8 fixtures. There are no lighting controls in the building. Plug loads are high due to the high occupancy and use of the building as a tribal office.

Post office

Building goal: Reduce electrical and fuel oil use.

The only post office in Kwigillingok is open 6 days a week to provide residents with mail services.

The post office employs 1 community member and receives 1-20 daily visitors. The facility is open Monday through Friday from 10:00 a.m. – 5:00 p.m. and on Saturdays from 11:00 a.m. until 3:00 p.m. throughout the year.

The post office is a 1,344 square-foot, single story, triodetic foundation, wood framed structure. The building was constructed in the early 2000s and the shell is in good condition. Two Toyotomi Laser 73 stoves provide heat. Heat distribution is provided by two small transfer fans. Controls are provided by the internal Toyotomi thermostat. There is plumbing in this facility. Exterior lighting consists of HID wall packs and interior lighting consists of 48" linear fluorescent, 32 watt, 2-lamp T8 fixtures. Plug loads are low for this building with 1 computer and several office products.

VPSO office and jail

Building goal: Reduce electrical and fuel oil use.

The VPSO office and jail employs 1 community member. The single staff member occupies the building intermittently from 8:00 a.m. until 5:00 p.m. on weekdays. The second shift Tribal Police Officer occupies the building regularly from 12:00 a.m. until 4:00 a.m. When there is a cell mate present the building is occupied on a 24 hour basis.

The VPSO office and jail is a 384 square foot, single story, elevated pier foundation, wood framed, T1-11 sided structure. The building shell is in good condition. Heating is provided by a Toyotomi Laser 56 stove with an internal programmable thermostat. There is plumbing for both potable and waste water in this facility, but it is not in use. A honey bucket is in use. Interior lighting consists of 48" linear fluorescent, 32 watt, 2-lamp T8 fixtures and recessed cans in the jail cells which appear to use LEDs. Exterior lighting is a single fixture with an incandescent bulb. Plug loads are minimal due to the infrequent occupancy.

The tribal police in Kwigillingok use this building both as their office and to intermittently house people in the single holding cell.

DATA MONITORING PLAN

At the kickoff meeting for this project, the Kwigillingok 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 Kwigillingok, all data monitoring activities, including the collection and storage of data, will be overseen by the tribal finance officer.

Data collection

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

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 officer will decide where to store building condition and occupant comfort data if they conduct additional surveys during an energy retrofit project.

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

Building data

Data requirements for each building are shown in the table below and reflect the conditions and systems of the building at the time of the building surveys.

	Building	Data	Notes
1	ANTHC bunkhouse	☐ Annual fuel oil use ☐ Monthly electrical energy use ☐ Occupant comfort levels and building condition report	This building is currently unoccupied, but is normally heated with fuel oil.
2	Clinic	☐ Annual fuel oil use ☐ Monthly electrical energy use ☐ Occupant comfort levels and building condition report	This building is heated primarily with fuel oil.
3	Fisheries building	☐ Annual fuel oil use ☐ Monthly electrical energy use ☐ Occupant comfort levels and building condition report	This building is heated primarily with fuel oil using a TOYOTOMI stove.
4	I.R.A. Council office	☐ Annual fuel oil use ☐ Monthly electrical energy use ☐ Occupant comfort levels and building condition report	This building is heated primarily with fuel oil.
5	Post office	☐ Annual fuel oil use ☐ Monthly electrical energy use ☐ Occupant comfort levels and building condition report	This building is heated primarily with fuel oil.
6	VPSO office and jail	☐ Annual fuel oil use ☐ Monthly electrical energy use ☐ Occupant comfort levels and building condition report	This building is heated primarily with fuel oil.

Accessibility

The tribal finance officer 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 website (http://www.cchrc.org/doe-energy-efficiency-and-renewable-energy-projects) and is also documented in the *Baseline data* chapter of this report.

Analysis

The tribal finance officer 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 officer to consolidate energy use and occupant comfort data for each building.

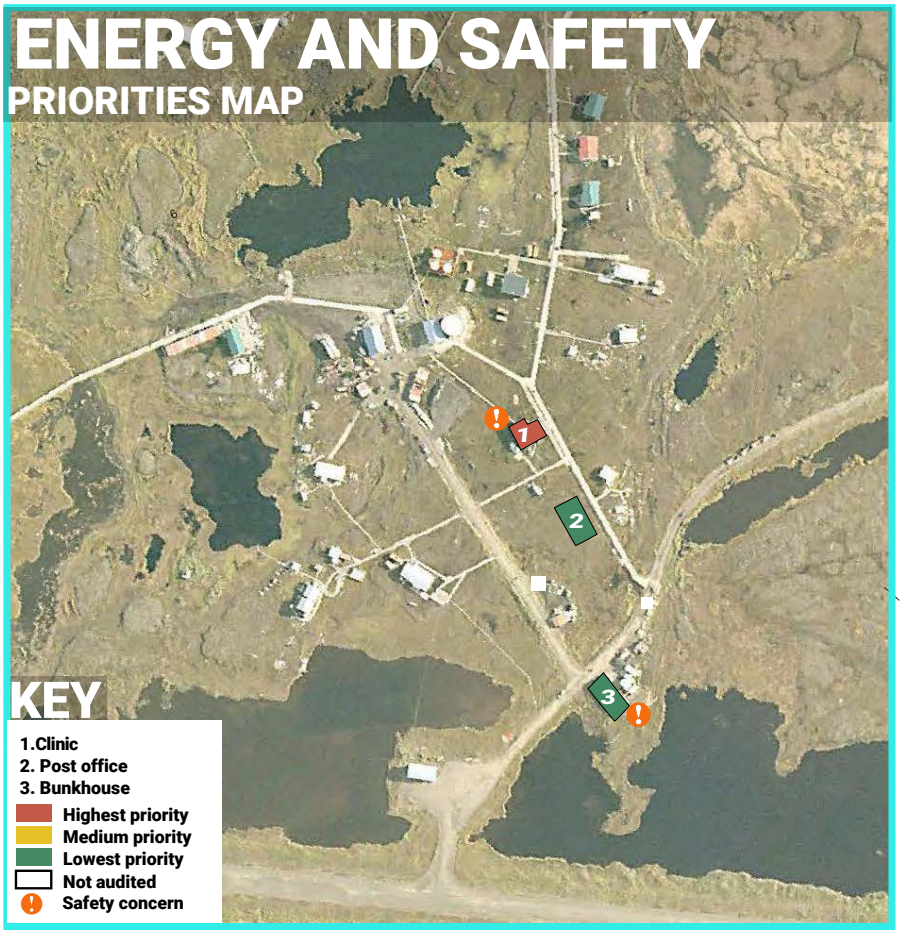
BASELINE DATA

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 chapter show the six buildings that participated in this energy audit project. Three of them are at a high priority for a retrofit because of high energy costs. The I.R.A. Council office, the clinic, and the fisheries building use the majority of the energy required by the tribal buildings. They all have good potential to reduce future energy costs through an energy efficiency retrofit project. The building conditions chart following the maps provides more details on the buildings, highlighting any safety, maintenance, and occupant comfort concerns of the buildings. One building, the ANTHC bunkhouse, has several safety issues, including structural damage, broken windows, and fire damage, that should be addressed should the building be occupied in the future. While no other buildings have any major issues to address, the I.R.A. Council office is in generally poor condition with issues such as deteriorating siding, windows that need replacement, and a lack of ventilation. Any retrofit project should include a focus on this building to improve occupant comfort and prevent current issues from becoming safety hazards in the future.

Many residents in Kwigillingok enjoy playing basketball outside in the summer and inside in the winter.

ENERGY AND SAFETY
PRIORITIES MAP



KEY

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

NOTES

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

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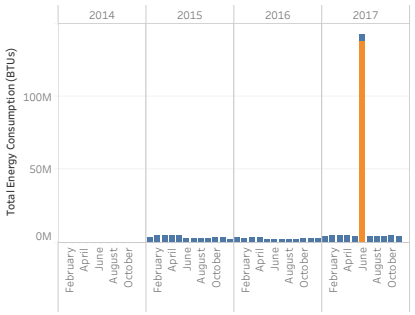
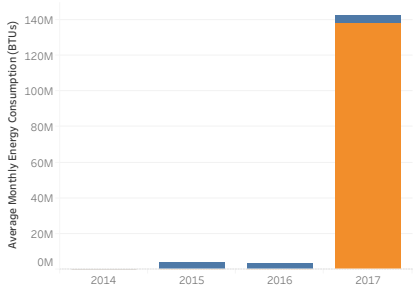
CLINIC 1

Clinic Total Energy Consumption

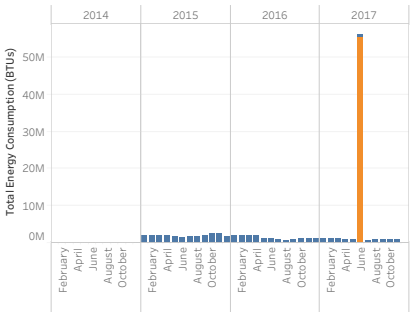


Clinic Monthly Energy Consumption Average per Year

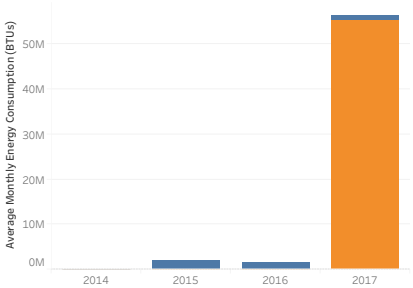


POST OFFICE 2

Post Office Total Energy Consumption

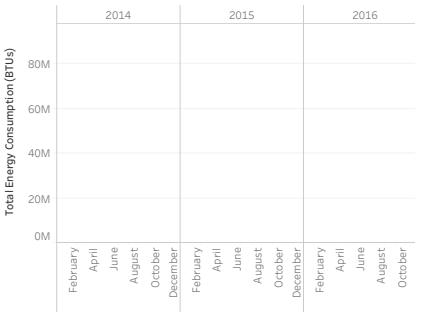


Post Office Monthly Energy Consumption Average per Year

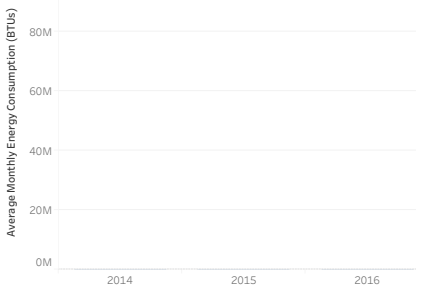


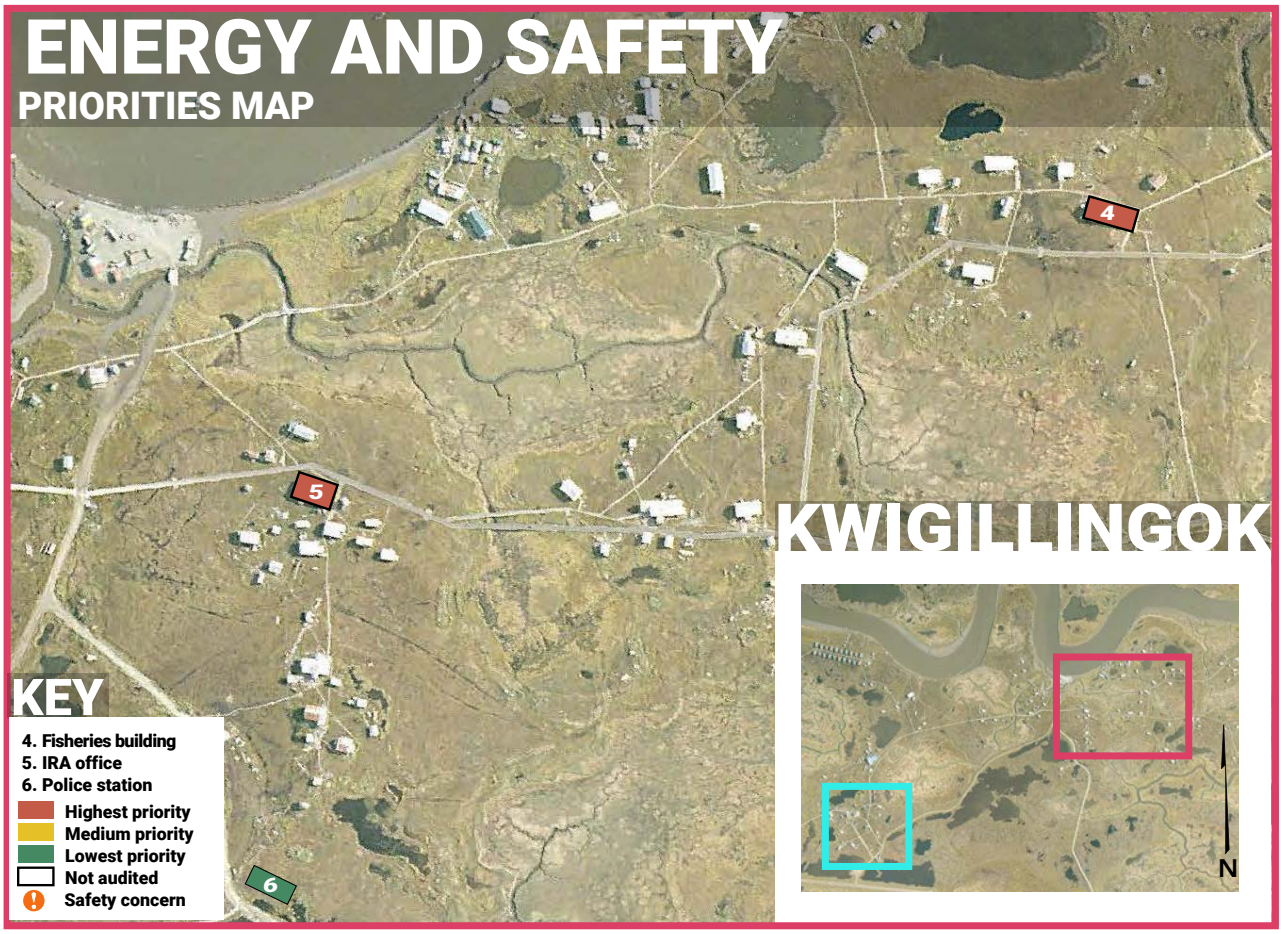
BUNKHOUSE 3

Bunkhouse Total Energy Consumption



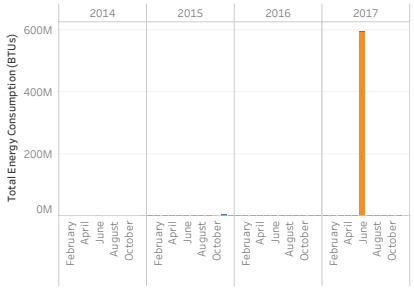
Bunkhouse Monthly Energy Consumption Average



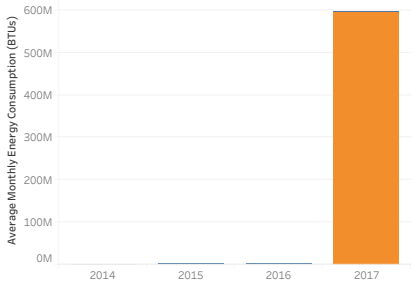


FISHERIES BUILDING 4

Fisheries Support Building Total Energy Consumption

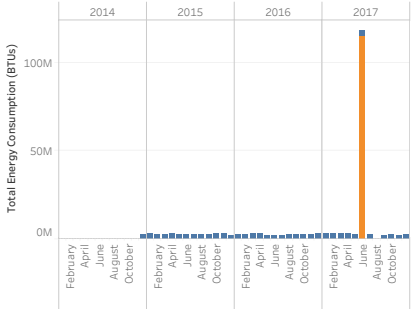


Fisheries Support Building Monthly Energy Consumption Average per Year

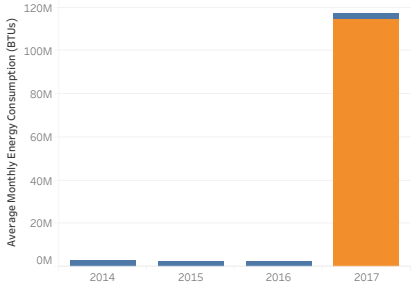


IRA OFFICE 5

Office Total Energy Consumption

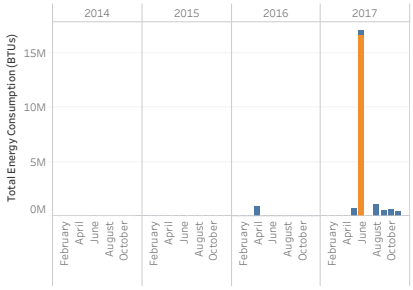


Office Monthly Energy Consumption Average per Year

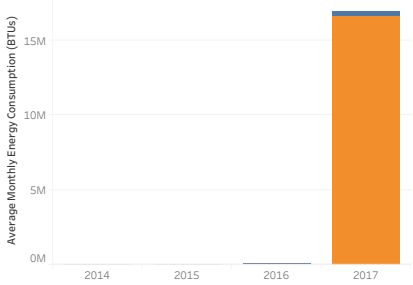


POLICE DEPARMENT 6

Tribal Police Department Total Energy Consumption



Tribal Police Department 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
ANTHC bunkhouse	This building is in poor condition and needs significant maintenance. Several windows are broken and will need to be replaced. The foundation of the building has detached from the structure in several places. Structural analysis should be performed by a qualified professional before any new long term occupancy.
Clinic	This building is relatively new and in generally good condition. However, the occupants report feeling cold drafts throughout the building. The furnace combustion air intake grille must always remain clear of any obstructions because this is a safety hazard and reduces the efficiency of the furnace.
Fisheries building	This building was constructed in 2005 and is in very good condition. There is no potable or waste water connection to the building itself, although the lavatory faucet is operable. However, the occupants report that the office portion of the building is cold. This is partly due to the heating being controlled manually by shop staff and a thermostat that is likely not working. The bathroom has a tankless toilet and no ventilation, which causes the room to smell.
I.R.A Council office	This building is in poor condition and needs significant maintenance. The windows on the west side need to be replaced. The outside of the building needs to be painted to help prevent further weathering damage. There is no domestic hot water in the building. The material stored in the attic needs to be permanently moved to access any damaged insulation for replacement. The occupants report that there is not enough heat for the building and that heat doesn't spread throughout the building when the interior office doors are closed. The bathroom has a tankless toilet and no ventilation, which causes the room to smell. The exhaust fan for the bathroom has to run constantly to prevent wind from pushing unpleasant odors into the building. The occupants also report that the lighting does not provide sufficient illumination.
Post office	This building was constructed in the 2000s and is in generally good condition. There is domestic hot water and potable water plumbing.
VPSO office & jail	This building is relatively new and in generally good condition. There is plumbing for both potable and waste water, but a honey bucket has been in use.

ENERGY AUDIT SUMMARIES

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

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

The auditor identified several recommendations that applied almost universally to the tribal buildings, including installing and using setback thermostats to decrease the temperature set point when the buildings are unoccupied, and upgrading lighting to LED bulbs. Additionally, many of the buildings could benefit from occupancy sensors for ventilation equipment and lighting and installing insulating blankets on hot water heaters.

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.

ANTHC bunkhouse

The ANTHC bunkhouse is a 1,536 square foot building constructed around 1980. The building is occupied intermittently by summer work crews. The tribal council is considering renovating the building for use as an office. The energy audit thus considers two scenarios – one where the building continues in its current use, and a second where it would be occupied by 3 people Monday-Friday from 8:30 AM to 3:00 PM. As housing for summer work crews, the annual energy cost is approximately $3,700 per year, mainly due to electrical use. Should the building be converted into an office, annual energy use with no energy upgrades would be over $10,000, over $8,000 of which would be for electricity. The remaining would pay for fuel oil.

As the bunkhouse is currently not in use, the energy audit addresses retrofits that would improve the building and reduce energy consumption should it be used in the future.

The energy audit recommends four important actions which should be addressed as soon as possible, regardless of the future use of the building:

1. The zoning for space heating in the building is inadequate when doors are closed. This can be improved by installing a boiler and hydronic distribution system.

2. The existing Toyo stove has a programmable thermostat for setting back space temperatures when the building is unoccupied.

3. The unsafe foundation should be repaired.

4. There are several wall, floor, and ceiling electrical penetrations that are unsafe and should be repaired.

Other recommendations include replacing existing lighting with LED, replacing clothes washer at its end of life an Energy Star version, adding blown-in cellulose insulation to the attic, and installing occupancy sensors on the bathroom fans.

If the bunkhouse continues in its current use, and Tribe is able to implement all recommendations, the annual energy use would decrease by 8.9 MBTU, resulting in an energy and maintenance savings of **$1,025**. At an approximate installation cost of $18,359, the simple payback of a retrofit project would be **16.3 years**. If the bunkhouse is converted into an office, the annual savings would increase to approximately $4,300, shortening the payback period to under 5 years.

The audit also includes suggestions for several ECMs, including ongoing energy monitoring, efficient building management, reducing air infiltration, turning off plug loads, and servicing HVAC equipment annually. Additionally, specific to the ANTHC bunkhouse, the Tribe should make sure to maintain the air sealing on the envelope, use electronic timers for large electronic equipment, at the end of useful life replace refrigeration equipment and commercial cooking equipment with Energy Star versions, and keep refrigeration coils clean.

Clinic

The clinic is a 1,465 square foot building constructed in 1997. The building is regularly occupied by four staff members and receives patients and visitors from 9am to 4pm Monday through Friday. In 2018, the predicted annual energy costs were upwards of $10,000. This is split equally between the cost of fuel oil used for space heating and electricity.

The energy use of the clinic could decrease by over $3,000 per year if audit recommendations are implemented.

The energy audit recommends four important actions, two of which are safety concerns, which should be addressed as soon as possible:

1. Remove the cardboard from the combustion intake vent in the furnace room allowing for unrestricted combustion air for proper operation. This is a serious safety issue.

2. Remove all combustible materials from the furnace room, particularly the cardboard boxes adjacent to the water heater burner. This is also a serious safety issue.

3. Install plug load management devices in exam rooms to manage computer power usage when the room is unoccupied.

4. Investigate erratic year-to-year electric consumption - consumption decreased 21% between 2015 and 2016 but increased 53% between 2016 and 2017.

Other recommendations include installing setback thermostats throughout the building and implementing a 63 degrees Fahrenheit unoccupied setback temperature, replacing existing lighting with LEDs, replacing the existing

furnace at end of life (EOL) with a model with 85% thermal efficiency, add an R-9 insulating blanket to the water tank, and when the hot water heater reaches end of life replace with a higher efficiency model.

If the Tribe is able to implement all recommendations, the annual energy use would decrease by 58.2 MBTU, resulting in an energy and maintenance savings of **$3,504**. At an approximate installation cost of $20,605 (this includes replacement costs for EOL devices); the simple payback of a retrofit project would be **5.9 years**.

The audit also includes suggestions for several ECMs, including ongoing energy monitoring, efficient building management, reducing air infiltration, turning off plug loads, and servicing HVAC equipment annually. Additionally, specific to the clinic, the Tribe should be sure to maintain the air sealing on the envelope, use electronic timers for large electronic equipment, replace refrigeration equipment and commercial cooking equipment at the end of useful life with Energy Star versions, and keep refrigeration coils clean.

Fisheries building

The fisheries building is a 1,292 square foot building constructed in 2005. It is generally occupied by 2 staff members and a number of visitors who come to use the public-use computers Monday through Friday from 8am to 5pm. There are also three shop staff members who are intermittently in the building during operating hours. In 2018, the predicted annual energy costs were a little more than $9,000, which is split between the cost of fuel oil used for space heating and electricity.

Recommendations for the fisheries building include using setback thermostats and upgrading lighting to LED bulbs.

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

1. Unset the programmable thermostat in the southwest office from *hold*, set the clock to the proper time, and program setback temperatures for unoccupied hours.

2. Program the Toyotomi stoves in the garage to set back the temperature during unoccupied hours, checking the settings after every power outage.

Other recommendations include implementing a heating temperature unoccupied setback to 64° Fahrenheit in the office, adding occupancy sensors to bathroom exhaust fans, upgrade lighting controls from manual switching to occupancy and daylight sensing capabilities, replacing the existing furnace at end of life (EOL) with a model with greater thermal efficiency, add an insulation blanket to the water heater, and replace existing lighting with LEDs.

If the Tribe is able to implement all recommendations, the annual energy use would decrease by 32.4 MBTU, resulting in an energy and maintenance savings of **$1,966**. At an approximate installation cost of $13,166 (this includes replacement costs for EOL devices) the simple payback of a retrofit project would be **6.7 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 fisheries building, the Tribe should be sure to maintain the air sealing on the envelope, use electronic timers for large electronic equipment, replace refrigeration equipment and commercial cooking equipment at the end of useful life with Energy Star versions, keep refrigeration coils clean, and keep heating coils and fan filters in furnaces in the Toyotomi stoves clean.

I.R.A. Council Office

The I.R.A. Council Office is a 2,400 square foot building constructed in 1982. The building is occupied by 14 people including visitors with offices occupied intermittently between 8am and 6pm Monday through Friday. In 2018, the predicted annual energy costs were upwards of $10,000. This is split between the cost of fuel oil $4,724 used for space heating, and electricity $5,808.

The office building could benefit from several retrofits, such as setback thermostats, occupancy sensors, and air-sealing of the building envelope.

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

5. Be sure to turn off the heat trace on the wastewater line during the warmer months.
6. Program the Toyotomi stoves to set back the temperature during unoccupied hours and checking the settings after every power outage.
7. Investigate and repair the Toyotomi stove indicating a fuel obstruction (error EE6) for optimal performance.
8. Remove the items stored in the attic and reinsulate with a minimum of R-42, store the items in a non-attic location.
9. Add switch mounted occupancy sensors to each office that is intermittently occupied.

Other recommendations include implementing a heating temperature unoccupied setback to 63° Fahrenheit throughout, replace existing lighting with LEDs, add an R-9 insulating blanket to the hot water heater, replace bathroom fans with models with occupancy and humidity sensors, perform air sealing to reduce leakage by 50%, replace the existing window with a U-0.22 vinyl window, and remove manual switching and add new timers or scheduled controls on the heat trace.

If the Tribe is able to implement all recommendations, the annual energy use would decrease by 75.7 MBTU, resulting in an energy and maintenance savings of **$3,718**. At an approximate installation cost of $24,983, the simple payback of a retrofit project would be **6.7 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 I.R.A. Council Office, the Tribe should be sure to maintain the air sealing on the envelope, use electronic timers for large electronic equipment, replace refrigeration equipment and commercial cooking equipment at the end of useful life with Energy Star versions, and keep refrigeration coils clean.

Post office

The post office is a 1,344 square foot building constructed in 2001. It is generally occupied by 1 staff person and 20-50 visitors requiring postal service when it is open on Monday through Saturday. In 2018, the predicted annual energy costs were around $5,500. This is split between the cost of fuel oil $2,313 used for space heating, and electricity $3,239.

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

1. Program the Toyotomi stoves to set back the temperature during unoccupied hours, and check the settings after every power outage.

Other recommendations include implementing a heating temperature unoccupied setback to 63° Fahrenheit throughout, replace existing lighting with LEDs, add a switch mounted occupancy sensor controlling the bathroom fan and light, and remove manual switching from lighting controls and add an occupancy sensor.

If the Tribe is able to implement all recommendations, the annual energy use would decrease by 15.9 MBTU, resulting in an energy and maintenance savings of **$1,995**. At an approximate installation cost of $5,858, the simple payback of a retrofit project would be **2.97 years**.

The primary recommendation for the post office is to program the heating appliance's temperature setback option.

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 Post Office, the Tribe should be sure to maintain the air sealing on the envelope, use electronic timers for large electronic equipment, and keep heating coils and fans on the Toyotomi stoves clean.

VPSO building

The VPSO building is a 384 square foot building that was constructed in 2015. The building is typically occupied by 1-2 people from 8am to 5pm and 12am to 4am. In 2018, the predicted annual energy costs were around of $1,730. This is split between the cost of fuel oil used for space heating and electricity.

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

1. Program the Toyotomi stove to set back the temperature during unoccupied hours and check the settings after every power outage.

Other recommendations include implementing a heating temperature unoccupied setback to 65° Fahrenheit throughout, add occupancy sensors to bathroom light, and replace existing lighting throughout with LEDs.

Energy retrofits for the small VPSO building would pay back in a little over a year.

If the Tribe is able to implement all recommendations, the annual energy use would decrease by 3.3 MBTU, resulting in an energy and maintenance savings of **$444**. At an approximate installation cost of $540, the simple payback of a retrofit project would be **1.2 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, specific to the VPSO building, the Tribe should be sure to maintain the air sealing on the envelope.

MAINTENANCE PLAN

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

Monthly maintenance tasks

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

ANTHC bunkhouse

- Heating: Check that the internal programmable thermostat of the Toyotomi is configured. If it is not, then it will need to be reprogrammed to run at lower temperatures when there is no one in the building. Create a parts list that can be used for reference when ordering replacement heating components.
- Lighting: Ensure all lighting fixtures are operating and document failed fixtures. Ensure replacements are LED.
- Appliances: Replace appliances with Energy Star

During the monthly walk around the exterior of the bunkhouse, be sure to note if there has been further movement of the foundation, which could exacerbate the current safety issues.

certified appliances when necessary.

- Envelope/Structure: Walk around the exterior of the building and document any damage: cracked windows, siding damage, or further 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.

Clinic

- Heating: Check that the furnace is not running during summer months. Ensure that the area around the air intake of the furnace is clear of any items that could block airflow. Create a parts list that can be used for reference when ordering replacement heating components.
- Envelope/Structure: Walk around the exterior of the building and document any damage, such as cracked windows, shifting foundation, or missing/broken weather-stripping.
- 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. Check that all non-medical equipment is operating properly. Replace appliances with Energy Star certified appliances when necessary.
- 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.

Check that the furnace is not running during the summer. Make sure the air intake for the furnace pictured above doesn't have anything blocking it.

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

Fisheries building

- Heating: Check that the internal programmable thermostats of the Toyotomi stoves in the shop area are configured in addition to checking the American Standard furnace's programmable thermostat in the southwest office. If they are not, they will need to be reprogrammed to run at lower temperatures when there is no one in the

building. Create a parts list that can be used for reference when ordering replacement heating components.

- 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. Ensure that the refrigerator is not running if there is no plan to use it. Replace the refrigerator with an Energy Star certified appliance when the current one fails.
- Envelope/Structure: Walk around the exterior of the building and document any damage: cracked windows, siding damage, or 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 Toyotomi stove should be checked periodically to ensure that the programmable thermostat is running correctly.

The American Standard's furnace should be checked periodically to ensure that the programmable thermostat is running correctly.

I.R.A. Council office

- Heating: Check that the internal programmable thermostats of the Toyotomi stoves are configured. If they are not, then it will need to be reprogrammed to run at lower temperatures when there is no one in the building. Create a parts list that can be used for reference when ordering replacement heating components.
- Lighting: Ensure all lighting fixtures are operating and document any failed fixtures. Ensure replacements are LED.
- Appliances: Check to ensure office equipment is not running during off hours and that staff is utilizing plug load management devices.
- Envelope/Structure: Walk around the exterior of the building and document any damage: cracked windows, shifting foundation, remove any materials stored in the attic, and areas that need new paint.

The office equipment should be set up with plug load management devices to ensure that the equipment isn't running while no one is at the office.

- 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 Toyotomi stoves should be checked periodically to ensure that the programmable thermostats are running correctly.

Post office

- Heating: Check that the internal programmable thermostats of the two Toyotomi Laser 73 stoves are set up. If they are not, then they will need to be rescheduled to run at lower temperatures when there is no one in the building. Create a parts list that can be used for reference when ordering replacement heating components.
- Plumbing: Check that heat trace is only operating during the winter months to keep the pipes from freezing.
- Lighting: Ensure all lighting fixtures are operating and document any failed fixtures. Ensure replacements are LED.
- Appliances: Check to ensure office equipment is not running during off hours and that staff is utilizing plug load management devices.
- Envelope/Structure: Walk around the exterior of the building and document any damage: cracked windows, siding damage, or shifts in the foundation.

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

- 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.

VPSO office and jail

- Heating: Check that the internal programmable thermostat of the Toyotomi stove is configured. If it is not, then it will need to be reprogrammed to run at lower temperatures when there is no one in the building. Create a parts list that can be used for reference when ordering replacement heating components.
- Lighting: Ensure all lighting fixtures are operating and document failed fixtures. Ensure replacements are LED.
- Appliances: Check to ensure office equipment is not running during off hours and that staff are utilizing plug load management devices.

- Envelope/Structure: Walk around the exterior of the building and document any damage: cracked windows, siding damage, or 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 Toyotomi stove should be checked periodically to ensure that the programable thermostat is running correctly, especially after a power outage.

During the visual inspections of the building exterior, check the foundation.

FUNDING AND TRAINING OPPORTUNTIES

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

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

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

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

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

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

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

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

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

7. Reach out to other communities who have completed similar projects to improve their buildings, either

through deep retrofit projects or little by little. Ask them for their stories, lessons learned, and advice!

This chapter contains a table of funding and training opportunities that exist at the time of publication. 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 fit into several smaller projects.

ABBREVIATIONS

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

NOTES

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

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

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

GRANTS

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

GRANTS

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

GRANTS

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

LOANS

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

LOANS

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

ADDITIONAL RESOURCES

	AVEC	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 Kwigillingok are a key part of the region. Collectively, they provide benefits to the community every day, including health services, facilitation of public safety, mail service, 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 Kwigillingok 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 Kwigillingok, 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 chapter, 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 Kwigillingok Tribal Office attended two D.O.E. Office of Indian Energy Program Reviews during the project. In 2017, Richard John presented on the objectives and future plans for the project. His presentation can be found at the link listed below. In 2018, Darrel John 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 Kwigillingok residents. Similarly, the video reviews the project procedure, as well as showing viewers the community of Kwigillingok.

Links to online outreach materials

2017 Program Review presentation:

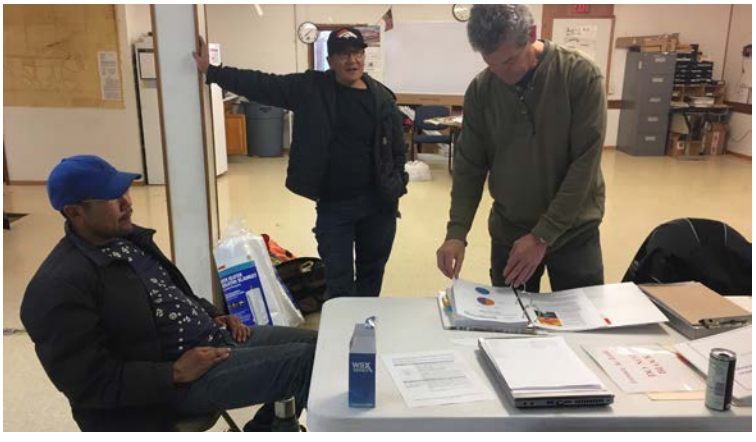
https://www.energy.gov/indianenergy/2017-office-indian-energy-program-review-meeting-presentations

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



Tribal office staff discuss the results of the energy audits with project staff.

CONCLUSION

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

Through this project, the Kwigillingok 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 Kwigillingok 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 I.R.A. Council. They walked through each building, speaking with the Tribal Administrator, maintenance personnel, 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 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 promote the project to the community of Kwigillingok. 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 six tribal buildings in the project and their management. One of the buildings, the ANTHC bunkhouse has safety concerns, including structural issues and a damaged building envelope, which should be addressed immediately. Three other buildings, the I.R.A. Council office, fisheries building, and the clinic, all have energy costs that approach $10,000 per year. However, all of these buildings could realize energy savings of a few thousand dollars through a retrofit project. In fact, if all the Tribe were to implement all recommendations, they could realize over $10,000 in annual energy savings, paying back a retrofit project in a little over 5 years. The tribal office already has a dedicated and motivated staff, including several employees dedicated to building maintenance. They have started to track energy and baseline conditions of the buildings. The staff frequently collaborates with the Council members to discuss the best next step for each building.

The tribal office staff identified a few lessons learned for Tribes that might embark on a similar project. First, energy audits can show Tribes how to reduce their energy use by listing customized improvements for each building. Tribes can benefit from this knowledge by following those recommendations to reduce their operating costs. Additionally, audits can provide valuable perspective by quantifying how investments in buildings can pay back, information that can be used to apply for funding to retrofit or replace buildings.

As this project concludes in 2019, the Native Village of Kwigillingok is looking toward next steps. The tribal office staff have 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, and energy efficient tribal buildings.

WORKS CITED

ISER / UAA. (2018). Community Data Summary: Kwigillingok. (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/community-data-summary/

United States Census Bureau. (2010). American Fact Finder: Kwigillingok CDP, Alaska. Retrieved May 25, 2018, from United States Census Bureau: https://www.census.gov

APPENDIX A: KICK-OFF MEETING FLYER

The Kwigillingok I.R.A. Council and project staff held a kick-off meeting for the project in January 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.

CCHRC

Kwigillingok 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 or to use when applying for future projects.

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

Questions for the Native Village of Kwigillingok

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. How did past energy efficiency and renewable energy projects go, such as the Water Treatment Plan energy audit and the wind turbine installation? What did the community like or dislike about the projects?

2. Which buildings would the Native Village of Kwigillingok like us to audit? The project can audit 4-8 Tribal buildings, and ANTHC can pay for additional audits.

DOE audits:
- Main office
- Heath clinic
- Post office
- Tribal police department
- Fisheries support building
- Bunkhouse

ANTHC audits:
- National Guard building
- Kwig, Inc. store
- Kwig, Inc. marina
- Russian Orthodox Church
- Maravian Church

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

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

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

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

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

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

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

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

Project contacts

CCHRC - Conor Sosebee (907-450-1782, conor@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 received energy audits through this project, there are seven other buildings in Kwigillingok with existing energy audits, shown in the table below.

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

Building	Audit date
National Guard Armory	May 2018
Russian Orthodox Church	May 2018
Kwik Inc. Store	May 2018
Moravian Church	May 2018
Marina	May 2018
Kwigillingok Washeteria	August 2016
Kwigillingok Water Treatment Plant	August 2016

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 Kwigillingok 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 seven buildings would benefit from a lighting retrofit to replace the current bulbs with LEDs, and every building except the Russian Orthodox Church would save energy by installing programmable thermostats and implementing unoccupied temperature setbacks. Other cost-effective recommendations seen in the following audit summaries include installing occupancy sensors for lighting, replacing heating appliances with more efficient models, and installing additional insulation. If a retrofit project were to address the recommendations of all four audits, the building owners could collectively save over $63,000 in energy costs each year.

National Guard armory

Energy audit completed May 29, 2018 by Energy Audits of Alaska

1,500 square foot building

Annual energy cost per square foot: $6.63/SF

Predicted annual energy cost per square foot if all recommendations are implemented: $5.16/SF

Building description

The National Guard Armory was constructed in 2005 but was vacant and winterized at the time of the audit. The building is projected to become an office building with 8 occupants from 9am to 5pm , Monday through Friday. The exterior walls of the armory are constructed with 2x6 studs and are presumed to have R-19 batt in their cavities. The building has two Toyo laser 73 heaters and a Nordic Deluxe 400 diesel drip stove. At current rates, it would cost approximately $9,938 annually for the electricity and other fuel costs.

Recommendations

The energy audit includes a list of priorities that are cost-effective and have a fast payback period. Temperature control was one of the highest priority energy efficiency measures (EEMs). Implementing a heating temperature setback of 63 degrees Fahrenheit in the office and open space, during unoccupied hours, would cost $300 to install and would save $1,152 per year. This investment would pay off in just 0.3 years.

Improving the lighting is another simple upgrade. Since this building currently uses fluorescent lighting, converting to more efficient LED lighting can provide a significant increase in efficiency. For example, performing this change in the main room, two small rooms, toilet and storage, wall packs, exterior lighting, and INC-A-60W would cost about $3,205 and save $1,167 per year. This investment would take only 2.75 years to pay off.

A comprehensive retrofit for the armory would reduce annual energy costs by over $2000 and pay back in less than two 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 suggested several ECMs, including maintaining air sealing, turning off plug loads, and scheduling regular inspections of each piece of HVAC equipment within the building.

Post-retrofit expectations

If all of the Energy Efficiency Measures recommended in the audit are completed, the annual costs can be reduced by $2,300 . These measures are estimated to cost $3,505 for an overall simple payback of 1.5 years.

Table 1: If the building owner implements all the recommendations, energy costs would decrease by over $2,200 per year.

Improvement description	Predicted annual energy savings	Estimated installation cost	Simple payback (years)
Replace INC-A-60W with 3 LED 8W Module StdElectronic	$126	$15	0.1
Implement a Heating Temperature Unoccupied Setback to 63.0 deg F for the open and Office space.	$1,152	$300	0.3

Replace exterior lighting and wall pack lighting with LED 17W Module StdElectronic	$307	$380	1.2
Replace main room and two small rooms lights with 18 LED (2) 15W Module StdElectronic, direct wire.	$574	$2,408	3.6
Replace toilet and storage lights with 3 LED (2) 15W Module StdElectronic, direct wire.	$35	$402	8.0
TOTAL, all measures	**$2,195** **+ $125 Maint. Savings**	**$3,505**	**1.5**

Russian Orthodox church

Energy audit completed May 29, 2018 by Energy Audits of Alaska

960 square foot building

Annual energy cost per square foot: $1.65/SF

Predicted annual energy cost per square foot if all cost-effective recommendations are implemented: $1.65/SF

Building description

The Russian Orthodox Church was constructed around 1970 with a normal occupancy of 21 people during church services. Services are held once per month and last 2-3 hours. The exterior walls of the church are constructed with 2"x4" wood studs and are presumed to have R-11 batt in their cavities. The building has a Toyo laser 76 oil heater and a Steffes 2105 electric heater that is used as a dispatchable load when the power plant receives excess wind. At current rates and usage, it would cost approximately $1,588 annually for electricity and fuel costs.

Due to its low occupancy, the only retrofit recommended for the church is a lighting upgrade.

Recommendations

Due to the very low occupancy and usage, the payback periods of improvements to this building are generally longer than their useful life. From a strict financial perspective, only one recommendation is justified.

This energy efficiency measure (EEM) is to replace the INC-A-60W light with an LED 8W Module StdElectronic light. Implementing this measure would cost $5 and save $1 annually, paying off after 3.7 years.

Energy efficiency measures that are NOT recommended

A number of measures were identified in the audit that were not determined to be cost-effective by the energy model. While they may improve the building, these measures are not recommended because they may save only a small amount of energy or be too expensive to install. For example, installing extra insulation on the walls would make the church more energy efficient but would not yield enough energy savings to justify the upfront cost. Additionally, replacing existing windows with more efficient vinyl windows could improve comfort but would take nearly 227 years to recoup the investment.

Post-retrofit expectations

If the cost-effective Energy Efficiency Measure in the audit is completed, the annual costs can be reduced by $1 . This measure is estimated to cost $5 for an overall simple payback of 3.7 years.

Table 2: If the building owner implements all the cost-effective recommendations, the energy costs would decrease by $1 per year.

Improvement description	Predicted annual energy savings	Estimated installation cost	Simple payback (years)
Replace INC-A-60W with LED 8W Module StdElectronic	$1	$5	3.7
TOTAL, cost-effective measures	$1	$5	3.7

Kwik Inc. store

Energy audit completed May 29, 2018 by Energy Audits of Alaska

4,160 square foot store

Annual energy cost per square foot: $4.36/SF

Predicted annual energy cost per square foot if all recommendations are implemented: $2.89/SF

A lighting upgrade is the top recommendation for the store.

Building description

The store was constructed around 1985, with a normal occupancy of 5-7 staff members and 50-100 customers visiting daily. The building is in operation for 9 hours on average, every day of the week. The exterior walls of the store are constructed with 2x6 studs and are presumed to have R-19 batt in their cavities. The building is heated by a Toyo laser 73 heater and a Baisi boiler. At current rates, it costs approximately $18,156 annually for the electricity and other fuel costs.

Recommendations

The energy audit includes a list of priorities that are cost-effective and have a fast payback period. Temperature control was one of the highest priority energy efficiency measures (EEMs). Implementing a heating temperature setback of 60 F in the office and 63 F in the store, during unoccupied hours, would cost $600 to install and would save $648 per year. This investment would pay off after just one year.

Improving the lighting is another simple upgrade. Since this building currently uses fluorescent lighting, converting to more efficient LED lighting can provide a significant increase in efficiency. For example, performing this change in the rear entry, bathroom, wall packs, retail space, office, entryway, and boiler room would cost about $3,880 and save $1,510 per year. This investment would take only 2.6 years to pay off.

The Kwik Store's boiler is more than 20 years old and is at or approaching its end of useful life (EOL). Replacing this boiler with a new boiler at 87% thermal efficiency will save energy. Concurrently with this upgrade, the constant speed circulation pumps should be replaced with variable speed pumps. These changes would cost about $38,000 and have a combined heating and maintenance savings of $2,112. The payback time on this investment is 18 years.

Another cost-effective measure is to add a CoolingMiser to the single door display and double door display refrigerators. This would cost about $948 and would save $680 every year.

Adding R-21 blown cellulose insulation to the attic with Standard Truss would cost $15,928, paying off in 8.3 years and continuing to save a round $1,918 every year after that.

Energy conservation measures

Energy conservation measures (ECMs), or operations & maintenance (O&M), is an opportunity to save money without capital investment. A well-implemented O & M plan is often the driving force behind energy savings. The audit suggested several ECMs, including maintaining air sealing, turning off plug loads, and scheduling regular inspections of each piece of HVAC equipment within the building. It is recommended to implement a basic energy monitoring system for this building, including installation of a cumulative fuel oil meter on the oil day tank.

Specific ECM recommendations for the Kwik Store included replacing refrigeration equipment at the EOL with Energy Star Versions. Other recommendations include cleaning the refrigeration coils, keeping heating coils clean and inside the air handlers, and turning off gas valves on gas consuming appliances when they are not in use.

Post-retrofit expectations

If all of the Energy Efficiency Measures recommended in the audit are completed, the annual costs can be reduced by $7,300 . These measures are estimated to cost $59,100 for an overall simple payback of 8.1 years.

Table 3: If the building owner implements all the recommendations, the energy costs would decrease by over $7,300 per year.

Improvement description	Predicted annual energy savings	Estimated installation cost	Simple payback (years)
Replace rear entry and bathroom lighting with 2 LED 8W StdElectronic	$110	$10	0.1
Implement a Heating Temperature Unoccupied Setback to 60.0 deg F for the Office space.	$233	$100	0.4

Implement a Heating Temperature Unoccupied Setback to 63.0 deg F for the Store space.	$415	$500	1.2
Add CoolingMiser; in single door display refrigerator www.vendingmiser.com	$483	$340	0.7
Add CoolingMiser; in two door display refrigerator www.vendingmiser.com	$465	$340	0.7
Replace wall pack lighting with LED 34W Module StdElectronic	$164	$195	1.1
Replace entry wall pack lighting with 2 LED 17W Module StdElectronic	$165	$330	1.8
Replace retail and office space lights with 22 LED (2) 15W Module StdElectronic, direct wire lamps	$1,009	$2,943	2.6
Add R-21 blown cellulose insulation to attic with Standard Truss.	$1,918	$15,928	8.3
Replace entryway lights with LED 15W Module StdElectronic	$30	$114	3.2
Replace officeT8-4 light with LED (4) 15W Module StdElectronic, direct wire	$17	$114	5.1
Replace boiler room light with LED (4) 15W Module StdElectronic, direct wire	$15	$174	7.0
Replace old boiler with a new boiler having 87% thermal efficiency	$1,112	$38,000	18.0
TOTAL, all measures	**$6,137** **+ $1,160 Maint. Savings**	**$59,088**	**8.1**

Moravian church

Energy audit completed May 23, 2018 by Energy Audits of Alaska

6,512 square foot building

Annual energy cost per square foot: $3.21/SF

Predicted annual energy cost per square foot if all recommendations are implemented: $2.55/SF

Building description

The Moravian Church was constructed in 2015, with an average occupancy of 21 people for 3.5 hours per day, every day of the week. The exterior walls of the church are constructed with 2"x6" wood studs and are presumed to have R-19 batt in their cavities. The building is heated by three Toyo Laser 56 and two Toyo Laser 73 heaters, a Rheem water heater, and a Steffes 2105 that is used as a dispatch-able load when the power plant receives excess wind. At current rates, it costs approximately $20,891 annually for the electricity and other fuel costs.

Recommendations

The energy audit includes a list of priorities that are cost-effective and have a fast payback period. Temperature control was one of the highest priority energy efficiency measures (EEMs). Programming a heating temperature setback of 60 F, during unoccupied hours, requires no installation and would save $2,809 per year.

Improving the lighting is another simple upgrade. Since this building currently uses fluorescent lighting, converting to more efficient LED lighting can provide a significant increase in efficiency. For example, performing this change in the outdoor wall, surf wrap, and surf wrap core zone would cost about $2,658 and save $953 per year. This investment would take only 2.8 years to pay off.

Another cost-effective measure is to add an insulating blanket to the electric hot water heater. Completing this action would cost about $50 and take 1.7 years to 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. This is the case for lighting improvements in all other areas of the church. Although not cost-effective, these improvements are included in the audit because they may be selected for reasons other than cost.

Energy conservation measures

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

Specific ECM recommendations for the church included purchasing electronic timers and power strips for large copy/scan/fax machines or other appliances with a sleep cycle. Another recommendation is to replace refrigeration and cooking equipment, once their end of useful life has been reached, with more efficient Energy Star versions.

Post-retrofit expectations

If all of the cost-effective Energy Efficiency Measures recommended in the audit are completed, the annual costs can be reduced by $3,800. These measures are estimated to cost $2,700 for an overall simple payback of 0.7 years.

Table 4: If the building owner implements all the cost-effective recommendations, the energy costs would decrease by over $3,800 per year.

Improvement description	Predicted annual energy savings	Estimated installation cost	Simple payback (years)
Implement a Heating Temperature Unoccupied Setback of 60.0 deg F.	$2,809	$1	0.0
Add insulating blanket to the electric hot water heater.	$29	$50	1.7
Replace outdoor wall light with 2 LED 8W Module StdElectronic.	$778	$1,320	1.7
Replace surf wrap light with LED 8W Module StdElectronic.	$21	$134	5.1
Replace surf wrap core zone light with 3 LED 8W Module StdElectronic.	$104	$1,204	8.1
TOTAL, cost-effective measures	**$3,741** **+ $50 Maint. Savings**	**$2,709**	**4.7**

Marina

Energy audit completed May 29, 2018 by Energy Audits of Alaska

1,456 square foot building

Annual energy cost per square foot: $5.34/SF

Predicted annual energy cost per square foot if all recommendations are implemented: $4.44/SF

A lighting upgrade and attic insulation would reduce the energy use of the marina building.

Building description

The Marina was constructed around 1995, with a normal occupancy of 2 staff members and 10-15 customers visiting daily. The building is in operation for 4.2 hours on average, every day of the week. The exterior walls of the Marina are constructed with 2”x6” studs and are presumed to have R-19 batt in their cavities. The building is heated by a Monitor 2400 and Norodyne furnace. At current rates, it costs approximately $7,775

annually for the electricity and other fuel costs.

Recommendations

The energy audit includes a list of priorities that are cost-effective and have a fast payback period. Improving lighting efficiency was the most common energy efficiency measure (EEM). The building currently uses fluorescent lighting. Converting to more efficient LED lighting provides a significant increase in efficiency. For example, performing this change on the entrance, storage, shop, attic, and T8-2-strip, would cost about $838 and save $570 per year. This investment would take only 1.5 years to pay off. Additionally, implementing a 63 F heating temperature setback during unoccupied hours would save about $443 annually.

Another cost-effective measure is to remove plywood and stored items from the attic space and add R-21 blown cellulose insulation to the attic with Standard Truss. Completing this action would cost about $5,113 and pay back after 15.7 years.

Energy efficiency measures that are NOT recommended

A number of measures were identified in the audit that were not determined to be cost-effective by the energy model. While they may improve the building, these measures are not recommended because they may save only a small amount of energy or be too expensive to install. For example, installing extra insulation on the walls would make the Marina more energy efficient but would not yield enough energy savings to justify the upfront cost. Additionally, replacing the window with a cracked pane could improve comfort but would take nearly 25 years to recoup the investment.

Energy conservation measures

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

Specific ECM recommendations for the Marina included purchasing electronic timers as power strips for large copy/scan/fax machines or other appliances with a sleep cycle. Another recommendation is to Sub-meter, or closely monitor the electric consumption in the shop (and for the entire building) to identify the excessive electric load.

Post-retrofit expectations

If all of the cost-effective Energy Efficiency Measures recommended in the audit are completed, the annual costs can be reduced by $1,337. These measures are estimated to cost $6,251 for an overall simple payback of 4.7 years.

Table 5: If the building owner implements all the cost-effective recommendations, the energy costs would decrease by over $1,300 per year.

Improvement description	Predicted annual energy savings	Estimated installation cost	Simple payback (years)
Replace entrance light with LED 8W Module StdElectronic	$288	$5	0.0
Replace storage light with LED 8W Module StdElectronic	$41	$5	0.1
Replace shop lights with 2 LED 8W Module StdElectronic	$66	$10	0.2
Implement a Heating Temperature Unoccupied Setback to 63.0 deg F for the Store space.	$443	$300	0.7
Replace attic lights with 3 LED 8W Module StdElectronic	$25	$15	0.6
Replace T8-2-strip with 6 LED (2) 15W Module StdElectronic, direct wire	$120 + $30 Maint. Savings	$803	5.4
Add R-21 blown cellulose insulation to attic with Standard Truss after removing stored items and plywood. Do not store new items afterwards	$325	$5,113	15.7
TOTAL, cost-effective measures	**$1,307** **+ $30 Maint. Savings**	**$6,251**	**4.7**

Kwigillingok washeteria

Energy audit completed August 24, 2016 by Alaska Native Tribal Health Consortium

1,645 square foot facility

Annual energy cost per square foot: $22.67/SF

Predicted annual energy cost per square foot if recommendations are implemented: $19.20/SF

Building description

The washeteria was originally built in 2010 and has a normal occupancy of 4 people for 7.7 hours every day. The exterior walls of the washeteria are constructed with single stud 2x6 lumber construction and approximately 5.5 inches of polyurethane panel insulation. Four Burnham boilers provide space heat , At 2016 fuel rates, the Native Village of Kwigillingok paid approximately $37,288 annually for the electricity and other fuel costs associated with operation of the Kwigillingok Water Treatment Plant.

Recommendations

The energy audit includes a list of priorities that are cost-effective and have a fast payback period. Improving lighting efficiency was the most common energy efficiency measure (EEM). The building currently uses fluorescent lighting. Converting to more efficient LED lighting provides a significant increase in efficiency. For example, performing this change on the front office, main room, entryway, boiler room, storage room, and bathrooms, would cost about $2,120 and save $900 per year. This investment would take only 2.4 years to pay off.

The most desirable action, with a payback time of just 2 months, is to program the thermostat to a heating setback of 60 F during unoccupied hours. This action would save $1,353 annually.

Additionally, the broken solenoid valve on the clothes dryer can be replaced with a more efficient Belimo valve. Completing this action would save $1,533 annually and cost $3,000 to implement. This would pay back after just 2 years and it would improve the dryer's run time as well.

Cleaning lint traps regularly would also save energy because the dryers would not have to run as long and the plenum vent would not have to run as often. If this action is completed, $777 can be saved every year.

The building operator should be trained on how to maintain the boiler. This involves practices such as cleaning boilers to reduce idle losses, replacing hi-lo limit controllers, and reprogramming the Tekmar boiler controller to stage boilers in a way that enables them to run cold more often. A larger expansion tank should also be installed in line with boiler #3 to bring it back into commission. This would save about $1,235 every year and would cost about $8,000, paying back after 6 years.

Post-retrofit expectations

If all of the Energy Efficiency Measures recommended in the audit are completed, the annual energy costs can be reduced by $5,703 in energy savings and an additional $200 in maintenance savings. These measures are estimated to cost $14,400 for an overall simple payback of 2.4 years.

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

Improvement description	Predicted annual energy savings	Estimated installation cost	Simple payback (years)
Implement a heating setback of 60 deg F in the Washeteria during unoccupied hours.	$1,353	$200	0.1
Clean dryer lint traps regularly so that dryers don't run as long and plenum vent doesn't have to run as often.	$777	$500	0.6
Replace front office lights with new energy-efficient LED lighting.	$124	$160	1.3

Replace main room lights with new energy-efficient LED lighting.	$494	$640	1.3
Replace dryer's broken solenoid valves with Belimo valves to improve dryer efficiency and reduce electrical consumption and run time.	$1,533	$3,000	2.0
Replace entryway light with new energy-efficient LED lighting.	$23	$60	2.6
Clean boilers, replace hi-lo limits controllers, install larger expansion tank to address boiler #3 expansion issues, reprogram Tekmar boiler controller.	$1,039 + $200 Maint. Savings	$8,000	6.5
Replace boiler room lights with new energy-efficient LED lighting, replace manual switch with occupancy sensor.	$205	$980	4.8
Replace bathroom 1, light 1 with new energy-efficient LED lighting.	$4	$20	4.9
Replace bathroom 1, light 2 with new energy-efficient LED lighting	$8	$40	4.9
Replace bathroom 2, light 2 with new energy-efficient LED lighting	$4	$20	4.9
Replace bathroom 2, light 1 with new energy-efficient LED lighting	$8	$40	4.9
Replace bathroom 1, light 3 with new energy-efficient LED lighting	$8	$40	5.1
Replace storage room lights with new energy-efficient LED lighting	$23	$120	5.2
Perform air sealing to reduce air leakage by 5%.	$97	$500	5.2
Replace mop room lights with new energy-efficient LED lighting	$1	$20	24.7
Replace dryer plenum lights with new energy-efficient LED lighting	$2	$60	25.8
TOTAL, all measures	**$5,703 + $200 Maint. Savings**	**$14,400**	**2.4**

Kwigillingok Water Treatment Plant

Energy audit completed August 24, 2016 by Alaska Native Tribal Health Consortium

2,065 square foot facility

Annual energy cost per square foot: $30.54/SF

Predicted annual energy cost per square foot if recommendations are implemented: $8.95/SF

Building description

The water treatment plant was originally built in 2010, with a normal occupancy of 1 person for 6 hours every day. The exterior walls of the water treatment plant are constructed with single stud 2”x6” lumber construction and approximately 5.5 inches of polyurethane panel insulation. Waste heat is recovered from the power plant all year, and during the winter two oil-fired boilers are used to meet remaining heating needs. At current rates, the Native Village of Kwigillingok pays approximately $63,070 annually for the electricity and other fuel costs associated with operation of the Kwigillingok Water Treatment Plant.

Recommendations

The energy audit includes a list of priorities that are cost-effective and have a fast payback period. Improvements to electrical controls were among the highest prioritized energy efficiency measures (EEM’s). This included installation of switches with clear on/off indicators for heat tapes in the raw water pump house, clinic sewer, and new and old laundry. Additionally, these heat tapes should only be run for freeze-up recovery. Completing this action would cost $2,000 and save about $10,294 annually.

Repairing leaks in the raw water transmission line would allow the operator to circulate heated water during the winter instead of running heat tape. This measure would cost about $40,000 to complete and would save about $36,621 each year, paying off in just over 1 year.

Lighting was another priority. The building currently uses fluorescent lighting. Installing occupancy sensors and converting to LED lighting, provides a significant increase in efficiency. For example, performing this change for the boiler room, the loading door, and the main process room, would cost about $2,630 and save $2,150 per year. This investment would take only 1.2 years to pay off.

The water treatment plant operator should be trained on how to operate an ideal circulating pump schedule for heating the water storage tank. This involves practices such as only using the circ pumps during the winter and alternating circ pump usage so that only one is in use at any given time. This would save about $903 every year and the training would cost about $500.

Post-retrofit expectations

If all of the Energy Efficiency Measures recommended in the audit are completed, the annual utility costs can be reduced by $44,506 in energy savings and an additional $8,550 in maintenance savings. These measures are estimated to cost $67,570 for an overall simple payback of 1.3 years.

Table 7: If the building owner implements all the recommendations, the energy costs would decrease by over $44,000 per year.

Improvement description	Predicted annual energy savings	Estimated installation cost	Simple payback (years)
Install switch with clear on/off indicator for clinic sewer heat tape and use only for freeze-up recovery.	$3,671	$500	0.1
Install switch with clear on/off indicator for raw water heat tape and use only for freeze-up recovery.	$3,166	$500	0.2
Install switch with clear on/off indicator for new laundry heat tape and use only for freeze-up recovery.	$2,600	$500	0.2
Two circ pumps were running in parallel to heat the water storage tank. Pumps should be alternated with only one running at a time.	$903	$500	0.6
Replace Goldline on heat recovery with Tekmar 156 diff setpoint controller, reprogram so that pump only runs when there is a demand for heat in the Water Treatment Plant.	$2,003	$1,000	0.5
Replace main process room lights with new energy-efficient LED lighting, replace manual switching with occupancy sensor.	$1,415	$1,500	1.1
Install switch with clear on/off indicator for raw water heat tape section 1, 2, &3 and use only for freeze-up recovery. Repair all leaks.	$28,621 + $8,000 Maint. Savings	$40,000	1.1
Install switch with clear on/off indicator for old laundry heat tape and use only for freeze-up recovery.	$857	$500	0.6
Replace loading door light with new energy-efficient LED lighting.	$93	$150	1.6
Replace boiler room light with new energy-efficient LED lighting.	$608	$980	1.6

Build smaller plywood box around the old WTP electric space heater's connection point, install thermostat to run heater only at temps below 36 deg F.	$833	$3,000	3.6
Reprogram Tekmar boiler controller, clean boilers, replace hi-low limit controls, clean up wiring on boilers, relocate waste heat sensor to return line, insulate, reposition circ pump.	$1,099 + $200 Maint. Savings	$4,400	3.4
Replace office lights with new energy-efficient LED lighting.	$12	$80	6.8
Replace bathroom light with new energy-efficient LED lighting.	$6	$40	6.8
Implement a heating setback of 60 deg F in the Water Treatment Plant during unoccupied hours.	$281	$2,400	8.5
Replace WST connection heat tapes with single heat tape, control using thermostat so that heat tape only runs at temps below 36 deg F.	$89	$1,000	11.3
Replace bathroom sink light with new energy-efficient LED lighting.	$2	$40	16.3
Perform air sealing to reduce air leakage by 5%.	$39	$500	12.8
Replace counter space lights with new energy-efficient LED lighting.	$4	$120	32.6
Replace chemical room lights with new energy-efficient LED lighting.	$2	$160	88.9
Replace both circ pumps (one is broken) with Magnas, install flow meter, flow sensor to better control circulation rates, move soda ash injector to avoid clogging heat exchanger, clean heat exchanger. Necessary to realize savings from changes in raw water heat tape controls.	-$1,798 + $350 Maint. Savings	$9,700	999.9
TOTAL, all measures	**$44,506 + $8,550 Maint. Savings**	**$67,570**	**1.3**

APPENDIX C: OUTREACH MATERIALS

While the main goal of the Kwigillingok 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 Kwigillingok 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

CCHRC

Kwigillingok 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 Kwigillingok in December 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.

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

- Jim Fowler and Richard John collected baseline energy data on the buildings in the project and wrote plans to continue to track the data.

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

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

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

Preliminary Findings from Tribal Building Surveys

Jim Fowler (energy auditor from Energy Audits of Alaska) completed a short report on preliminary findings after conducting building surveys in December 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 6 tribal buildings that are participating in the project:

- IRA office building
- Clinic
- Post office
- Tribal police department building
- Fisheries support building
- ANTHC bunkhouse

There are three primary community needs:

1. There is a need for an individual to perform energy efficiency checks each month, completing tasks such as checking programmable thermostats, monitoring fuel consumption, and addressing occupant comfort complaints.

2. Renovate or replace the IRA office building.

3. Increase utilization and generation of wind-generated electricity. Mr. Fowler observed that the wind turbines do not always all operate, and that some of the electric heaters that use excess wind-generated electricity were not operating.

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 and doors.
2. Adding insulation to attics and walls.
3. Air-sealing the floors, walls, and ceilings.
4. Turning off or replacing electrical appliances.
5. Installing programmable thermostats.
6. Replacing lighting with LED bulbs.
7. Adding occupancy sensors.

The completed energy audits will be a part of the Energy Action Plan. We hope to present a draft of the Energy Action Plan to the Tribal Council later this year so that we can listen to your feedback on its contents.

PROJECT CONTACTS

CCHRC - 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)

TOYO SET BACK INSTRUCTIONS

* IF CLOCK IS FLASHING, TOYO NEEDS TO BE RESET

5 Auto Mode

Push AUTO button to activate Set Back mode

4 Set Back

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

1 Reset Clock

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

2 Start Set

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

3 Stop Set

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

Kwigillingok Energy Efficiency Project

In 2017, the Native Village of Kwigillingok 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 six 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.

Three of the buildings in the project have energy costs of nearly $10,000 per year, and following all the recommendations in the Energy Action Plan can result in over $10,000 in savings annually. The tribal maintenance personnel and building occupants have already begun to act on these recommendations, and the dedicated tribal staff and Tribal Council are now looking towards the next steps to realizing safe, comfortable, and energy efficient tribal buildings.

Cold Climate Housing Research Center
CCHRC

U.S. Department of Energy
Office of Indian Energy

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

SCOPES OF WORK

For energy efficiency upgrades recommended for
The Native Village of Kwigillingok

Prepared For

Native Village of Kwigillingok
Darrell T. John, Tribal Administrator
P.O. Box 90
Aniak, AK 99622
kwigtribe@gmail.com
907-588-8114

May 18, 2019

Prepared By:
James Fowler, PE, CEM
Energy Audits of Alaska
200 W 34th Ave, Suite 1018
Anchorage, AK 99503
jim@jim-fowler.com

Energy Audits of Alaska

Table of Contents

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

	HVAC & DHW			Lighting			Envelope			
Building	Other	Controls	Hot water heating	Interior	Exterior	Controls	Air Sealing	Doors	Insulation & other	Windows
IRA Council Office	Replace 1 bath fan with unit with integral humidistat and occupancy sensor	Program 2 Toyo Stove setback thermostats	Add R-9 insulation blanket to hot water heater		Retrofit 1HID entry wall pack with LED				Blow in R-42 attic insulation	Replace existing window with U-0.22 unit
	Add 1 remote bulb thermostat and controls to electric heat trace				Retrofit 1 incandescent wall pack with LED					
Clinic	At EOL of existing furnace, replace with 85% efficient unit with ECM fan motor	Program 3 Toyo Stove setback thermostats	At EOL of existing water heater, replace with high efficiency model	retrofit 27 T8 fixtures & 53 lamps with LED						
	Add 2 occupancy sensor to existing bathroom exhaust fan switches	Install 7-day programmabl e thermostat in west wing	Add R-9 insulation blanket to hot water heater		replace 2 HID wall packs with LED					
ANTHC Bunkhouse	Remove 2 electric wall convectors, replace with 1 new Toyo Laser 72	Program 2 Toyo Stove setback thermostats		retrofit 20 T8 fixtures & 40 lamps with LED	replace 2 HID wall packs with LED		Seal all floor, wall and ceiling penetra tions		Blow in R-42 attic insulation	
	Replace 3 bathroom exhaust fans with units with integral humidistat and occupancy sensor			retrofit 1 T8-U Tube fixture with 2 lamps with LED						
	Replace 1 existing clothes washer with new front loading, Energy Star washer									
Fisheries Building	Add 1 occupancy sensor to bathroom lights and fan	Program 2 Toyo Stove setback thermostats	Add R-9 insulation blanket to hot water heater	retrofit 1 CFL A-type with LED		add 2 occupancy sensors to corridor and computer room lights				

Building	HVAC & DHW			Lighting			Envelope			
	Other	Controls	Hot water heating	Interior	Exterior	Controls	Air Sealing	Doors	Insulation & other	Windows
	At EOL of existing furnace, replace with 85% efficient unit with ECM fan motor									
VPSO Office		Program 1 Toyo Stove setback thermostat		replace 3 Incandescent or CFL A-type bulbs with LED	replace 1 CFL-A type bulb in arctic entry with LED	add 1 occupancy sensor to bathroom light and fan switch				
				retrofit 1 T8 fixture & 4 lamps with LED						
Post Office	Add 1 occupancy sensor to bathroom lights and fan	Program 2 Toyo Stove setback thermostats		retrofit 22 T8 fixtures & 44 lamps with LED	replace 7 HID wall packs with LED	Add 3 occupancy sensors to rear space and lobby				

1. HVAC & DHW

a. CONTROLS

i. Programmable Setback thermostat

- Contractor shall identify the zone valve, wall convector, electric baseboard of heating coil valve controlled by existing thermostat.
- Field verify control voltage.
- Field verify proper operation of controlled component (zone valve, control valve, damper actuator, baseboard convector, etc.)
- If new thermostat requires 3 or more signal wires, field verify that sufficient conductors exist and there are no shorts or breaks in conductors.
- If insufficient conductors exist, run new signal wire, verify no shorts or break 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.

b. HOT WATER HEATING

i. Clinic Hot Water Heater (HWH) replacement

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

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

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

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

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

Reconnect flue and confirm proper installation with no leaks.
Reconnect oil supply; confirm proper installation and no leaks.
Confirm oil supply is properly filtered and oil meets manufacturer's requirements.
Reconnect electric supply.

Reconnect plumbing, confirm no leaks.
Confirm water hardness, PH, and chlorination are within manufacturer's recommended range.
Set water temperature to occupant preference.
Confirm proper operation of unit and proper water temperature is produced.

ii. Hot water heater insulation blanket

If hot water heater storage tank remains in use, contractor shall install an insulation blanket with minimum insulation value of R-9 per manufacturer instructions.

c. OTHER

i. Furnace Replacement

Clinic

Existing equipment: Metzger Machine model WHBO-12A, SN 984014320, 140 MBH capacity.

Fisheries Building

Existing Equipment: American Standard model AHV1M087A936SAA, SN 6084523DX, 105 MBH capacity.

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

- 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.
- 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. 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.
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.

iii. 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.

iv. Install new direct vent heating stove - ANTHC Bunkhouse

Existing wall convectors:

- Cadet model 1402, 4kW
- Broan model 192-B, 2 kW

Contractor shall disconnect 2 existing electric wall convectors and abandon in place as follows:

- Safely disconnect electric power and turn off at breaker.

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

- Minimum 20 MBH heating capacity.
- Maximum 76w 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 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.

v. Install heat trace controls – IRA Council Office

This scope covers the installation of temperature based controls on the electric heat trace on the building's waste-water plumbing.

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 heat traces off when OSAT >38F.
- Turns heat traces on when OSAT = 37F or below.
- Has sufficient capacity to handle the existing heat trace amperage and voltage.
- Maximum throttling range of 2F.

Contractor shall confirm proper operation of unit after installation.

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 owners 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 warrantee.
- Color temperature shall be between 4000K-5000K.

Contractor to install as follows:

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

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, otherwise dispose of properly.

- Replace socket as necessary.
- Connect electric supply to new socket.
- Clean fixture and lens.
- Close fixture, turn electric service on, test for proper operation.

c. *LIGHTING CONTROLS*

Occupancy Sensors

Contractor shall install new occupancy sensors with the following requirements:

- Sensor shall be utilize passive infra-red, ultrasonic or dual technology and shall mounted in existing switch location or ceiling.
- Sensor shall have a programmable “lights off” delay, program delay to owner preference.
- Sensor shall control all lights in the room.

Sensors will be installed in the following spaces:
Fisheries Building – corridor ceiling, computer room
Post Office – rear work and storage area, lobby
VPSO Office - bathroom

3. ENVELOPE UPGRADES

a. *AIR SEALING*

Contractor shall seal all wall, floor and ceiling penetrations in the ANTHC bunkhouse.

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 in ANTHC Bunkhouse and IRA Council Office

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.

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 R-42 cellulose or other insulation per manufacturer's recommendation.
Insulate access hatch with minimum R-42.
Install baffles as required.
Confirm that attic is vented properly, add venting as needed.

c. WINDOW REPLACEMENT

IRA Council Office – SW boarded up window

The following windows shall be replaced in the IRA Council Office:

West wall, bathroom window, quantity 1, 2'9" x 2'9", slider

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 facia, trim, exterior siding and repaint to match existing.
- Repair any damaged interior walls and finish and paint to match existing.
- Final caulk and seal.