ALASKA NATIVE
TRIBAL HEALTH
CONSORTIUM

Rural Energy Initiative

2015 REPORT ON ACTIVITIES

Pictured: Shaktoolik, Alaska (Photo courtesy Joni Sweetman)

Contents

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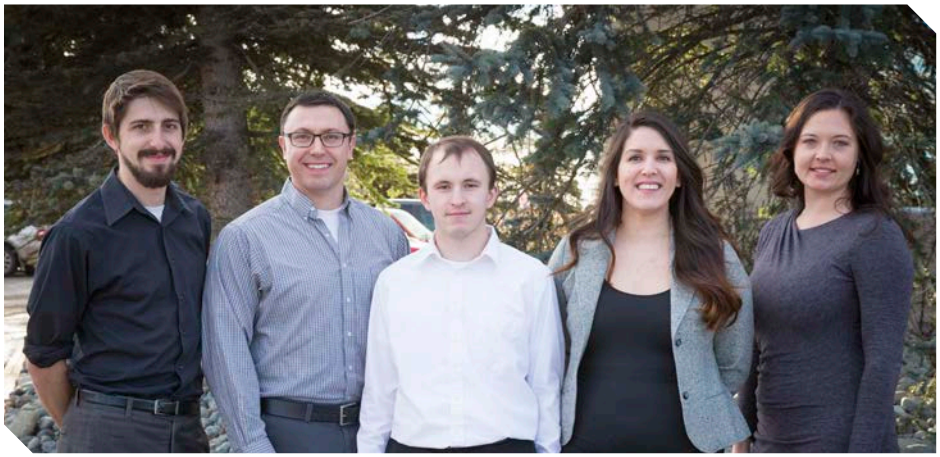
What is the Rural Energy Initiative?

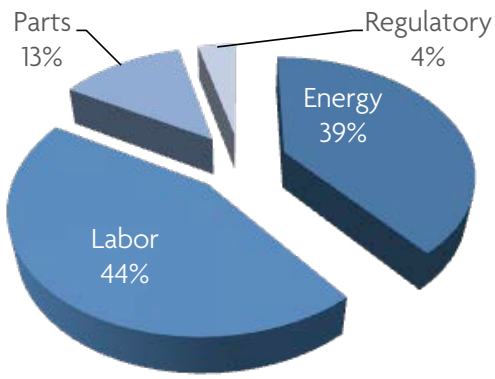
The Alaska Native Tribal Health Consortium's Environmental Health & Engineering team provides planning, design, construction, and operations support for sanitation projects throughout Alaska. These services contribute to ANTHC's vision that Alaska Native people are the healthiest people in the world by providing preventative health through access to clean water and sewer. Recognizing the high cost to operate sanitation infrastructure in rural Alaska, in 2010 ANTHC created the Rural Energy Initiative. The Rural Energy Initiative works with communities to implement innovative energy efficiency and renewable energy solutions to make public sanitation affordable for the people we serve across Alaska.



Gavin Dixon, Eric Hanssen, Kevin Ulrich, Sharnel Vale and Tashina Duttle

What does energy have to do with water and sewer service?

Providing clean water and sanitary sewer systems for remote communities with no road access in extremely cold climates presents unique challenges, including extremely high energy usage and high energy costs. On average, energy costs are 39 percent of the total cost of providing public sanitation in rural Alaska, with electricity costs as high as $1.00/kilowatt hour, and heating fuel costs over $10.00 per gallon in some locations. Water and sewer bills in rural Alaska range from $80 to $250 per month, and average 3-8 percent of median household income. This confluence of factors is a direct threat to the sustainability of public sanitation across rural Alaska.



Average operating costs for water/sewer systems in rural Alaska

Our Path to Rural Sanitation Energy Savings

Audit

Onsite Assessment
Collect Data
Evaluate Operating Practices
Assess Facility Energy Use

Analysis

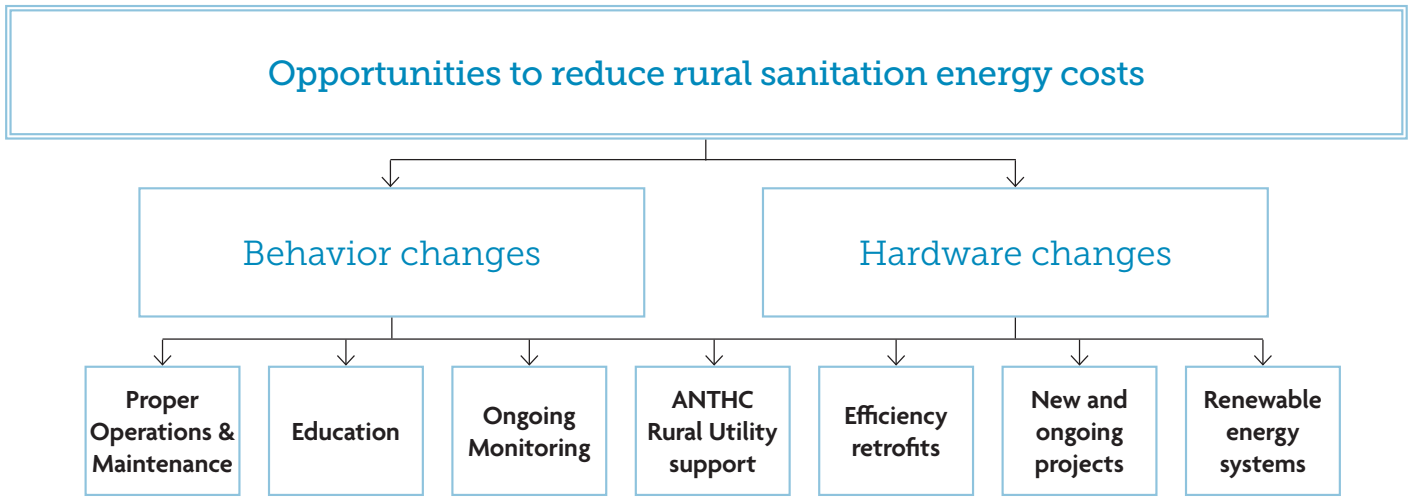
Develop Energy Model
Identify Potential Improvements
Identify Cost to Implement

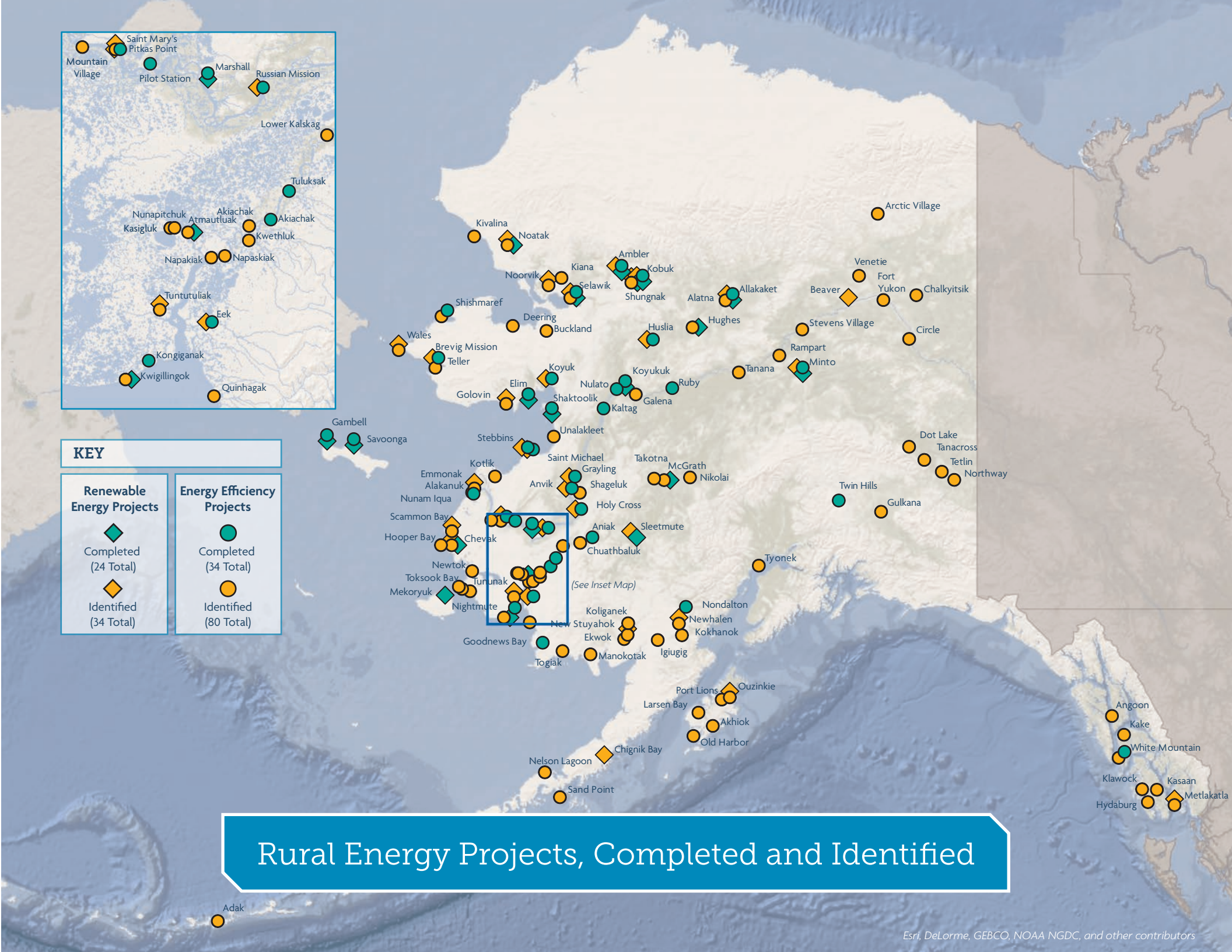
Implement Recommendations

Develop Training Plan
Purchase Materials
Implement Changes
Provide Operator Training
Construct Renewable Energy Systems

Savings

Monitor Energy Usage
Evaluate Effectiveness



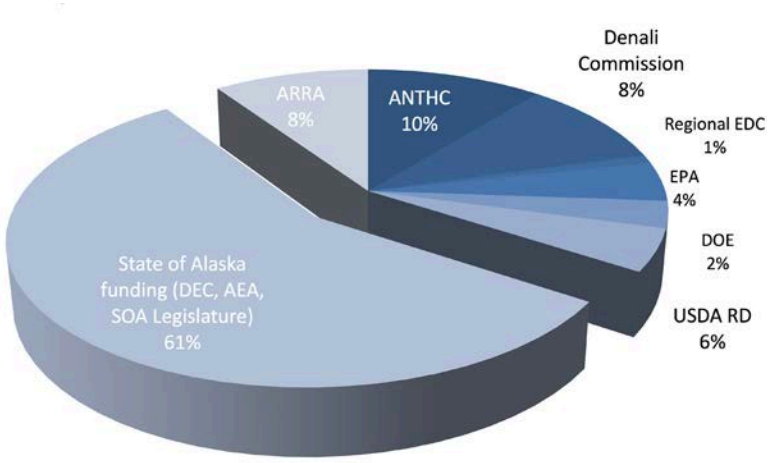

Saint Mary's
Pitkas Point
Mountain Village
Pilot Station
Marshall
Russian Mission
Lower Kalskag
Tuluksak
Nunapitchuk
Akiachak
Atmautluak
Akiachak
Kasigluk
Kwethluk
Napakiak
Napaskiak
Tuntutuliak
Eek
Kongiganak
Kwigillingok
Quinhagak
Arctic Village
Kivalina
Noatak
Ambler
Kiana
Kobuk
Noorvik
Selawik
Shungnak
Venetie
Fort Yukon
Beaver
Chalkyitsik
Alatna
Allakaket
Shishmaref
Deering
Buckland
Huslia
Hughes
Stevens Village
Circle
Wales
Brevig Mission
Teller
Rampart
Minto
Tanana
Koyuk
Koyukuk
Nulato
Ruby
Galena
Elim
Golovin
Shaktoolik
Kaltag
Gambell
Savoonga
Unalakleet
Stebbins
Saint Michael
Takotna
McGrath
Nikolai
Dot Lake
Tanacross
Tetlin
Northway
Kotlik
Emmonak
Alakanuk
Grayling
Anvik
Shageluk
Twin Hills
Gulkana
Nunam Iqua
Holy Cross
Scammon Bay
Hooper Bay
Chevak
Aniak
Sleetmute
Chuathbaluk
Tyonek
Newtok
Toksook Bay
Tununak
Mekoryuk
Nightmute
(See Inset Map)
Koliganek
New Stuyahok
Ekwok
Goodnews Bay
Togiak
Manokotak
Nondalton
Newhalen
Kokhanok
Igiugig
Port Lions
Ouzinkie
Larsen Bay
Akhiok
Old Harbor
Chignik Bay
Nelson Lagoon
Sand Point
Angoon
Kake
White Mountain
Klawock
Kasaan
Metlakatla
Hydaburg
Adak
KEY
Renewable Energy Projects
Completed (24 Total)
Identified (34 Total)
Energy Efficiency Projects
Completed (34 Total)
Identified (80 Total)
Rural Energy Projects, Completed and Identified
Esri, DeLorme, GEBCO, NOAA NGDC, and other contributors

Our Finances

In 2015, our work to improve the energy efficiency of sanitation systems for communities across rural Alaska was made possible from the investments of our funders.

Thanks to funding from the Denali Commission, USDA Rural Development, the State of Alaska, the Alaska Energy Authority, the EPA, local communities, regional Tribal health organizations, and the Alaska Village Electric Cooperative, this year's projects included innovative upgrades that provide notable cost savings to the rural communitities we serve.

Energy Program Funding Sources



Total project funds awarded by fiscal year

Fiscal Year 2012	$4,179,436
Fiscal Year 2013	$4,786,458
Fiscal Year 2014	$5,000,701
Fiscal Year 2015	$6,471,000

Rural Energy Initiative impact

$749,000

Projected annual savings of projects implemented in fiscal year 2015

$2,050,000

Projected annual savings of projects implemented from start of program through fiscal year 2015

Energy Efficiency


Kwigillingok

Reducing energy use is much cheaper than increasing energy supply; therefore ANTHC identifies ways to make existing home and utility systems operate more efficiently. ANTHC has conducted energy efficiency retrofits for 33 community sanitation systems across rural Alaska since 2011. These energy efficiency retrofits have been funded by U.S. Department of Energy, USDA Rural Development, the State of Alaska, and the Denali Commission.

These funds help provide maintenance and operations training, installation of more efficient retrofitted equipment, and increases the useful life of the aging sanitation infrastructure in rural Alaska. Implementing appropriate new technologies, such as LED lighting, high efficiency pumps, and new controls infrastructure, helps realize significant energy savings. ANTHC is further able to provide personalized operator training, so that operators can run their sanitation facilities more efficiently and maintain energy savings for communities for years to come. **These projects have produced a total of $776,922 annual energy savings in rural sanitation systems.**

The goal of reducing energy costs in rural sanitation systems is to improve the long-term sustainability of facilities and reduce the cost of water and sewer service for homeowners.

Case Study: Kongiganak Energy Efficiency

Faster, more effective drying

Reduced moisture and mold

Pictured: John Phillips Jr., Primary Water Treatment Plant Utility Operator and James Tikiun, Alternate Water Treatment Plant Utility Operator

In 2015, ANTHC completed energy efficiency work on the washeteria in Kongiganak. Since these retrofits were implemented, the community has seen a 17 percent reduction in electricity usage compared to before the energy audit conducted in 2012. Additionally, the washeteria has seen a reduction in fuel use of 14 percent.

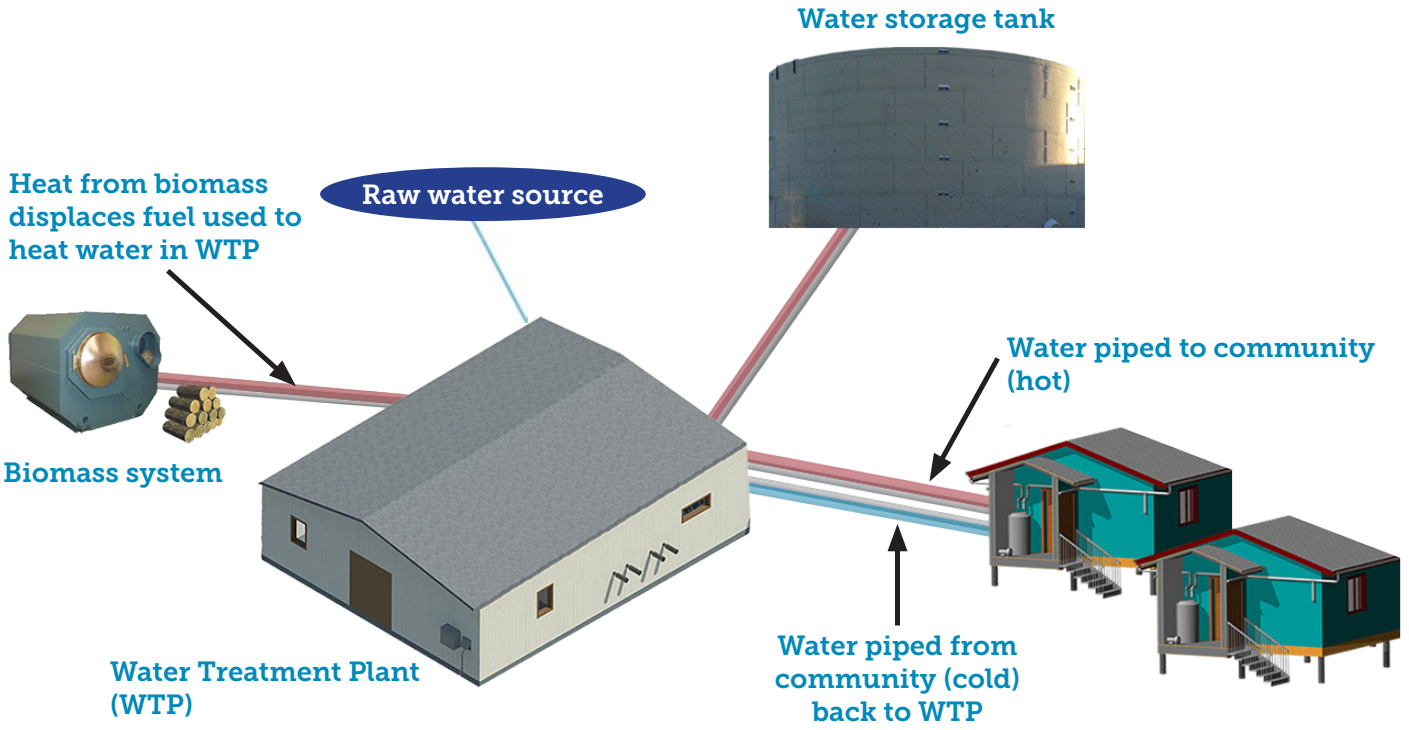
Upgrades included: cleaning and tuning of the boilers, upgrading hydronic controls, replacing interior and exterior lights with LEDs, minor repairs to the heat recovery system, new thermostats, improvements to the fuel delivery and glycol expansion system and minor building weatherization. Training was provided to the local operators, which included boiler tuning and testing, setting and maintaining proper operational parameters and preventative maintenance schedules. Overall training for the washeteria building operators was the most intensive and important piece of the project.

Many benefits have been recognized in Kongiganak in addition to the significant energy and costs savings for operating the washeteria. Increased safety through reduction in fire risk and improved lighting, increase in technical capacity and job skills confidence for the operator, more time efficient and effective clothes drying, reduced mold risk, and improved user comfort are just a few of the non-energy savings related improvements that have resulted from the energy efficiency and training effort in Kongiganak.

Renewable Energy: Biomass

Biomass projects use wood fired boiler systems that displace fuel oil for heating public facilities. Using locally harvested wood in the heating system, instead of fuel oil, keeps energy dollars in the local economy and reduces the dependence on fuel oil for heating. These benefits promote energy sustainability and provide the added benefit of creating new jobs for local wood cutters in rural communities, where employment is hard to come by.

The Rural Energy Initiative is at the forefront of biomass projects for rural communities. During 2015, three new projects were designed and began construction in the communities of Kobuk, Hughes, and Koyukuk. Combined, these projects are expected to reduce annual heating consumption by an estimated 18,000 gallons and save an estimated $136,000 in annual fuel costs. The Rural Energy Initiative is also working with the communities of Huslia and Ambler to develop and seek funding for future public facility biomass heating systems.



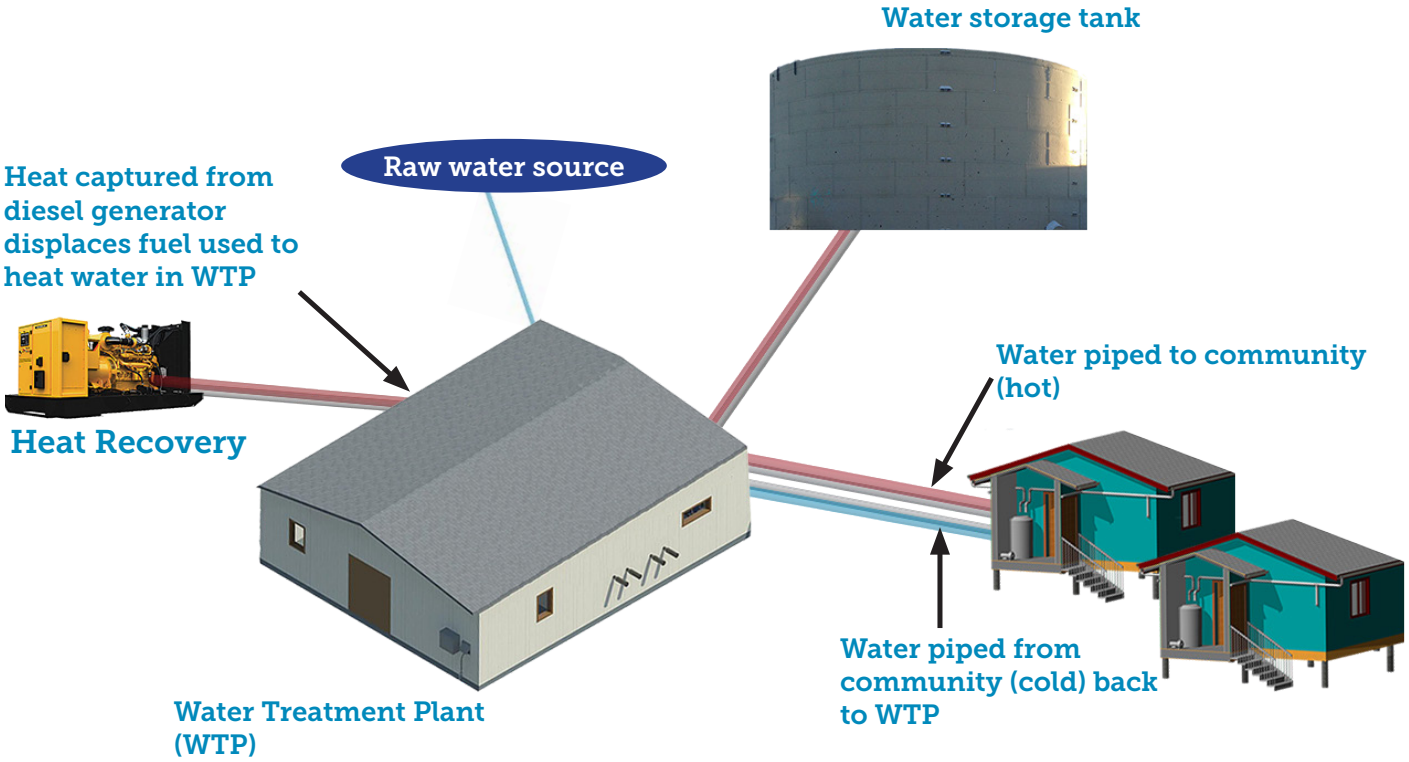
Case Study: Hughes Biomass

In 2013, Hughes received funding through the State's Alaska Energy Authority to design and construct a biomass boiler to heat the community's water system and City/Tribal office. Thanks to the combined efforts of ANTHC's Rural Energy Initiative team, the Interior Regional Housing Authority, and the City of Hughes, the biomass project was completed in summer 2015. It is anticipated that the Hughes biomass project will help the community reduce its annual energy consumption by $38,923.

Of the overall $38,923 annual savings, $16,322 goes to local wood cutters for supplying cordwood and $22,601 will be the direct savings to the operation of the Hughes Water Plant and Tribal Building.

Renewable Energy: Heat Recovery

Up to 70 percent of the energy from diesel generators is lost as heat. This is a normal part of the generator's cooling processes. This means that only 30 percent of the diesel used goes towards creating electricity. To make use of this "wasted" energy, ANTHC has partnered with the Alaska Village Electric Cooperative and other local power companies to recover heat from community power plant cooling systems and redistribute it for heating water.



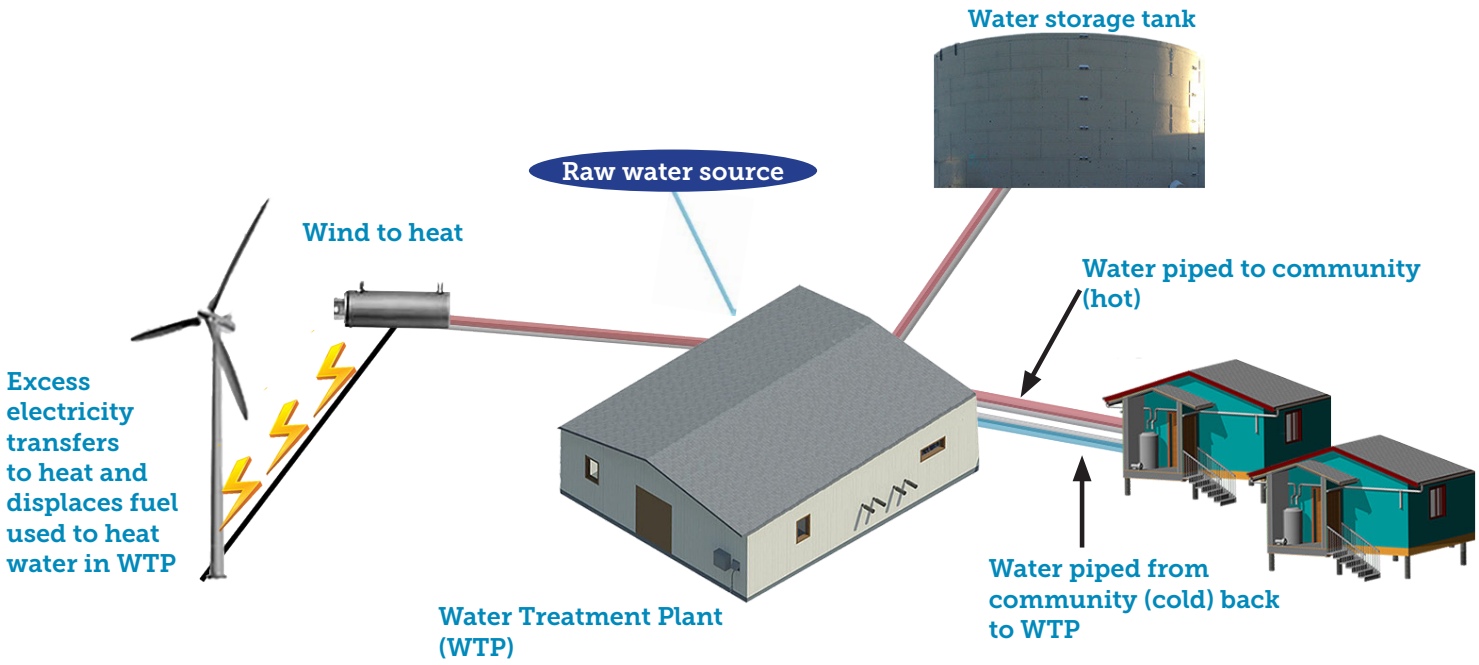
In a heat recovery system, excess heat energy is captured from the local electric plant and transferred to heat the water plant instead of burning heating fuel. This results in substantial cost savings for both utilities. The heat in the electric plant is created as a byproduct of diesel-powered electricity generators. Since the installation of these heat recovery systems in communities, there are tremendous results in energy savings from reducing fuel oil consumption. Examples of such savings can be seen in a case study of the system in Quinhagak on the following page.

Case Study: Quinhagak Heat Recovery

In collaboration with the Alaska Energy Authority, Alaska Village Electric Cooperative (AVEC), and ANTHC's Alaska Rural Utility Collaborative program, in December 2015, the heat recovery system was brought online in Quinhagak, Alaska. This system captures waste heat from the existing AVEC power plant and uses it to heat the community's washeteria and combined utility building. Recovered heat, measured and metered in BTUs, is sold by the power utility to the community at 30 percent of the cost of fuel oil.

With the system now fully operational, it is expected that the community will reduce their annual heating fuel usage by 14,200 gallons, for a fuel savings of almost $64,000 per year. Net savings after recovered heat sales cost is expected to be $45,000 per year.

Renewable Energy: Wind to Heat



"Wind to Heat" systems use the extra electricity generated from wind turbines during peak wind events to heat water for use in Arctic sanitation systems. Development of the "wind to heat" system was conceived by ANTHC's Rural Energy Initiative in 2011. This innovation, the first in Alaska and perhaps in the country for public water systems, was developed by ANTHC in partnership with the Alaska Village Electric Cooperative, an electric company that owns and operates rural electrical utilities utilizing a mix of diesel and wind power. AVEC has agreed to sell extra power generated by wind turbines under interruptible power agreements at substantial discounts to the community sanitation utilities. Wind energy is transferred through use of electric boilers in the water treatment plant and displaces fuel used to heat the water. Examples of wind to heat savings can be seen in a case study of the system in Shaktoolik on the following page.

Case Study: Shaktoolik Wind to Heat

Potential fuel savings of $20,034 annually

Cost of $0.05 per kWh is equivalent to fuel oil at $1.46 per gallon.

The wind to heat system in Shaktoolik began transferring heat to the community's water plant in March 2015, and is projected to offset up to 10,100 gallons of heating fuel every year.

AVEC, a member-owned nonprofit company, produces some of its members' power, including Chevak, with wind turbines. On occasion the wind turbines produce more power than the traditional diesel electric systems can readily absorb. The wind to heat electric boiler helps to balance the entire communities' electrical grid when there is excess electricity being generated by the wind turbines by utilizing the additional electricity to offset the heating requirements of treating, storing, and distributing the community's water.

Innovative wind systems like Chevak are helping to make Alaska a leader in micro-grid technology for the entire world, by helping to allow high penetration of renewable energy into small micro grids that primarily utilize reliable fossil fuels. With reduced energy costs at the community water plant, and improved grid balancing of renewables at the power plant; the entire community can benefit from cheaper and more sustainable crucial public services such as sanitation and electricity.

Photo courtesy Joni Sweetman

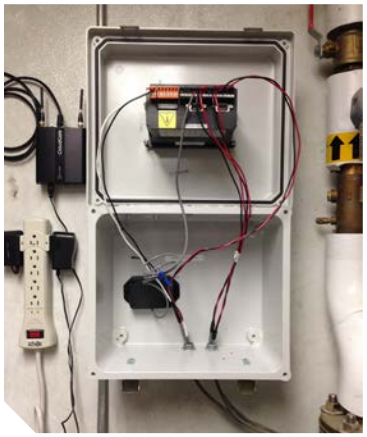
View from one turbine to the other

Electric boiler

Remote Monitoring

Monitoring energy investments to ensure that ongoing energy savings are realized and maintained is an important part of the Rural Energy Initiative.

ANTHC installs simple monitoring equipment to remotely monitor sanitation systems performance and maintain information on energy use. To date, this program provides monitoring service to 20 communities, with 28 communities expected to be served by the end of 2016. In addition to tracking energy performance, remote monitoring enables utility operators to access maintenance expertise outside the community to identify potential catastrophic failures such as freeze-ups and avoid expensive and damaging emergencies.



What it is and how it can help

Small wireless devices are installed in key locations in the water plant (and other facilities), which supplies information to an internet-based data bank on a regular recurring schedule. Information such as water temperature, plant temperature, water flow rates and tank levels are typically reported. The data assists state, federal and Tribal health organization responders to identify threats to the systems that may not be detected locally. The data will also create a record of long-term operational performance that can help operators, engineers and others identify trends and make recommendations to save energy, supplies, labor and money.

All remote monitoring equipment is labeled and does not change the existing operation of the water plant. This system simply allows for improved outside technical support when necessary. If desired, the water operators, financial administrators or other community members are welcome to also monitor the information captured by visiting the Remote Monitoring Dashboard available online.

Remote Monitoring serves two critical functions:

1. Direct monitoring of a facility to prevent catastrophic failure
2. Data collection for past, present, and future energy efficiency and renewable energy work.

The Remote Monitoring Dashboard can be accessed by visiting www.rm.anthc.webfactional.com.

Sanitation Energy Efficiency Training

ANTHC's Environmental Health and Engineering and the State of Alaska partnered to develop a two-week off-site Alaska Vocational Technical Center (AVTEC) Sanitation Energy Efficiency Training for rural water plant operators in Seward, Alaska. The session focuses on how to achieve maximum operational and energy efficiency in water and sewer facilities, and how to operate and maintain new technologies likely to be installed in the facility in the future. 15 operators attended the first training in June and the training received very positive feedback. When asked whether or not the operators felt that they were able to improve and make progress as a water plant operator, 33 percent said they agree and 66 percent said they strongly agree. Additionally, the water plant operators were able to receive 8.8 continuing education units from the State of Alaska for completing the training that went towards maintaining their operator certification.

Exploring Different Technologies

Ground Source Heat Pump

ANTHC is partnering with the Metlakatla Indian Community and the Annette Island Service Unit to design and construct a ground source heat pump system to serve the Lepquinum Wellness Center in Metlakatla, Alaska, through funding from the Alaska Renewable Energy Fund.

Ground source heat pump systems harness the relatively constant temperature of the subsurface earth as an essentially unlimited renewable energy resource. The proposed ground source heat pump system for the Lepquinum Wellness Center will extract heat from a geothermal loopfield on the facility's property and transfer it to the building hydronic heating system via a water-to-water heat pump.

Once complete, Metlakatla's ground source heat pump system is estimated to reduce the overall energy costs for the Wellness Center by 73 percent. The new system is poised to displace 47,200 gallons of heating oil per year, and lower the overall annual energy and operational costs for the Wellness Center by $203,000. Through the savings created by this project, dollars normally spent on heating oil can stay in the local economy and enable support of other important public programs and services in Metlakatla.

Solar Power for Water Treatment Plants

In 2015, ANTHC completed solar photovoltaic feasibility studies for water treatment plants in the eight rural Alaska communities of Allakaket, Beaver, Holy Cross, New Stuyahok, Newhalen, Pitkas Point, Russian Mission and Sleetmute. Partnering with each community, ANTHC is actively seeking funding to make this project a reality.

The goal of the proposed project is to produce as much renewable solar electricity for each water treatment plant as possible without feeding electricity back onto the local electric grid. Therefore, the proposed solar photovoltaic systems will be sized to produce between 6 to 12 kilowatts of power, and be comprised of 22 to 44 solar panels, each rated at 275 watts.

By completing installation of the proposed solar photovoltaic systems at water treatment facilities in each of the eight rural Alaskan communities, this project is projected to produce electricity savings of 93,906 kWh per year and would provide a total annual savings of approximately $61,808.

Four Year Implementation Plan

		Activity	Total Communities	Funding Needed	Total Funding Needed
Energy Audits		**Conduct Energy Audits**	**80**	$400,000	**$400,000**
Feasibility Studies		**Conduct Renewable Energy Feasibility Studies for Future Renewable Projects**	**40**	$4,00,000	**$400,000**
Implement Recommendations		**Implement Energy Efficiency Improvements & Training**	**80**	$7,300,000	**$22,550,000**
		**Design Renewable Energy Systems**	**30**	$2,600,000	
		**Construct Renewable Energy Systems**	**34**	$12,650,000	
Monitor Results		**Install Remote Monitoring Systems**	**80**	$1,450,000	**$1,450,000**
		Combined Total			**$24,800,000**
		Total Anticipated Annual Savings			**$3,615,000**
		Payback/Return on Investment			**6.86 years**

Our Path Forward

Deliver – Carry out funded energy audits, efficiency retrofits, renewable projects, remote monitoring and operator training for dozens of communities through collaboration with our rural customers and statewide partners.

Expand – Increase the positive impact of the Rural Energy Initiative by expanding energy auditing and retrofit recommendation services to multiple public facilities in rural communities

Innovate – Explore and demonstrate new technologies and approaches to addressing rural energy challenges, including micro wind turbines, combined heat and power, waste-to-energy, energy storage, and heat pump technologies.

Diversify – Proactively address Alaska's funding challenges by working on behalf of rural communities to seek new grant and loans to implement energy efficiency and renewable energy projects.

Collaborate – Continue active engagement in local, regional and statewide partnerships to collaboratively develop solutions that address the energy challenges across rural Alaska.

Share – Use results of completed energy improvements to develop and share energy "best practices" that can improve energy savings and increase community sustainability across all of rural Alaska.

Lead – Build from ANTHC's rural energy experience and technical capabilities to serve rural customers by orchestrating community-wide strategic energy planning.

We would like to thank the following partners for their assistance and support:

Alaska Center for Energy and Power
Alaska Department of Commerce
Alaska Department of Environmental Conservation
Alaska Federation of Natives
Alaska Housing Finance Corporation
Alaska Energy Authority
Alaska Village Electric Cooperative
Alaska Vocational Technical Center
Aleutian Pribilof Islands Association
Annette Island Service Unit
ANTHC Alaska Rural Utility Collaborative
Association of Village Council Presidents
Bristol Bay Area Health Corporation
Bristol Bay Native Association
Cold Climate Housing Research Center
Denali Commission
Indian Health Service
Institute of the North
Interior Regional Housing Authority
Kodiak Area Native Association
Lake and Peninsula Borough
Maniilaq Association
Metlakatla Indian Community
NANA Regional Corporation, Inc.
National Renewable Energy Laboratory
Norton Sound Economic Development Corporation
Norton Sound Health Corporation
Northwest Arctic Borough
Norton Sound Health Corporation
Nuvista Light and Electric Cooperative
Renewable Energy Alaska Project
Tanana Chiefs Conference
U.S. Arctic Research Commission
U.S. Department of Energy
U.S. Environmental Protection Agency
USDA Rural Development
Yukon-Kuskokwim Health Corporation

Our Vision:
Alaska Native people are the healthiest people in the world.

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