DOE Award No.	DE-IE0000050
Project Title	Technical Assistance for Rural Alaska Tribal Energy Solutions
Recipient Organization:	Alaska Native Tribal Health Consortium (ANTHC)
Project Location	Alaska Statewide
Project Period	Start: 09/01/2016 End: 09/30/2022
Total Project Costs:	$589,549
DOE Share:	$530,589
Recipient Cost Share:	$58,960
Project Manager:	Bailey Gamble, bbgamble@anthc.org

Acknowledgment

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Disclaimer

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Executive Summary

The original intent of this project was to provide technical assistance (TA) to rural Tribal communities across all regions of Alaska with a focus on public infrastructure. The Alaska Native Tribal Health Consortium (ANTHC) met this goal by providing more than 48 instances of energy-related technical assistance to rural Alaska Native communities, many of which led to them securing funding and implementing new projects that contributed to reducing the high cost of energy.

Additionally, the Department of Energy (DOE) Office of Indian Energy staff saw the benefits of the energy technical assistance services being provided by ANTHC and, recognizing the value of having a trusted tribal non-profit entity providing technical support to its membership, amended the project to include standardization of TA services, internal capacity building, and regional outreach. This amended scope allowed ANTHC to streamline and standardize its technical assistance process, provide outreach to rural Alaska Native communities about DOE and ANTHC's technical assistance program, and improve the ability of staff to provide even higher quality technical deliverables in support of energy projects.

Overall, this project was successful in using technical assistance to empower both rural Alaska Native communities and the Alaska Native Tribal Health Consortium to develop and deploy energy efficiency and renewable energy solutions that will reduce the extremely high energy cost burdens facing Tribal communities in Alaska.

Background

Part of the U.S. Department of Energy, Office of Indian Energy's mission is to fund and implement a variety of programmatic activities that assist American Indian Tribes and Alaska Native villages with energy cost reductions. To advance this mission, the Office of Indian Energy awarded $530,589 in grant funding (and $58,960 in matching funds provided by ANTHC) to ANTHC to carry out technical assistance for communities across Alaska. With technical assistance requests diminishing during the initial stages of the COVID-19 pandemic, this award was amended to include internal training and technical assistance standardization for ANTHC staff, increasing the ability of this Tribal non-profit to provide the highest quality energy support the Tribes and Alaska Native people that make up its membership.

The Alaska Native Tribal Health Consortium is a non-profit Tribal health organization designed to meet the unique health needs of Alaska Native and American Indian people living in Alaska. In partnership with communities and health organizations across the state, ANTHC provides health services to over 175,000 Alaska Native and American Indian people. Part of ANTHC's mission includes ensuring that rural Alaska Native communities have access to clean and safe water and sewer services. ANTHC works with communities to provide safe drinking water and healthy wastewater services that directly supports the health of Alaska Native people.

Rural Alaska water and sanitation systems can make up nearly 1/3 of a community's energy use, and on average energy accounts for 39% of the total cost of operating and maintaining this essential public health infrastructure. Residents of Alaska's rural communities are burdened with the high cost of energy to operate and maintain these utilities through paying user fees; the State of Alaska Department of Environmental Conservation estimates that 56% of rural communities have a high-cost burden due to the limited ability of households to pay these fees. ANTHC's Rural Energy Program develops and

implements renewable energy and energy efficiency projects to reduce the cost of energy so that communities are able to afford to operate and maintain their water and sanitation services.

Project Objectives and Activities Performed

The objective of this project was to provide tribes across Alaska with technical assistance and assist in developing energy projects, overcoming the barriers limiting the implementation of energy projects. In providing the tribes with reliable engineering documents and financial assessments, it is ANTHC's goal to help identify, and assist in the obtaining of, new project funding.

Activities performed under this technical assistance award provided technical documentation to Tribes that outlined solutions to address the current high energy costs associated with operating and maintaining public infrastructure. This project allowed the ANTHC Rural Energy Program to expand its services to include auditing and energy improvement planning for all public facilities within a community, as well as enable its staff to lead communities in strategic energy planning efforts.

Table 1: Completion Dates of Milestones from the Statement of Project Objectives

Task Number	Description	Milestone Verification	Completion Date
1.1	Develop Technical Assistance Request Form	Form Posted on ANTHC-REI website	3/2017
1.2	Provide a Minimum of 40 Instances of Technical Assistance	Completed associated deliverable. This may take the form of a report, funding application, review form or other format.	9/2020
2.1	Define TA Services Offered	List of defined services.	7/2021
2.2	Develop Standard Methodology for Each TA Service	Document describing preferred methodology for each defined service.	9/2022
2.3	Develop Deliverable Template for Each TA Service Offered	Deliverable template for each defined service.	9/2022
2.4	Develop Training Packages for Each TA Service Offered	Training packages including description of methodology, templates and supplemental materials.	9/2022
2.5	Train ANTHC Employees to Provide Energy TA	Completed training for 1-3 ANTHC employees for each defined service	9/2022
2.6	Apply Standardized Methodology to Provide TA	Completed associated deliverables.	Ongoing beyond grant agreement
3.1	Attend Mandatory Training	Attend five (5) one-week training courses in Golden Colorado.	3 out of 5 Completed due to COVID-19
3.2	Conduct a Skills Inventory of ANTHC Energy TA Providing Employees	Completed skills inventory.	2/2021
3.3	Train, Certify and Credential Staff	Completed trainings, acquired certifications and credentials.	9/2022
4.1	Develop Outreach Materials	Completed outreach packet.	7/2021

4.2	Create "menu" of ANTHC TA Services	Complete "menu" of services.	7/2021
4.3	Share Outreach Materials	Count of energy events where materials have been shared.	7/2021
5.1	Attend and Report Out at Annual Review Meetings	Attendance and completed presentations on progress.	7/2021
5.2	Document Successes	Completed narrative describing successes.	1/2023
5.3	Seek ANTHC board commitment to maintain increased funding	Proposal submitted to ANTHC leadership.	6/2022

1.1 Develop Technical Assistance Request Form

As a part of this award, ANTHC wanted to give tribes an easy way to apply for technical assistance, so our team created a simple request form. This form allowed communities to provide ANTHC with basic information such as, community name, contact person, authority to apply on behalf of the community, desired targets/buildings for technical assistance, contact information, any projects or opportunities previously identified, etc. This form was then made available online at the ANTHC Rural Energy Program website.

1.2 Provide a minimum of 40 Instances of Technical Assistance

Using these funds, ANTHC staff provided over 48 instances of Technical Assistance to tribes across Alaska. These included creating and providing to the communities (See Appendix A for list by community and Appendix B for report samples):

- 19 Energy Audit Reports (See Appendix B for Sample)
- 9 Engineering Feasibility Studies (See Appendix C for Sample)
- 4 Material Take Offs
- 12 Funding Identification Support
- 1 Microgrid Modeling Report
- 3 Design and Engineering Report Reviews
- Application Reviews

2.1 Define TA Services Offered

Taking all the instances listed in Task 1.2, the ANTHC Rural Energy Program has defined the TA services offered under this award as:

- Strategic energy planning, preliminary microgrid modeling
- Energy audits and assessments
- Pre-feasibility studies (solar, heat recovery, biomass, wind-to-heat)
- Troubleshooting (solar, heat recovery, biomass, wind-to-heat)
- Engineering design review

2.2 Develop Standard Methodology for Each TA Service

ANTHC Staff developed a standard methodology to work with communities and conduct the TA Services listed under Task 2.1. This standardization involved consolidation of engineering data sources needed to conduct the various services, development of excel spreadsheet tools ensuring that all engineers work under similar base assumptions and calculations, and documentation of standard procedure for utilizing supporting software programs such as AkWarm and HOMER. These standardized methodologies focused on:

- Strategic Energy Planning
- Energy Audits (See Appendix D for sample)
- Pre-feasibility studies for:
    - Solar PV
    - Heat Recovery
- Troubleshooting using Remote Monitoring

As part of this effort, ANTHC was able to develop and document a process for evaluating the impact of integration of high penetration utility scale renewables on heat recovery systems. This was a meaningful development under the accelerating adoption of large renewable + battery systems in rural Alaska.

2.3 Develop Deliverable Template for Each TA Service Offered

ANTHC staff created a template for conducting each service defined in Task 2.1. The templates provide useful background information and goes over the steps needed to identify, plan, and perform the specified TA Service. The deliverable templates ensure continuity, ensuring all ANTHC staff generate reports of the same format and quality. This also promotes continuity over time as new staff take on technical assistance roles.

2.4 Develop Training Packages for Each TA Service Offered

Training packages for the TA Services defined under Task 2.1 were developed and used in the training of ANTHC staff.

2.5 Train ANTHC Employees to Provide Energy TA

Several trainings and seminars were hosted by ANTHC over the course of this award, which covered energy related issues faced across all regions of Alaska. The list of presenters for these included business leaders of companies designed to build and implement heating systems, engineers with a focus on heat recovery systems and other renewable energy resources, and project managers who have seen projects through the planning, design, construction, and implementation of renewable energy systems.

Under the guidance of these trainings ANTHC's Tribal Utility Support Program and the Rural Energy Program teams were able to expand upon their knowledge of Rural Alaska Energy solutions. An average of 23 ANTHC staff attended each of these sessions on topics covering:

- ANTHC Remote Monitoring
- Biomass District Heating Systems
- Combined Heat and Power
- Energy Auditing

- Energy Challenges in Polar Regions
- Energy Systems Commissioning
- Heat Pumps
- Heat Recovery Design Review
- HOMER Micro grid Modeling
- Wind to Heat
- Power Systems Controls

2.6 Apply Standardized Methodology to Provide TA

The methodologies developed through this award are regularly utilized by the ANTHC Rural Energy Department. Applying the skills, trainings, and certifications provided, ANTHC has supported tribal communities to successfully secure funding for several Rural Community Energy Projects. The funding has come from several agencies including the U.S. Department of Agriculture, Denali Commission, Alaska Energy Authority, and others.

3.1 Attend Mandatory Training- one week training during the first year

Three trainings were attended in the first year of the award.

3.2 Conduct a Skills Inventory of ANTHC Energy Employees providing TA

A skills inventory was completed and used to determine which additional trainings and certifications were needed.

3.3 Train, Certify, and Credential Staff

In an endeavor to improve on the TA services offered by ANTHC, the Rural Energy team encouraged ANTHC staff to attend trainings or classes applicable under this award. With substantial effort on their behalf, several staff members were able to undertake classes, trainings, and certification courses. By way of this effort, the following credentials and certifications were obtained:

- Project Management Professional Certification- 1 P.M.P awarded
- Electric Power Engineering Certificate- 1 awarded
- Principles and Practice of Engineering- 1 P.E. License awarded
- Certified Energy Manager Training- 13 C.EM.'s awarded
- Grants Management Certification Courses- 1 awarded
- V3 Wind Energy Training
- Project Closeout Training
- Solar Energy International Training

4.1 Develop Outreach Materials

The ANTHC writing team created a foldable brochure for the Rural Energy Program to distribute. This brochure details the purpose behind the ANTHC Rural Energy Program and the benefits of seeking Technical Assistance. It does this by providing steps a community may take to identify energy inefficiencies in their community public buildings, and the steps they can take if they would like assistance in reducing energy costs.

Alongside the Brochure, several PowerPoint presentations were created and shown to multiple communities and regions across rural Alaska detailing the technical assistance offerings available to Alaska Native entities.

4.2 Create "menu" of ANTHC TA Services

ANTHC defined the TA services the organization can provide and distributed this information to many of its external partners.

4.3 Share Outreach Materials

ANTHC mailed its TA brochure to all rural Alaskan communities. See Appendix F for materials.

The PowerPoint presentations were presented across many different regions across Alaska. Presentations detailed the TA services this award can offer. The locations and events include:

- Q4 2016 Bureau of Indian Affairs Providers conference in Barrow, Alaska
- Q1 2017 DOE Regional Workshops in Alaskan communities of Barrow, Fairbanks, and Gulkana
- Q2 2017 Chugach Region Energy Working Committee
- Q2 2017 Bethel Calista Energy Meeting
- Q1 2018 DOE Regional Energy Planning Workshop in Cordova, Alaska
- Q2 2018 DOE Regional Planning Workshop in Kodiak, Alaska
- Q1 2019 Northwest Arctic Borough's Energy Steering Committee
- Q2 2019 Bering Straits Energy Summit in Nome, Alaska

Project Performance and Success

Providing TA to Rural Communities

The first objective within this award was to provide communities with tangible documentation, which would assist the rural tribal communities in developing energy projects of their own. In an effort to spread awareness of the opportunity this award presented, ANTHC project managers launched a campaign to advertise its services. Over the course of the award, several ANTHC staff members attended 8 energy related conferences across Alaska to discuss the benefits of community TA with ANTHC's Rural Energy department. This outreach provided an inflow of TA support applications, then using pre-developed, equitable criteria, ANTHC selected over 30 communities and organizations for energy audits, feasibility studies, and assistance with financing.

Following the support, ANTHC successfully assisted several communities in the planning and obtaining of funds for community energy projects. Examples include:

- **St Mary's**- ANTHC setup a Technical Assistance subproject for the community and provided assistance to finalize legal review of project solicitation documents, other administrative documentation, and final site control. ANTHC continued to provide St Mary's with documentation support until they were able to successfully apply for grant/loan financing, which funded a multi building heat recovery project.

- **Quinhagak**- A collaborative effort by the ANTHC Alaska Rural Utility Collaborative and Rural Energy departments led to the community successfully completing a proposal to fund a solar project in the combined utility building. The proposal was a success, but the community decided on an alternate project to receive funding.

- **Unalakleet-** ANTHC partnered with Unalakleet Valley Electric Cooperative (UVEC) and a contractor team lead by TDX Power to troubleshoot the community's wind-diesel system. The findings of this analysis are captured in the *UVEC Wind-Diesel System Integration Analysis* report and were used in the development and submission of an application under the DOE Deployment of Energy Infrastructure on Tribal Lands FOA. Unalakleet was announced as an award recipient in August 2018.

- **Mertarvik**- ANTHC Rural Energy's Mechanical Engineer partnered with the community of Mertarvik on the development and submission of an application to fund construction of a proposed heat recovery system under the DOE Deployment of Energy Infrastructure on Tribal Lands FOA. Mertarvik was announced as an award recipient in August 2018.

- **Holy Cross-** ANTHC's Project manager worked with the community of Holy Cross to present an economic analysis of funding projects and filling in gaps using a loan/subsidy hybrid. Holy Cross proceeded to secure funding for a heat recovery project through the USDA High Energy Cost Grant during Q3 2018.

- **Ouzinkie-** ANTHC used funding from this project to support HOMER modeling and energy planning for the community of Ouzinkie. The findings from this analysis were then used in developing a successful USDA High Energy Cost Grant application to upgrade their hydroelectric system. Ouzinkie was announced as an award recipient in fall 2020.

Internal Capacity Building for Sustainable Technical Assistance

An additional objective for this award was to build on ANTHC's own internal capacities, creating sustainable technical assistance measures which can be implemented beyond the TA award. To accomplish this, ANTHC developed, and continues to maintain, Standardized TA Methodology documentation (see Task 2.2 for list) and offered a variety of trainings.

APPENDIX A: TA Checklist by Community

TA CHECKLIST BY COMMUNITY

Community	Energy Audit	Engineering Feasibility Study	Material Take Off	Micro grid Modeling Report	Design and Engineering Report Reviews	Application Reviews
Akiachak	X	X				
Aniak	X					
Arctic Village	X					
Atmautluak	X					
Brevig Mission						X
Chistochina	X					
Chugachimiut		X				
Elim						X
Golovin		X				
Holy Cross						X
Hoonah		X				
Kwigillingok	X	X				
Mertarvik		X				X
Metlakatla					X	
Mountain Village					X	
Northway					X	
Ouzinkie		X		X		X
Petersburg	X					
Quinhagak						X
Scammon Bay		X				
Seldovia	X					
Solomon	X					X
St Mary's						X
Togiak		X				X
Tyonek	X					
Unalakleet		X				X
Venetie	X					
Yakutat	X		X			
Alaska Native Heritage Center	X					

APPENDIX B: Energy Audit Sample

Comprehensive Energy Audit For

Tyonek Water Treatment Plant

Prepared For

Native Village of Tyonek

June 5, 2017

Prepared By: Kevin Ulrich, CEM

ANTHC-DEHE
4500 Diplomacy Dr.
Anchorage, AK 99508

PREFACE

This energy audit was conducted using funds provided by the United States Department of Energy as part of the Technical Assistance provider program. Coordination with the Native Village of Tyonek has been undertaken to provide maximum accuracy in identifying audits and coordinating potential follow up retrofit activities.

The Rural Energy Initiative at the Alaska Native Tribal Health Consortium (ANTHC) prepared this document for the Native Village of Tyonek, Alaska. The authors of this report are Kevin Ulrich, Assistant Engineering Project Manager and Certified Energy Manager (CEM); and Kelli Whelan, Americorps Vista.

The purpose of this report is to provide a comprehensive document of the findings and analysis that resulted from an energy audit conducted in May of 2017 by the Rural Energy Initiative of ANTHC. This report analyzes historical energy use and identifies costs and savings of recommended energy conservation measures. Discussions of site-specific concerns, non-recommended measures, and an energy conservation action plan are also included in this report.

ACKNOWLEDGMENTS

The ANTHC Rural Energy Initiative gratefully acknowledges the assistance of Water Treatment Plant Operator Samuel Bartels, President Arthur Standifer, Tribal Administrator Sandi Kroto, and Tyonek Tribal Conservation District Program Assistant Tonya Kaloa.

PRIORITY LIST – ENERGY EFFICIENCY MEASURES							
Rank	**Feature**	**Improvement Description**	**Annual Energy Savings**	**Installed Cost**	**Savings to Investment Ratio, SIR[1]**	**Simple Payback (Years)[2]**	**CO_2 Savings**
2	Other Electrical: Well Pump 2	Repair leaks and reduce water usage.	$1,819 + $2,000 Maint. Savings	$21,000	3.53	5.5	14,295.8
3	Other Electrical: Well Pump 1	Repair leaks and reduce water usage.	$1,617 + $2,000 Maint. Savings	$21,000	3.35	5.8	12,707.5
4	Lighting: Exterior	Replace with new LED lighting.	$25	$250	1.19	9.8	199.4
5	Air Tightening	Add weather stripping around the main entrance doors.	$24	$300	0.74	12.5	106.9
6	Other Electrical: Lower Village Pressure Pumps	Repair controls so that pump has fewer starts with longer runs.	$50	$1,000	0.58	20.2	559.4
7	Lighting: Office	Replace with new LED lighting.	$20	$560	0.38	27.4	209.7
8	Lighting: Process Room	Replace with new LED lighting.	$34	$960	0.36	28.5	353.6
9	Other Electrical: Indian Creek Pressure Pumps	Increase size of the pressure pumps to a more appropriate size, allowing the pressure pumps to stop when the desired system pressure is reached and start when needed to pressurize the system.	$125	$5,000	0.28	39.9	1,537.8
10	Lighting: Loft	Replace with new LED lighting.	$2	$160	0.10	93.8	20.1
11	Lighting: Chemical Room	Replace with new LED lighting.	$1	$160	0.06	148.6	12.8
	TOTAL, all measures		**$4,738 + $4,000 Maint. Savings**	**$50,690**	**3.18**	**5.8**	**34,558.0**

Table Notes:

[1] Savings to Investment Ratio (SIR) is a life-cycle cost measure calculated by dividing the total savings over the life of a project (expressed in today's dollars) by its investment costs. The SIR is an indication of the profitability of a measure; the higher the SIR, the more profitable the project. An SIR greater than 1.0 indicates a cost-effective project (i.e. more savings than cost). Remember that this profitability is based on the position of that Energy Efficiency Measure (EEM) in the overall list and assumes that the measures above it are implemented first.

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

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1. EXECUTIVE SUMMARY

This report was prepared for the Native Village of Tyonek. The scope of the audit focused on Tyonek Water Treatment Plant. The scope of this report is a comprehensive energy study, which included an analysis of building shell, interior and exterior lighting systems, HVAC systems, and plug loads.

Based on electricity and fuel oil prices in effect at the time of the audit, the total predicted energy costs are $10,654 per year. Electricity represents the largest portion with an annual cost of approximately $8,786. #1 Fuel Oil represents the remaining portion of the energy costs, with an annual cost of approximately $1,868.

Table 1.1: Predicted Annual Fuel Use for the Tyonek Water Treatment Plant

Predicted Annual Fuel Use		
Fuel Use	**Existing Building**	**With Proposed Retrofits**
Electricity	62,756 kWh	34,501 kWh
#1 Oil	393 gallons	229 gallons

Benchmark figures facilitate comparing energy use between different buildings. Table 1.2 lists several benchmarks for the audited building. More details can be found in section 3.2.2.

Table 1.2: Building Benchmarks for the Tyonek Water Treatment Plant

Building Benchmarks			
Description	**EUI (kBtu/Sq.Ft.)**	**EUI/HDD (Btu/Sq.Ft./HDD)**	**ECI ($/Sq.Ft.)**
Existing Building	189.9	19.53	$7.60
With Proposed Retrofits	105.6	10.86	$4.22
EUI: Energy Use Intensity - The annual site energy consumption divided by the structure's conditioned area. EUI/HDD: Energy Use Intensity per Heating Degree Day. ECI: Energy Cost Index - The total annual cost of energy divided by the square footage of the conditioned space in the building.			

Table 1.3 below summarizes the energy efficiency measures analyzed for the Tyonek Water Treatment Plant. Listed are the estimates of the annual savings, installed costs, and two different financial measures of investment return.

Table 1.3: Summary of Recommended Energy Efficiency Measures

PRIORITY LIST – ENERGY EFFICIENCY MEASURES							
Rank	**Feature**	**Improvement Description**	**Annual Energy Savings**	**Installed Cost**	**Savings to Investment Ratio, SIR[1]**	**Simple Payback (Years)[2]**	**CO_2 Savings**
1	Setback Thermostat: Water Treatment Plant	Program an unoccupied setback of 50 deg. F on the Toyo stove in the office.	$1,020	$300	46.09	0.3	4,554.9

APPENDIX C: Feasibility Study Sample

HEAT RECOVERY FEASIBILITY STUDY TOGIAK, ALASKA

Prepared By:

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December 6, 2016

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3. INTRODUCTION

3.1. Executive Summary

The Togiak power plant, water treatment plant, senior center/clinic, city office, old school, and police station were evaluated for heat recovery potential. The total amount of annual heating fuel used by the end users was estimated to be approximately 16,700 gallons of diesel fuel per year. The estimated savings from implementing a heat recovery system is approximately 16,700 gallons of fuel. The estimated cost for design and construction of the heat recovery project in Togiak is $1,079,544. The simple payback based on a fuel cost of $5.09 is 17.3 years.

Assuming construction in 2019, the design and construction cost plus 1 year of 2% escalation rate is $1,094,874. The construction and design estimate exceeds the original estimate. The annual fuel savings of 16,700 gallons also exceeds the 13,700 gallons from the heat recovery system in the Heat Recovery Study dated June 20, 2010 prepared by Alaska Energy and Engineering.

3.2. Introduction

CRW Engineering Group, LLC (CRW) was retained by Alaska Native Tribal Health Consortium (ANTHC) to review the feasibility of providing recovered heat from the new Power Plant in Togiak to the City Office, Water Treatment Plant (WTP), Police Station, the Library and Shop at the old school building, and the Senior Center/Clinic and provide mechanical and electrical engineering design for the heat recovery system.

In October 2014, the first phase of design of a new heat recovery system for the community of Togiak was started based on the concepts identified in the Heat Recovery Study dated June 20, 2010 prepared by Alaska Energy and Engineering. The original study and project included connection of five community facilities in Togiak to a heat recovery system. The specific facilities proposed to receive recovered heat as part of the original project included the Clinic, Police Station, City Office, Water Treatment Plant (WTP), and the old school. These buildings were all located within a 500-foot radius of the AVEC power plant. Initial estimates place annual fuel savings at approximately 13,700 gallons if the heat recovery system was fully implemented.

Since the original design and study were completed several of the buildings included in the study have had their heating systems upgraded with new boilers being installed. The old school has been shut down and modified to heat only a small section of the building that includes a library and City Shop area. A new AVEC power plant with different generators is currently being built across town from the original power plant near the old school. The AVEC power plant is scheduled to be completed and operational by summer 2018.

The following assumptions regarding buildings and existing heat systems were identified:

The Water Treatment Plant was upgraded in 2014. The upgrades included a heat exchanger and connections for recovered heat into the existing hydronic heating system and the WTP.

The City Office, Police Station, and Senior Center/Clinic buildings are all hydronically heated. None of these facilities have existing provisions for heat recovery; however there is space to

install the necessary equipment to incorporate a heat recovery system into each of the buildings hydronic heating systems.

The old school which was originally tied to a recovered heat system served by the old AVEC plant, but the school and the recovered heat system have been shut down and are not operational at this time. The existing recovered heat system was evaluated, but no portion of this system is salvageable. Since the old school has been shut down, the equipment in the mechanical room has fallen into disrepair and is no longer operational. Therefore, this study limits its heat recovery feasibility evaluation of the old school to only the remodeled areas currently in use. These spaces include the City Library and Shop Area.

In developing this study, CRW coordinated with AVEC personnel to determine anticipated plant operations, generator run times, and simulate anticipated available recovered heat for the new plant. Annual fuel usage was obtained from a variety of sources including the City of Togiak and engineered estimates were data was not available. Reported fuel consumption and engineered estimates were used to validate this feasibility study.

Additional assumptions and brief analysis have been made in the development of this study, including but not limited to, the proposed arctic piping route, building heat loads, and flow rates and pressure drops of the power plant heat recovery system. However, the arctic pipe routing and equipment selections will be updated as the design progresses.

4. OVERVIEW

4.1. Overview

The purpose of this feasibility study is to determine if the fuel savings identified in the original study is still achievable based on the changes in the community. This study will provide an estimate of the heat that is anticipated to be recovered from the AVEC power plant diesel engines and used to offset heating oil consumption at the WTP and other community buildings identified in this study. Useable recovered heat is quantified in gallons of heating fuel saved using a gross heating value of 134,000 BTU per gallon of No. 1 arctic diesel fuel and an overall boiler efficiency of 75% for a net heating value of 100,500 BTU per gallon.

Five community buildings in Togiak were evaluated for heat recovery potential. All buildings are located within approximately a 800-foot radius of the AVEC power plant site. The buildings evaluated included the city office, police station, clinic/senior center, water treatment plant, and the old school (library and city shop).

APPENDIX D: Standardized Methodology- Energy Audit Process Sample

ANTHC'S STANDARDIZED ENERGY AUDIT PROCESS April 2021

Background

Per ASHRAE guidelines[1], the energy audit process starts with a Preliminary Energy Use Analysis, then either a Level 1, 2 or 3 audit. A Level 2 audit takes everything that is performed, or would have been performed in a Level 1 audit and builds upon it to meet the requirements of the Level 2 audit; and the Level 3 does the same based on a Level 2 audit.

An Investment Grade Audit (IGA) is essentially a Level 3 audit performed for guaranteed performance contracts by Energy Service Companies (ESCO's). There is more data logging to eliminate unknowns and the financial costs, and subsequent financial analysis, are a fixed bid rather than an estimate.

We are typically performing Level 2 audits. The EEM cost estimate variance in a Level 2 audit can range +/-15% to +/-30% and should be stated in the report. Level 2 audits can be comprehensive or targeted. Comprehensive audits look at every energy consuming device in the building and the entire envelope while targeted audits look at specific systems, equipment or envelope features. Per ASHRAE requirements, a Level 2 audit does not require a simulation model (AkWarm or otherwise), but we will always model the building for a Level 2 audit; a calibrated simulation model accommodates the interactivity of EEMs whereas calculations made outside of a model may not consider this interactivity of EEMs.

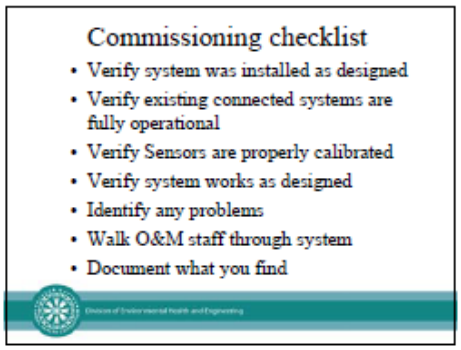
Steps in an Energy Audit

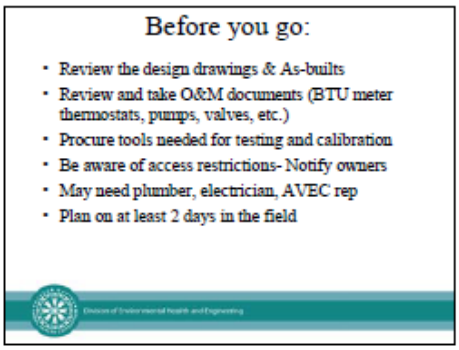
These are the recommended steps, in the recommended order. It is understood that there not be any plans, and the auditor may not have access to utility data before the site survey so the PEA may occur after the site survey.

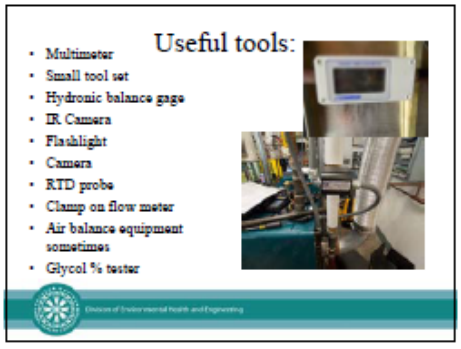
1. Create project with standard folders: \\deh02\Energy Program\Reference documents\Energy Audit Standardization\Energy Audit-new projects folder
2. Plan Review
    a. Locate any plans & review
    b. Review any info in ANTHC files (TUS, ARUC, Design, etc.)
3. Preliminary Energy Use Analysis (PEA)
    a. Obtain Utility data
        i. Send authorizations to release utility data to owner for signature & request recent invoices for each fuel type
        ii. Send signed authorizations to utility providers – request minimum of 3 years monthly data (more if there have been use and occupancy changes, or unique situations)
    b. Plot utility data & analyze
        i. Monthly graphs, year over year changes
        ii. EUI and ECI (need square footage estimate)
        iii. Benchmark against other buildings (EUI comparison bar chart)
4. Site survey

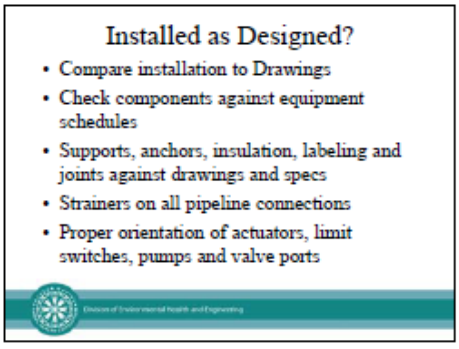
[1] The 2 ASHRAE documents that describe the energy audit process are "Procedures for Commercial Building Energy Audits" Second Edition, 2004, 2011 and ASHRAE Standard 211-2018, "Standard for Commercial Building Energy Audits"

APPENDIX E: ANTHC Commissioning Energy Systems Training Slides







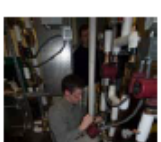


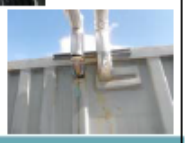
Pre-Start-up and testing:

- Verify power connected, controls complete and pressure tests performed
- Verify blow downs, air vents, relief valves, etc. are installed before filling
- Clean with TSP + water and flush system before charging with water / glycol

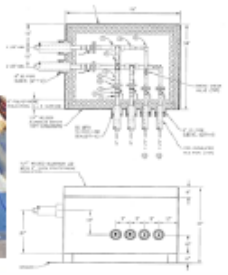
Be prepared to set up controls

Installation Gotchas





Gotchas



Verify existing systems

- Are the existing systems in good repair and working as intended?
- Gotchas to watch for:
  - Failed AMOT Valve
  - Missing insulation
  - Burned glycol / sludge
  - Failed / improperly set-up controls
  - Backwards pumps
  - System pressure / failed expansion tanks

Verify Existing Systems

Verify Sensor Calibration

- Most important: Temperature and Flow
- Less so: Pressure
- Verify Sensor type and curve match transmitter / controller
- Check against independent device (IR is usually not accurate enough)

Pre-Testing checks

- System flushed and cleaned
- Glycol pressure and concentration
- Strainers clear
- Pump spin correct
- Air purged
- AVEC controls set up and working
- Pressure gages installed
- Correct valves open

Verify System Operation

- Go from fully shut down through all operating modes, back to fully shut down.
- Valve actuation correct
- Setpoints correct
- Safeties verified
- Displays correct

Verify System Performance

- Are the temperatures and flows as expected, and if not, why not?
- Is glycol disappearing? are there leaks?
- Are pressures as expected?
- Pump cavitation / vibration / noise?
- Any short-cycling observed?

Walk O&M Staff through system

- eg. Proper biomass operation

Document Results

- Identify work remaining to be completed or corrected
- Identify what could not be tested
- Document testing and measurement results
- Document meeting with owner's O&M staff and training / instructions provided

Final Comments

- Verify the operator is comfortable with operating the system
- Photograph everything you can
- Never leave a system operating in an unsafe condition

The End

APPENDIX F: ANTHC Energy TA Outreach Materials

Technical Assistance

The Rural Energy Program is the statewide technical assistance provider for the U. S. Department of Energy's Office of Indian Energy (OIE).

The partnership streamlines the process for communities to obtain the expertise needed to advance tribal energy projects.

Alaska Native regional and village corporations, intertribal organizations, and tribal energy development organizations are all eligible for technical assistance at no cost through the OIE.

Eligible communities and organizations can request technical assistance on ANTHC's Rural Energy Technical Assistance webpage: anthc.org/what-we-do/rural-energy.

Our Purpose

The foundation for improving the health and well-being of Alaska Native people includes affordable access to clean water and sanitary waste disposal. The Rural Energy Program strives towards ANTHC's vision that Alaska Native people are the healthiest people in the world.

Contact Us

Contact us to begin the process of identifying your community's energy needs.

Rural Energy Program
4500 Diplomacy Drive
Anchorage, AK 99508
(907) 729-3600
energy@anthc.org
anthc.org/what-we-do/rural-energy

ALASKA NATIVE TRIBAL HEALTH CONSORTIUM
Environmental Health

The Rural Energy Program

Helping Communities Find Innovative and Sustainable Solutions to Their Energy Needs

Start With an Energy Audit

An energy audit is an on-site assessment of a community's public utilities, health clinics, and other public buildings.

The next step is to identify efficiency upgrades and develop renewable energy projects. We figure costs and help find funding sources.

During the next phase, we perform efficiency retrofits, construct renewable energy systems, and provide operator training.

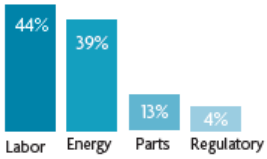
Finally, we provide on-going support, monitor energy usage, and evaluate the system for effectiveness.

Energy Efficiency Upgrades

The most effective way to reduce energy costs to the community is by reducing the amount of energy to operate and maintain its utilities. Even the smallest investments in energy efficiency upgrades reaps big rewards.

Some of the simplest things a community can do are installing programmable thermostats, using heat-tape operations for freeze-up recovery only, replacing fluorescent bulbs with LEDs, sealing air leaks in doors and windows, and cleaning boilers.

Water and Sewer Energy Costs



On average, energy costs represent 39 percent of the total cost of providing water and sewer services and make up nearly a third of the total amount of energy used by a rural community. These high costs are passed down to community members through their monthly bill.

Renewable Energy Projects

Renewable energy projects reduce the dependence on imported fuel for heating and electricity.

The Rural Energy Project assists communities in identifying renewable energy projects, helps find funding sources, oversees project construction, and provides ongoing support after completion of the project.

Renewable Energy Projects Include:

- Solar
- Wind to Heat
- Biomass Boilers
- Heat Recovery
- Hydroelectric
- Geothermal Energy

The Rural Energy Program

Since 2010 we've partnered with rural Alaska communities, saving them over $19 million in energy costs.

Technical Assistance

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To find out more, or to request technical assistance, visit ANTHC's Rural Energy Technical Assistance webpage: anthc.org/what-we-do/rural-energy.

Energy audits
Energy-efficient upgrades
Feasability studies
Renewable energy project development
Project management

Energy Audits

An energy audit is an on-site assessment of a community's public utilities, health clinics, and other public buildings. The audit identifies ways a community can save energy, including efficiency upgrades and renewable energy projects. We figure costs and help find funding sources.

Energy Efficiency Upgrades

The most effective way to reduce energy costs to the community is by reducing the amount of energy to operate and maintain its utilities. Even the smallest investments in energy efficiency upgrades reaps big rewards.

Some of the simplest things a community can do are installing programmable thermostats, using heat-tape operations for freeze-up recovery only, replacing fluorescent bulbs with LEDs, sealing air leaks in doors and windows, and cleaning boilers.

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