Maximizing Sustainability in Arctic Water and Sewer: Energy Efficiency

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ALASKA NATIVE TRIBAL HEALTH CONSORTIUM

ANTHC Rural Energy Initiative

Our Purpose

The Alaska Native Tribal Health Consortium's (ANTHC) 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.

We believe basic sanitation should be efficient, sustainable and affordable

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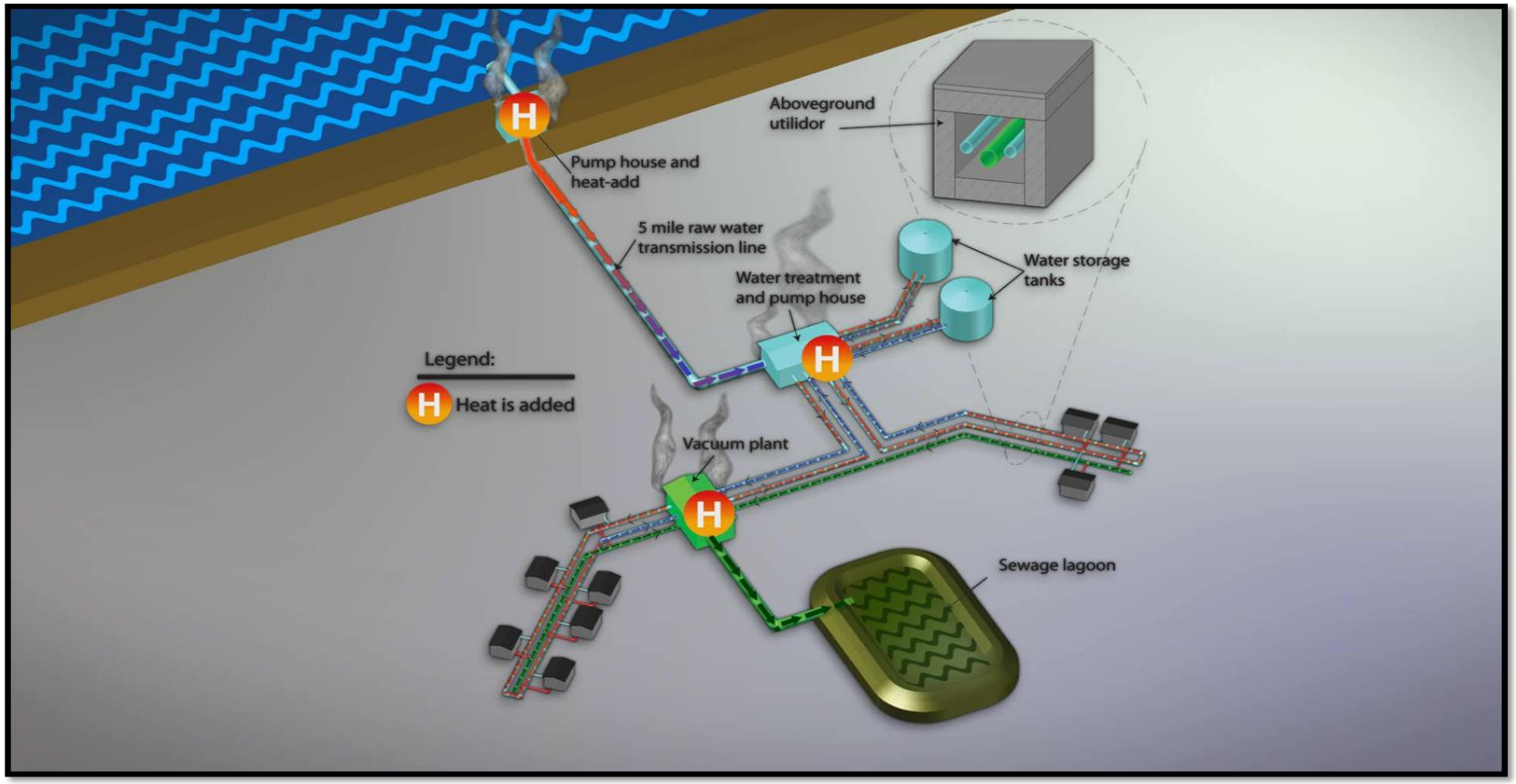
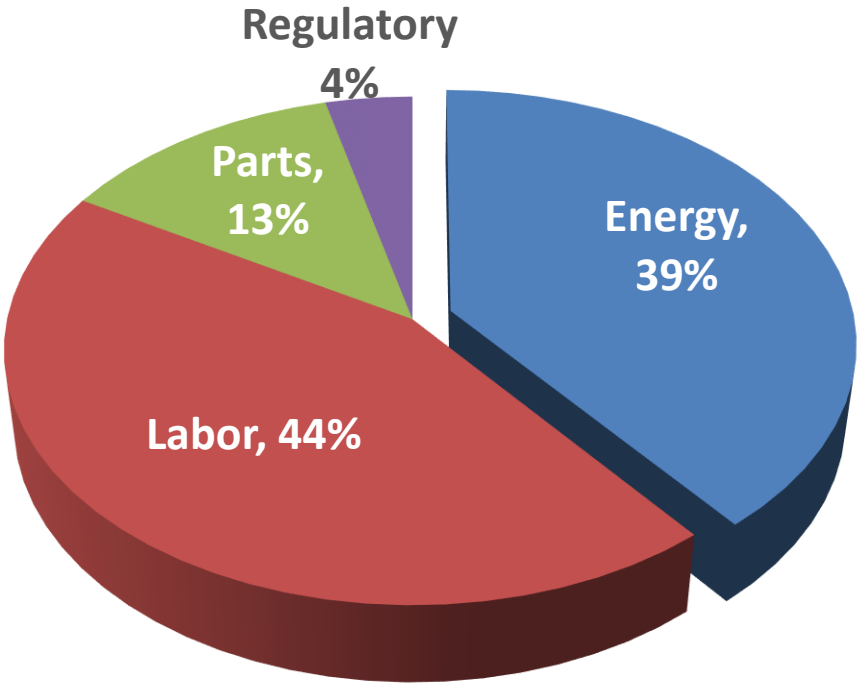
The Energy Intensive Arctic Sanitation System



Understanding the Arctic Water-Energy Nexus



Breakdown of average operating costs for a water/sewer system in rural Alaska

Our Path: A Comprehensive and Collaborative Approach

Energy Audit

Analysis

Implement Recommendations

$$$

Savings

Onsite Assessment

Collect Data

Evaluate Operating Practices

Assess Facility Energy Use

Develop Energy Model

Identify Potential Improvements

Identify Cost to Implement

Develop Training Plan

Purchase Materials

Implement Efficiency Retrofits

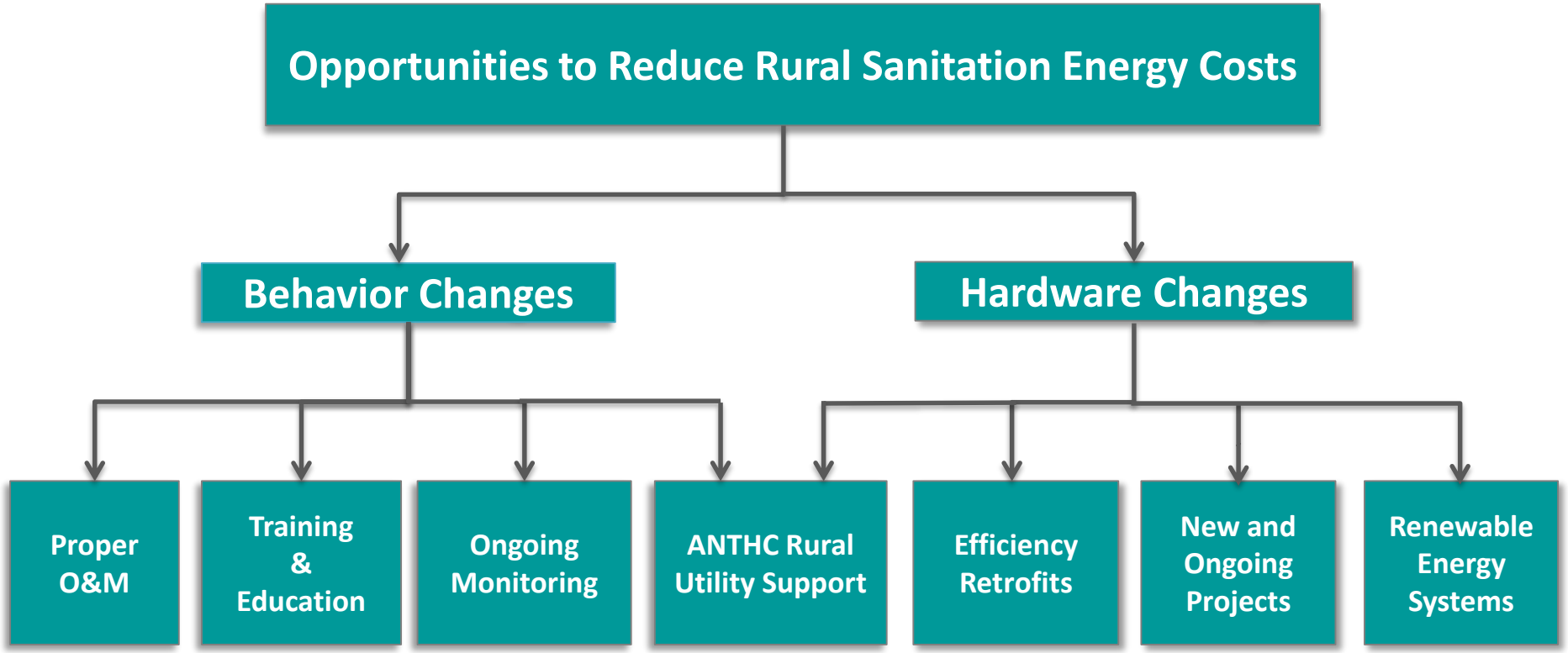
Provide Operator Training

Construct Renewable Energy Systems

Monitor Energy Usage

Evaluate Retrofit Effectiveness

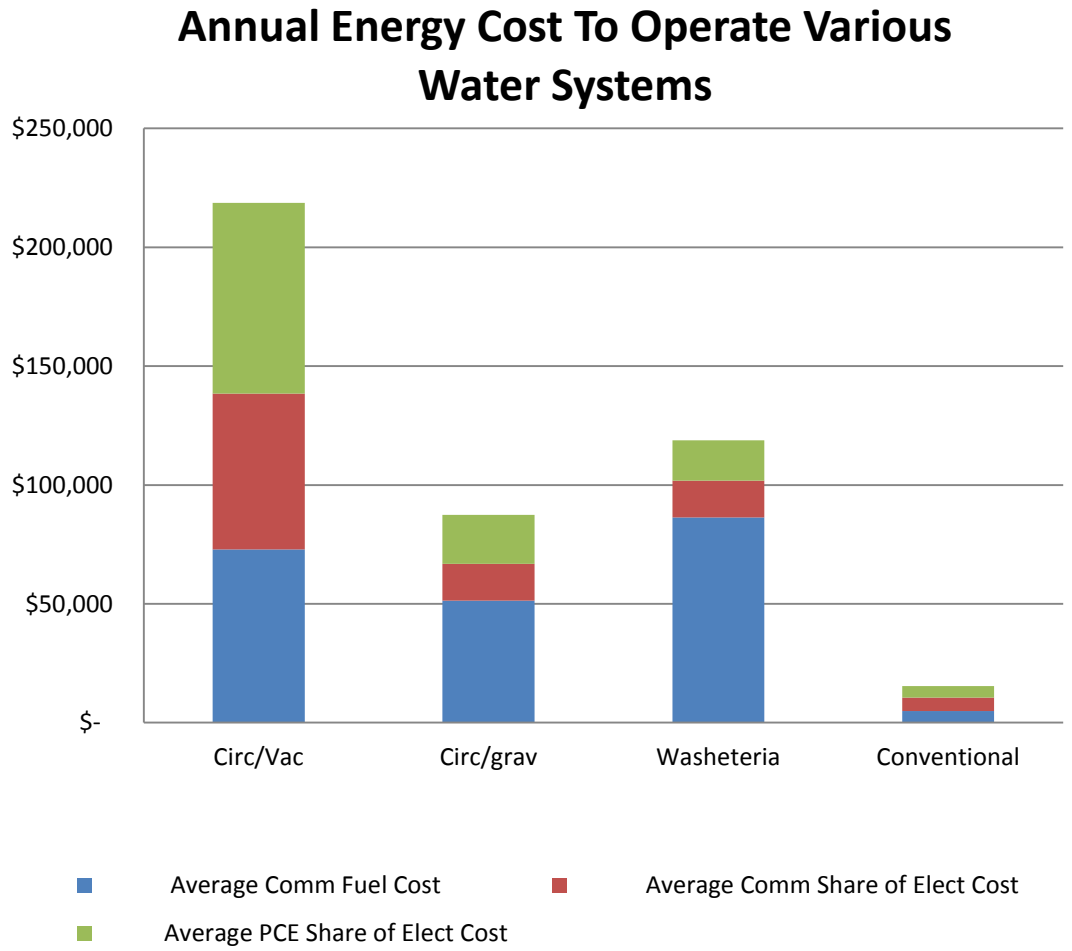
Our Path: A Comprehensive and Collaborative Approach



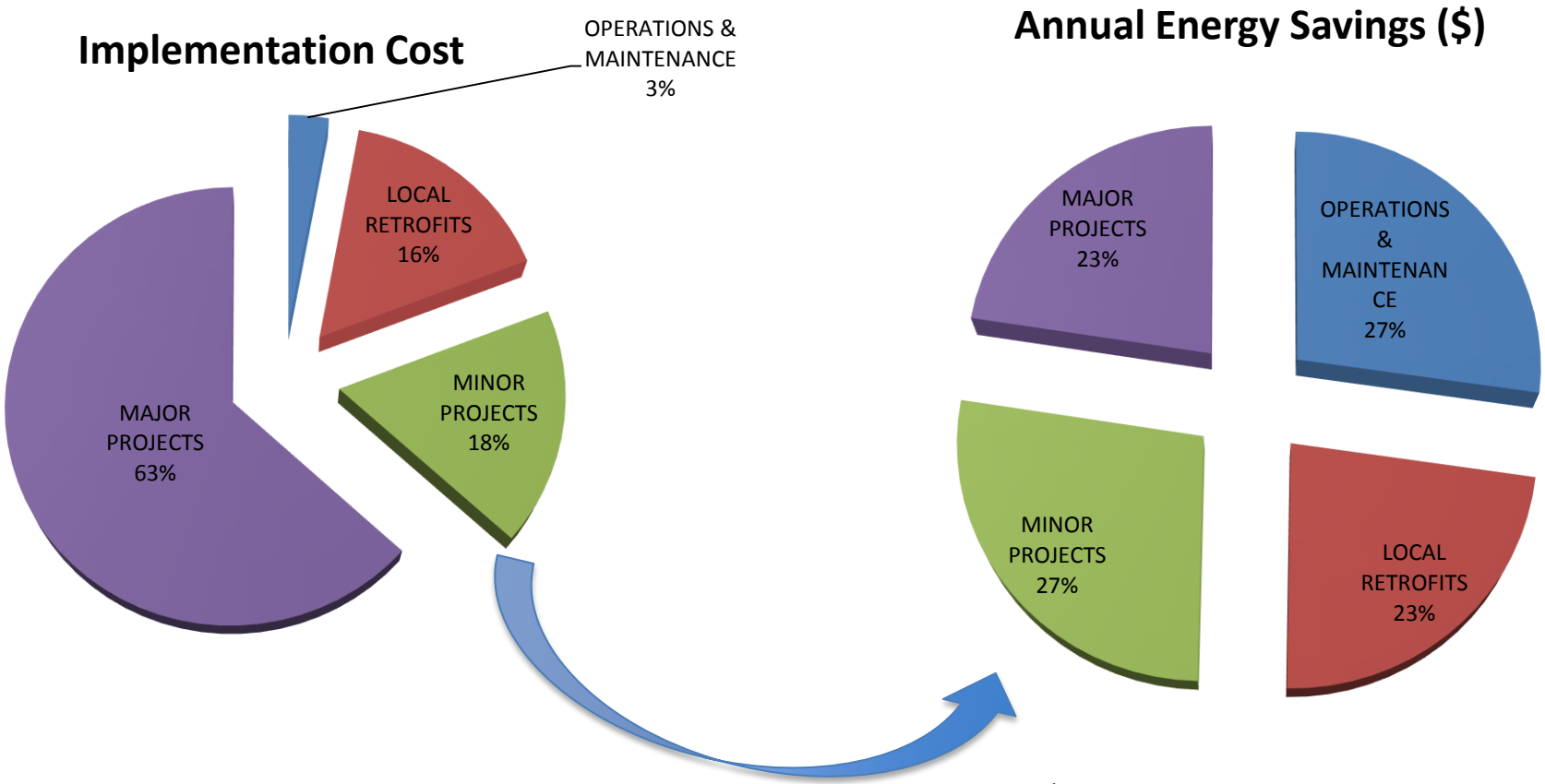
Energy Costs Vary by Type of Water System

- Northern & Interior Alaska communities have circulating water, and many have vacuum sewer, unlike Anchorage and Southeast Alaska conventional systems.

- The result is very high fuel and electricity costs.



Small Efficiency Investments Yield Big Savings



Small Efforts = **Big Results**

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Typical Operational Issues and Minor Fixes Identified

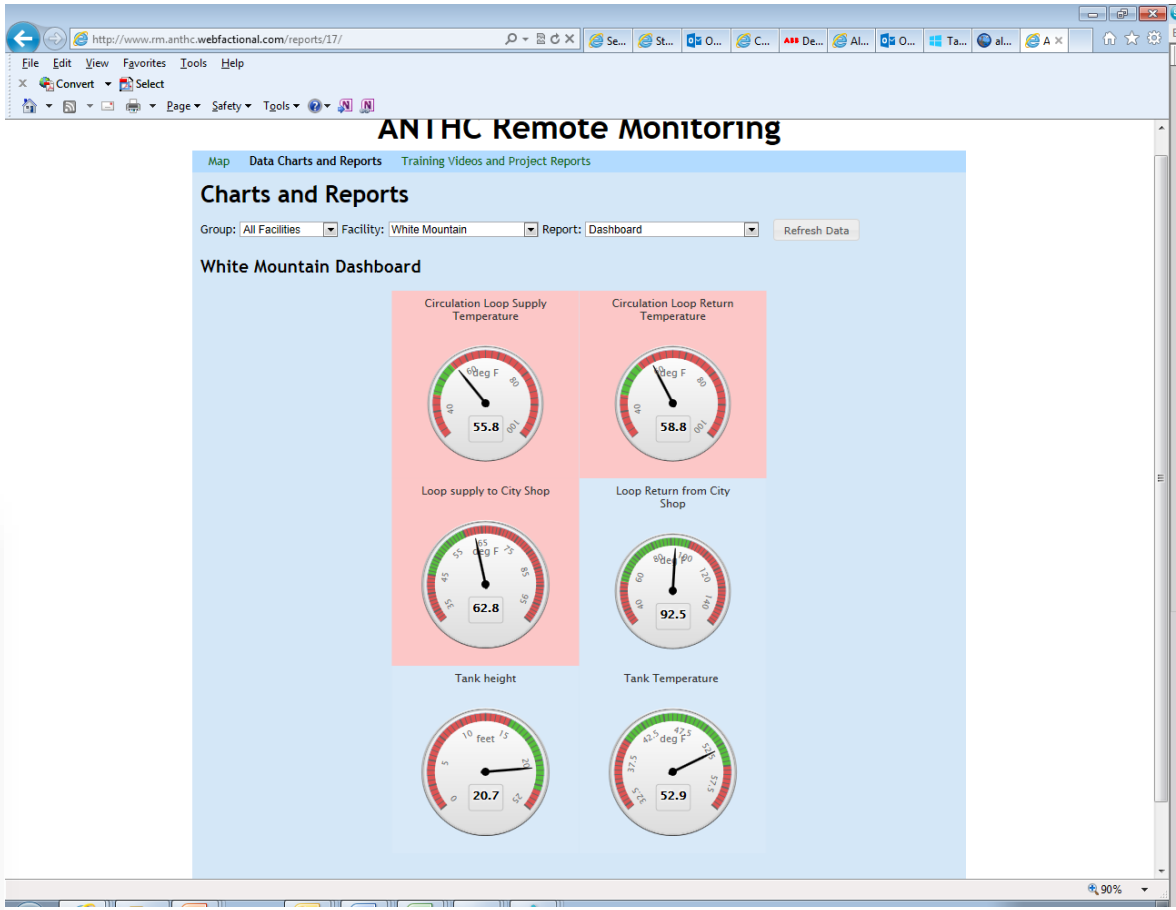
- Boilers need to be cleaned and tuned
- Boilers settings are too high and not properly staged
- Boilers are operated all summer when they are not needed
- Circulation pumps can be shut-off in summer
- Building temperature is not set back during unoccupied hours
- Water storage tank and circulating loop temperature set higher than needed
- Lift Station pumps short cycling due to fouled floats
- Electric heat trace used all winter (or all year) when designed for emergency thaw only
- Leaks in Distribution/Collection causing increased well pump/lift station run time

Longer Term Energy Upgrades Identified

- Improve the building shell by adding insulation and replacing windows/doors
- Replace old and tired boilers with new appropriately sized high efficiency cold start boilers
- Replace pumps with new high efficiency pumps and variable speed drives
- Repair and or replace process pipe and hydronic system insulation
- Add remote monitoring to optimize energy performance

Remote Monitoring

- http://rm.anthc.webfactional.com/reports/
- Records Results
- Allow for check ins and low cost technical assistance
- Greater access to information for regional partners



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Non-Energy Benefits: Capacity

- Expanded Local Capacity
  - Expanded Knowledge
  - Improved Job Satisfaction
  - Local Ownership
- Access to Regional Support

Safety and Comfort

- Better Lighting
- Reduced Fire Danger
- Greater Confidence Interval on Freeze-Ups
- Improved Space Heat Balancing
- More Regular Hot Water

Health and Performance Improvements

- Reduced Moisture/Mold
- Faster/More Effective Drying
- Reduced Water Waste

Expanded Lifespan

- Critical Component Replacement
- Improved Maintenance
- Improved Financial Sustainability
- Spare Parts Provision

Appropriate Technology

- Visual feedback to inform operator behavior
- Ultra Efficiency / High–Tech versus Low–Tech
  - Low tech but locally operable encourages engagement, long term sustainability
  - SCADA versus local control / simple remote monitoring
- Low O /M Technologies
  - Heat Recovery, Programmable Thermostats
- Appropriate Technology/Scaled Renewables
  - Biomass Heating, Solar PV

Case Study: Energy Efficiency Retrofits – Pilot Station, Alaska

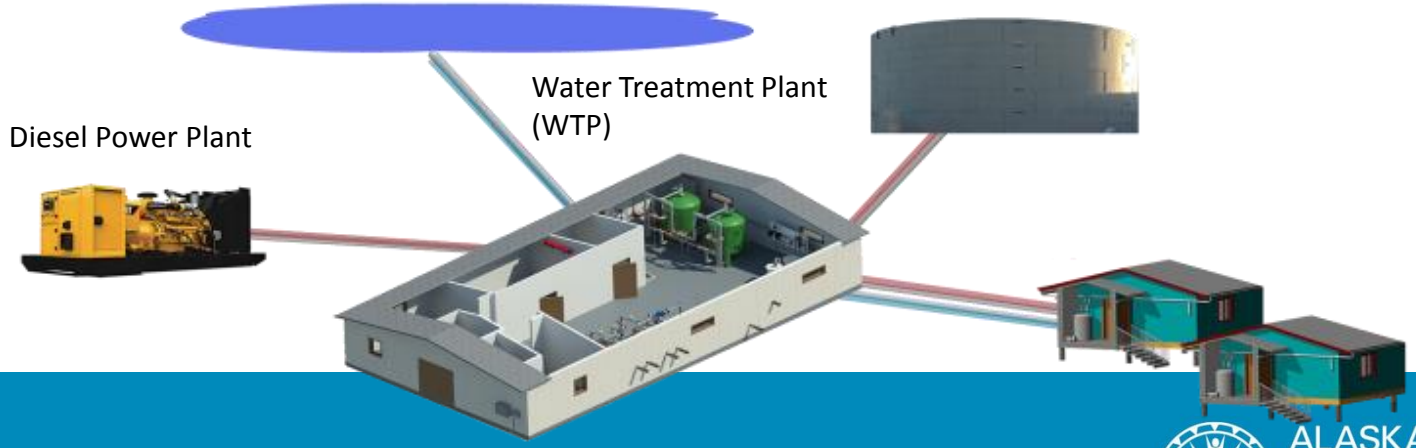
Training and small scale improvements.

- Saves sanitation system over **1,000** gallons of fuel oil and **25,000** kWh annually
- Equates to **66%** reduction in Fuel and **33%** drop in electricity
- Combined annual savings of **$11,090**

BEFORE:
Brushing & cleaning soot from boiler

AFTER:
Clean flue passage

Alternative Energy Options



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Current and Identified Projects Through 2018

Current Energy Efficiency Projects

- 44 communities

Identified Energy Efficiency Projects

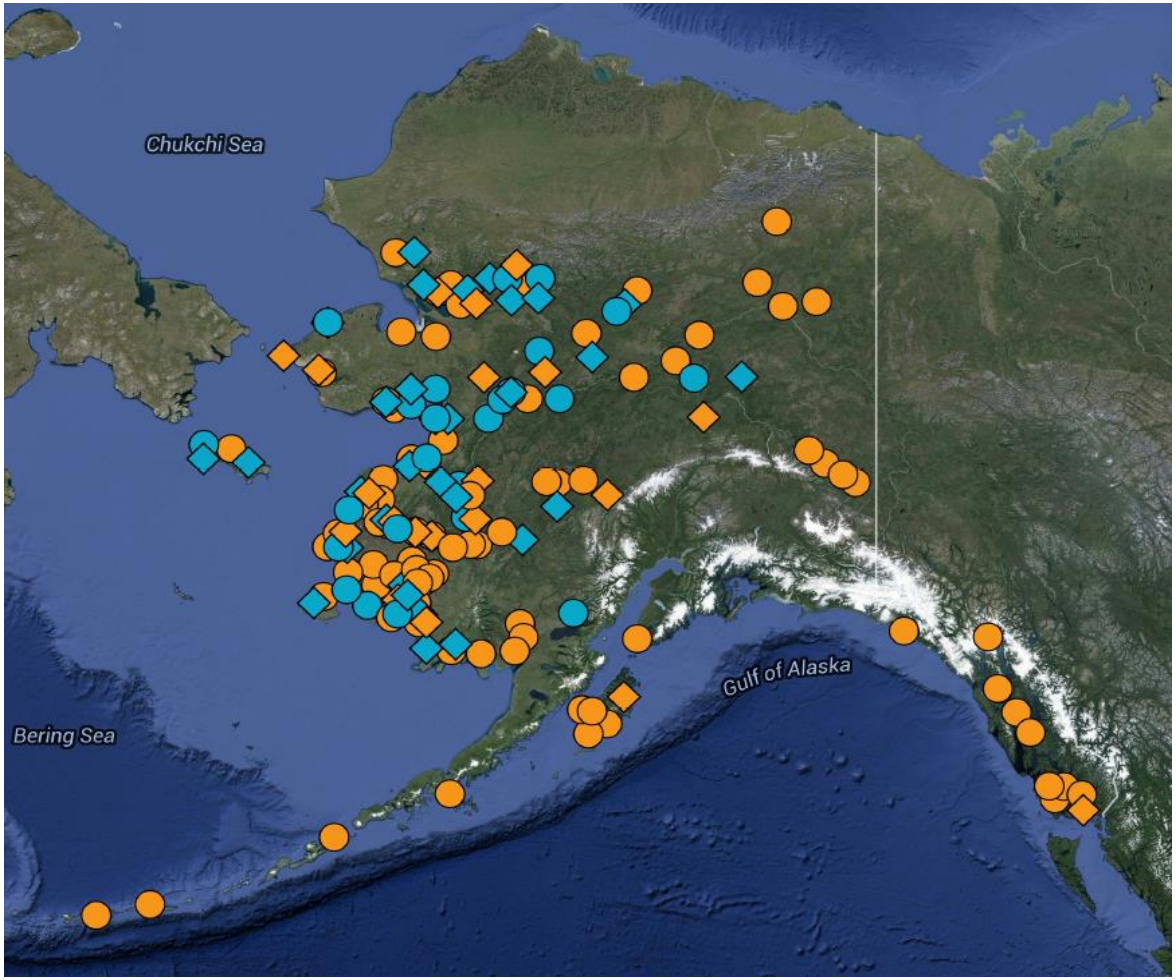
- 82 communities

Current Renewable Energy Projects

- 25 Heat Recovery Projects | 5 Biomass Projects | 4 Wind-to-Heat Projects

Identified Renewable Energy Projects

- 16 heat recovery projects | 5 Biomass Projects | 1 Ground Source Heat Pump Project | 1 Hydroelectric Project



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Thank You

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For more information, please visit:
http://anthc.org/what-we-do/rural-energy/