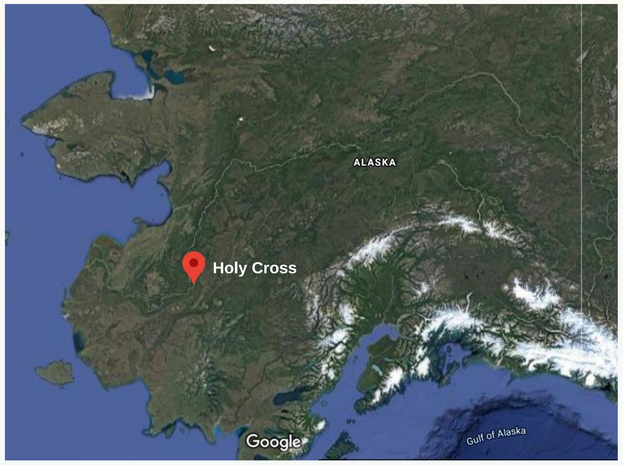
Holy Cross Sustainable Energy Project

Kasey Casort, *National Renewable Energy Lab – Cold Climate Housing Research Center*
Melinda Gregory, *City of Holy Cross*
Dave Messier, *Tanana Chiefs Conference*



Holy Cross is located in Alaska's Yukon Flats.

Weatherizing buildings in Holy Cross included improving insulation (photo courtesy of TCC Energy Program).

Newly installed solar PV panels on the Tribal Hall in Holy Cross (photo courtesy of TCC Energy Program).

The weatherized Deloycheet, Incorporated Lodge in Holy Cross (photo courtesy of TCC Energy Program).

Abstract

The City of Holy Cross is an Athabascan community in the Yukon Flats committed to investing in energy efficiency and renewable energy. Holy Cross applied for a Department of Energy Remote Alaskan Community Energy Efficiency Competition (RACEE) grant to increase tribal energy security through the implementation of energy efficiency projects with the goal to reduce energy consumption by 15% per capita by 2020. They were awarded the grant and used it to expand their Heat Recovery System, install a solar PV system on their Tribal Hall and water plant, conduct building envelope and HVAC improvements on tribal buildings and the Holy Cross school, conduct a community-wide LED lighting retrofit, and train an operator to maintain the new equipment. This poster summarizes the activities of the project, the resulting change in energy use, and the lessons learned from those involved. We also address the non-energy-specific results of the project and how it decreased the environmental impact of Holy Cross' buildings while reducing energy costs for residents.

Key words: energy efficiency, renewable energy, solar PV

Project Goal

Increase tribal energy security through the implementation of **energy efficiency projects** with the ultimate goal of **reducing energy consumption by 15% per capita by 2020**.

Implementing Energy Efficiency Projects

The City of Holy Cross used a Department of Energy Remote Alaskan Community Energy Efficiency (RACEE) grant to implement the following energy efficiency projects:

- Expand their Heat Recovery System,
- Install solar photovoltaic (PV) systems on the Tribal Hall and Water House,
- Conduct building envelope and HVAC improvements on tribal buildings and the Holy Cross School, and
- Conduct a community-wide LED lighting retrofit.

The **building envelope and HVAC improvements** included replacing and sealing windows and doors, replacing existing air handling control systems, sealing crawlspace ventilation outlets to prevent crawlspace air from being blown into buildings, replacing air handling unit system air filters, and improving bathroom blower units.

The expanded **waste-heat system** now provides a "totally different type of heat than what we've felt before… the heat was so much better than using a stove running off diesel," according to City Clerk Melinda Gregory.

The **community-wide LED lighting retrofit** involved replacing all lightbulbs with LED bulbs and/or appliances with Energy Star certified appliances in 56 homes and businesses, as well as the following tribal buildings: the Youth Center/IGAP building, the new tribal building, the clinic, City Garage Shop, City Washeteria, Community Hall, City Office, School Shop, Teaching Housing apartments A and B, and Holy Family Church. Additionally, the commercial Deloycheet, Incorporated office and lodge/apartments were included in the retrofit.

The **solar PV systems** on the Tribal Hall were installed but activation has been delayed due to insurance challenges between the Tribe and Alaska Village Electric Corporation (AVEC). The solar PV system on the water plant was turned on in winter 2021, so no records are available for comparison yet.

Additionally, the Holy Cross Sustainable Energy Project included **training a local operator** to maintain the new equipment. This supports the Tribe's long term goal of achieving, exceeding, and indefinitely maintaining their energy reduction pledge of 15% by 2020.

Results: Energy Savings in Holy Cross

Nearly all homes and public buildings in Holy Cross were affected in some way during this project. Note that data collection is ongoing, so these results are preliminary. The Holy Cross City Office showed a median change of 30 fewer kWh used each month after the retrofits (see Figure 1). The washeteria, however, shows a median of 22 more kWh used each month in 2020 compared to 2017. This may be associated with a more comfortable environment after retrofits increasing community usage. Similarly, the upgrades to the tribal office/lodge will result in greater energy consumption simply because the building was not in use for several years until the RACEE grant improvements were conducted, making the building habitable again.

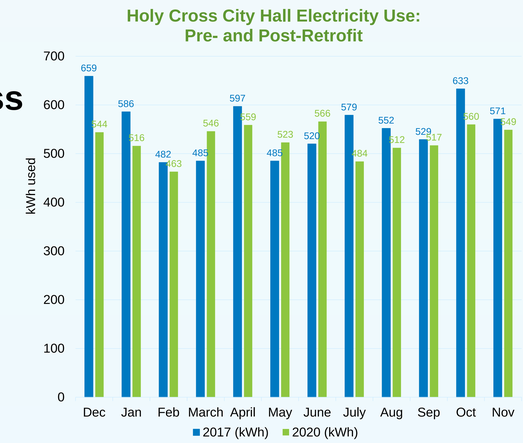


Figure 1. Holy Cross City Office Energy Use: Pre- and Post-Retrofit (2017, 2020). Data courtesy of Holy Cross City Clerk Melinda Gregory.

Timeline

- **Winter 2017** - Communications and Data Management Plan completed
- **Spring 2018**- Community hosts project kickoff meeting, project meeting with tribal council to plan solar PV array and renovations on tribal buildings; community-wide LED lighting retrofit underway
- **Fall 2018** - Solar PV installed at Holy Cross Tribal Hall, community-wide LED lighting retrofit completed
- **Winter 2018/19** - ANTHC and TCC sign cooperative agreement for construction of the Holy Cross waste heat system
- **Spring 2019** – Energy efficiency, building envelope, and HVAC improvements on tribal buildings underway
- **Summer 2019** - Holy Cross School LED lighting installed; AVEC inspection and approval of the solar PV project; ANTHC Heat Recovery System expansion begins
- **Fall 2019** - Holy Cross Lodge weatherized, heat loop lines installed; additional mechanical work associated with energy savings is identified at the Holy Cross School
- **Winter 2019/20** - Improvements completed on the clinic, youth center and old tribal office; School Contractor traveled to evaluate and repair the mechanical system; window upgrades completed in Holy Cross School; mechanical connections tied into waste heat loop; and ANTHC completed an analysis of issues with the waste heat system
- **Spring 2020** – Assessment and training trip to Holy Cross, all materials ordered and shipped
- **Fall 2020** - Holy Cross School weatherization completed; local operator trained to maintain new equipment
- **Winter 2021** – Solar PV system on the water plant completed

Impacts & Lessons Learned

One of the biggest impacts of this project has been bringing the school up to code, which was a priority because an additional goal was to help the kids and school. Another impact from this project was improving the lodge, which is now able to host workers on larger infrastructure projects, like an ongoing project at the Holy Cross airport.

COVID-19 delayed some work involving travel to Holy Cross, but it did not ultimately delay the project. The community entered their first COVID-19 lockdown in June 2020 and endured five more lockdowns during the project duration. Improving the lodge was critical to stopping the spread of COVID, as it provided a place for people to quarantine without putting the rest of their household at risk. This prevented any positive COVID tests based on community testing.

This material is based upon work supported by the National Renewable Energy Laboratory, operated by Alliance for Sustainable Energy, LLC, for the U.S. Department of Energy (DOE) under Contract No. DE-AC36-08GO28308. Funding provided by the U.S. Department of Energy, Office of Indian Energy Policy and Programs, under Award Number DE-0000092. The views expressed in the article do not necessarily represent the views of the DOE or the U.S. Government. The U.S. Government retains and the publisher, by accepting the article for publication, acknowledges that the U.S. Government retains a nonexclusive, paid-up, irrevocable, worldwide license to publish or reproduce the published form of this work, or allow others to do so, for U.S. Government purposes. Funding for this poster provided by the State of Alaska through a grant to Cold Climate Housing Research Center.

One Health, One Future 2021
April 6-11, 2021
NREL/PO-5600-79615