

Wrangell Hydroelectric Boilers



Wrangell, Alaska



Hydroelectric boilers decrease energy cost by 48 percent

Project Overview

In collaboration with the Alaska Energy Authority (AEA), Wrangell Municipal Light & Power (WMLP) completed the design, construction, and integration of three electric boilers in Wrangell, Alaska. The new electric boilers convert excess energy from the Tye Lake Hydroelectric facility into usable heat energy. The three building complexes that directly benefit from this energy are the Nolan Center, Public Safety Building (home to the fire hall, court, and public safety hall), and the High/Middle Schools.

Objectives

The main objective of this project was to reduce the community's reliance on diesel fuel to heat facilities reducing the cost of heat energy while lowering the city's carbon footprint.

Reasons This Project Was Chosen

Wrangell was using 2,982,822 gallons of diesel fuel annually to heat their entire community. The new electric boilers' capacity and efficiency provide a cleaner source of fuel and save thousands of dollars annually. Using an electric boiler also reduces maintenance costs when compared to diesel boilers.

Economic Feasibility

The system became operational in February of 2011. Between February of 2011 and December of 2014, it produced 30,090 MMBtu of thermal energy and displaced 305,000 gallons of diesel fuel. This displacement saved the community \$640,000 in energy costs. Over its 20 year projected lifespan, the project has a calculated benefit/cost ratio of 1.91.

Quick Facts

Total Project Costs: \$1.9 million

Funding:

Renewable Energy Fund: \$1,862,387

Local Funds: \$76,358

Capital Costs:

Design: \$288,175

Construction: \$1,650,570

Equipment

Boiler Make: (3) Precision Boilers

Output: 160 kW (Nolan Center), 240 kW

(Public Safety), & 700 kW (Schools)

Diesel Fuel Offset

Estimated Annual: 100,000 gallons

Actual Annual: 84,000 gallons

Feb. 2011-Dec. 2014: 305,000 gallons

Actual Fuel Savings

Estimated Annual: \$163,112

Actual Annual: \$145,000

Feb. 2011-Dec. 2014: \$640,000

Benefit/Cost Ratio: 1.91

Estimated Simple Payback: 11.9 years



Wrangell, AK., photo courtesy of Sitnews.us

Wrangell Hydroelectric Boilers

Power and Storage

Electrical power is provided to Wrangell Municipal Light & Power (WMLP) by the Tyee Hydroelectric facilities, owned by the Southeast Alaska Power Agency (SEAPA). Currently, Tyee has the capability of producing 20 MW of power. During the summer months, approximately 11 out of the 20 MW are excess power and during the winter 6-7 MW are excess. The community buildings that were converted to electrical energy have oil fired boilers in place as a back up energy source.

Learning Experiences/Challenges

The original application identified eleven buildings for conversion to electric boilers. Due to a reduction in funds it was only feasible to construct heating systems for the Nolan Center, Public Safety Building, and the High/Middle Schools. These buildings were ranked according to highest community need and value.

With the success of the project, private homes and businesses followed suit. WMLP has found that the additional electric demand has a negative impact on their distribution and stand-by generation capabilities. They partnered with Cold Climate Housing Research to promote air source heat pumps as alternatives to resistance-based electric boilers for future community conversion. These pumps can produce up to three times the heat with the same amount of electrical energy.



Hydroelectric boiler, photo courtesy of WMLP.

Any overages in energy output at the Tyee facility are given to WMLP by SEAPA in the form of a rebate equal to the overage amount. This has allowed Wrangell to keep their electrical rates at eight cents per kWh. This helps residents with heating costs and encourages them to use electric boilers instead of diesel. This rate has been unchanged until recently. Due to projects that SEAPA is performing with Tyee's excess water, there is not as much overage as Wrangell normally anticipates. As a result, rebates were lowered and electricity rates were increased slightly to 8.5 cents. Though this isn't a huge bump, WMLP hopes to bring the cost back down for residents soon.

Community Benefits

By implementing the conversion to electric boilers, the surplus energy produced by Tyee is used and the cost of energy for City facilities has decreased by approximately 48 percent. These savings have been passed on to WMLP customers through a decrease in taxes and power rates, which benefit all Wrangell community members.

The Tyee Hydroelectric Facility has provided a steady electric rate to WMLP for 6.8 cents per kWh for the last 17 years. Using excess energy from this facility has allowed the utility to reduce their dependence on diesel fuel, a resource that is constantly fluctuating in price.

Project Contact information

Parties Involved:

Clay Hammer, WMLP superintendent
Email: powerplant@gci.net
Phone: 907-874-3602

Brooke Williams, WMLP secretary
Email: wmlp@gci.net

Case Study Author:

Zoe Tressel, AEA
Website: Akenergyauthority.org
Phone: 907-771-3000

Published August, 2015