



# START Energy Grant

## FINAL REPORT: YAKUTAT TLINGIT TRIBE ENERGY CONSERVATION UPGRADES & ENERGY EFFICIENCY MEASURES

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# TABLE OF CONTENTS

EXECUTIVE SUMMARY.....	2
PROJECT OVERVIEW.....	3
OBJECTIVES.....	4
DESCRIPTION OF ACTIVITIES PERFORMED.....	5
CONCLUSIONS AND RECOMMENDATIONS.....	9
LESSONS LEARNED.....	10

## EXECUTIVE SUMMARY

The Yakutat Tlingit Tribe (YTT) was awarded Strategic Technical Assistance Response Team (START) assistance from the Department of Energy (DOE) Office of Indian Energy Policy and Programs (OIEPP) in 2014. Yakutat, a community of approximately 600 residents is located at the mouth of Yakutat Bay, 225 miles northwest of Juneau and 220 southeast of Cordova. Yakutat Borough is within and surrounded by the Tongass National Forest, Wrangell St. Elias National Park and Preserve, and Glacier Bay National Park and Preserve.

There were two energy audits performed and included into the grant award for energy efficiency and energy upgrades. The two facilities included were the Kwaan Plaza which houses the medical clinic and the Community Center which housed the Tribe's 477 Social Welfare Programs. Our cost share partner and Village Corporation, Yak-Tat Kwaan, is the owner of these facilities. The intent of the grant was to lower energy consumption at both facilities and to explore technology to provide electricity and heat to the Kwaan Plaza which was reportedly expected to be at a lower cost than the current rates offered by the local utility.

The major areas of energy efficiency work that took place were insulation measures, building sealing, LED lighting retrofits, occupancy sensors, thermostat setbacks, and crawl space excavation and water diversion.

The energy upgrades included the purchase of a YANMAR co-generation unit and heating system upgrades, both of which took place at the Kwaan Plaza.

There were a number of lessons learned through the duration of the grant's period of performance. Staff stability is critical, proper planning is essential, and innovative technology may look good in theory but reality checks are needed to ensure poor decisions are not blindly followed.

## PROJECT OVERVIEW

The Yakutat Tlingit Tribe (YTT) carried out the recommended energy efficiency measures outlined in the Investment Grade Energy Audits for two buildings leased by the Tribe but owned by the Yak-Tat Kwaan, Inc., an Alaska Native Village Corporation established under the Alaska Native Claims Act. Both facilities support vital services to the community including the Kwaan Plaza Facility, which houses the Yakutat Community Health Center (YCHC), as well as the Tribal Community Center, which houses the Tribal Human Services (HS) Department.

The Kwaan Plaza Facility has been selected for energy upgrades and efficiency measures because it houses the Yakutat Community Health Center, the only medical and emergency health care facility available within the community. The community is only accessible by air or water which means the community is isolated along the north gulf coast of Alaska, hundreds of miles away from any major hospital. This renders the emergency services provided by the health clinic critical. The Kwaan Plaza was built specifically to house the community health center and has been leased to the Tribe since 1990. Reducing the cost of heat and power to this building will increase the funds available to the YCHC to provide additional and critical medical services to community residents, tribal members and visitors.

Likewise, the Tribal Community Center also provides critical social services to the native and non-native residents and houses mental health and substance abuse counseling services, Tribal and public assistance programs, the local food bank, job placement and training, and other critical services.

In addition to implementing energy efficiency measures to both buildings, the Tribe also installed a 10 kilowatt (kW) propane fueled micro Combined Heat and Power unit into the Kwaan Plaza building. This unit can generate both heat and electricity and can function independent of the existing power grid. The Yanmar micro combined heat and power (mchp) 10 kW uses an internal combustion engine powered by clean natural gas or propane to produce both heat and electric power. This high efficiency generator utilizes the heat generated from the liquid-cooled engine to heat buildings and domestic hot water to a temperature of 158 degrees Fahrenheit (F). Although this system appears to be ideal for this facility, we have run into significant problems with securing feed stock at a reasonable price due to logistical issues.

A RFP was developed for all work identified in the Energy Audits. Two contractors were selected, Morley Electric and Rubbo Construction.

Morley Electric's scope of work included Setback Thermostats (both facilities), LED Lighting Retrofits (both facilities), Occupancy Sensors (both facilities), and heating system repairs (Kwaan Plaza).

Rubbo Construction's scope of work included insulation and building sealing measures at the Community Center.

## OBJECTIVES

The objective of this project was to reduce energy costs at the Kwaan Plaza and Community Center by 45-53% and 15-17% respectively.

There were 5 main areas of focus. LED lighting retrofits, occupancy sensors, thermostat setbacks, insulation/sealing measures, and Yanmar Co-Generator installation.

Both facilities' lighting systems were upgraded with low voltage LEDs, occupancy sensors, and thermostat setbacks.

The Community Center's insulation was either inadequate, mold ridden, or non-existent. We focused heavily on replacing, supplementing, and/or installing insulation under the floor and in the attic crawl space. We also looked at wall penetrations, windows, and doors to ensure adequate sealing was in place. Where needed, we applied caulk to areas indicating heat loss from infrared.

The Yanmar Generator was installed at the Kwaan Plaza with the intention of lowering both heat and electricity costs. Although this was a great idea in theory, the individuals who were making decisions at that point did not fully think this out. The cost of procuring, shipping, and storing propane in Yakutat was not cost effective and any savings realized by operating the system were reduced by the logistical costs of securing feed stock.

## DESCRIPTION OF ACTIVITIES PERFORMED

### **Kwaan Plaza**

#### **Task 1.0 Night Setback Thermostat Measures**

Digital, programmable thermostats with setback capability for night and unoccupied temperatures will be set to 60.0 degrees F and will be installed in the second floor two (2) office spaces.

Digital, programmable thermostats with setback capability for night and unoccupied temperatures will be set to 60.0 degrees F and will be installed in the second floor public assembly conference room.

Digital, programmable thermostats with setback capability for night and unoccupied temperatures will be set to 60.0 degrees F and will be installed in the first floor Dental suite space.

Digital, programmable thermostats with setback capability for night and unoccupied temperatures will be set to 60.0 degrees F and will be installed in the first floor offices, exam rooms, labs and corridors.

Digital, programmable thermostats with setback capability for night and unoccupied temperatures will be set to 60.0 degrees F and will be installed in the first floor emergency room.

#### **Task 2.0 Electrical and Appliance Measures**

Replace six (6) high pressure switch E26 screw-in bulbs with six (6) 8 watt (W) light-emitting diode (LED) Module StdElectronic on exterior soffit light fixtures.

Replace six (6) HPS wall packs with six (6) LED 60W Module StdElectronic wallpacks on Exterior lighting.

Replace HPS E26 screw-in bulbs with 17W LED tubes in exterior lighting 50W wall packs. Replace with four (4) LED 17W Module StdElectronic tubes.

Remove ballasts from twenty-eight (28) T12 fixtures and re-wire for LED tubes; replace with twenty-eight (28) LED fixtures (containing 4 tubes each) 12W Module StdElectronic in first floor offices; remove manual switching and add seven (7) switch mounted occupancy sensors (currently wired with manual switches so no fixture wiring is required).

Remove thirty-three (33) ballasts from T12 fixtures and re-wire for LED fixtures; replace with thirty-three (33) LED fixtures (containing 3 tubes each) 12W Module StdElectronic in second floor offices; remove manual switching and add six (6) ceiling mounted Occupancy Sensors.

Remove ballasts from thirty (30) T12 fixtures and re-wire for LED tubes in first floor offices and corridors; replace with thirty (30) LED fixtures (containing 2 tubes each) 12W Module StdElectronic; remove manual switching and add six (6) new ceiling mounted occupancy sensors in the main corridor and three (3) switch mounted sensors in the administration office, pharmacy and small lab.

Remove ballasts from eight (8) T12 fixtures on the second floor common areas and re-wire and install eight (8) LED fixtures (containing 2 tubes each) 12W Module StdElectronic; remove manual switching and add four (4) ceiling mounted occupancy sensors.

Remove five (5) ballasts from T12 fixtures in the first floor high use offices and re-wire and install five (5) LED fixtures (containing 2 tubes each) 12W Module StdElectronic; remove manual switching and add one (1) ceiling mounted occupancy sensor.

Remove nine (9) ballasts from T12 fixtures in the second floor conference room and re-wire and install nine (9) LED fixtures (containing 2 tubes each) 12W StdElectronic; remove manual switching and add one (1) switch mounted occupancy sensor.

Remove ballasts from seventeen (17) T12 fixtures on the second floor and re-wire and install seventeen (17) LED fixtures (containing 3 tubes each) 12W Module StdElectronic; remove manual switching and add two (2) ceiling mounted occupancy sensors and two (2) switch mounted occupancy sensors.  
Remove ballasts from T12 fixtures in northeast (NE) and southwest (SW) offices and large lab and re-wire and install 13 LED fixtures (containing 2 tubes each) 12W Module StdElectronic; remove manual switching and add three (3) switch mounted occupancy sensors.

Remove ballasts from T12 fixtures, and re-wire and install six (6) LED fixtures (containing 3 tubes each) 12W Module StdElectronic; remove manual switching and add two (2) ceiling mounted occupancy sensors.

Remove ballasts from T12 fixtures in the mechanical room, storage and janitors closet on the second floor, and re-wire and install seven (7) LED fixtures (containing 2 bulbs each) 12W Module StdElectronic tubes; remove manual switching and add one (1) ceiling mounted occupancy sensor.

Remove ballasts from T12 fixtures in the Men and Women restrooms, and re-wire and install four (4) 36 inch LED fixtures (containing 2 tubes each) 12W Module StdElectronic; remove manual switching in the Women's restroom and add one (1) ceiling mounted occupancy sensor.

Remove ballasts from T12 fixtures in the first floor storage and janitor rooms and re-wire and install fifteen (15) LED fixtures (containing 2 tubes each) 12W Module StdElectronic; Remove manual switching and add five (5) switch mounted occupancy sensors.

Remove ballasts from T12 fixtures in the first floor dental suite and re-wire and install seven (7) LED (2) 12W Module StdElectronic tubes; Remove manual switching and add two (2) switch mounted occupancy sensors.

Replace T12 fixture in the first floor Dental suite restroom and re-wire and install one (1) 48 inch LED fixture 12W module StdElectronic; remove manual switch and add one (1) switch mounted occupancy sensor.

#### **Lighting Measures- Lighting Controls Only**

Remove manual switching in the first floor clinic lobby and rest room and install a switch mounted occupancy sensor in the restroom.

#### **Heating System Repairs**

Replace faulty valves to allow for correct utilization of the Night Setback Thermostat Measures installed as Task 1.0

**Task 3.0** Purchase and install the Yanmar CP10WN unit into the Kwaan Plaza facility.

### **Community Center**

#### **Task 1.0 Building Shell Measures**

1.1 Remove 3-4 inches of existing insulation from 2 X8 floor cavity and replace with R-30 fiberglass batt.



**Task 2.0      Night Setback Thermostat Measures**

- 2.1      Implement a Heating Temperature Unoccupied Setback to 60 Degrees F for the east wing Community Center area.

**Task 3.0      Electrical and Appliance Measures**

- 3.1      Replace existing exterior Par 30 incandescent flood light bulbs with two (2) LED 20W Module StdElectronic lights.
- 3.2      Remove ballasts from one (1) T12-4 lamp fixture in the multi-purpose room and re-wire for LED tubes; replace with four (4) 12W Module StdElectronic; Remove manual switching and add new occupancy sensor.

**Task 4.0      French Drain/Water Mitigation**

- 4.1      Trench 18"x20" French Drain and Fill with Gravel @ East Side of Building. Lower dirt-line 3" around Community Center, and expose crawlspace vents in order to promote healthy ventilation throughout building.
- 4.2      Front Entry Deck/East Side Deck: Front Entry Deck (Approx. 6'x14')/ East Side Deck (Approx. 2'x90'). Protect drainage and ventilation system by covering with Pressure Treated deck. Deck boards attached at ½" spacing to maximize airflow under building.
- 4.3      Mold Remediation Below Boiler: Clean & Remove Mold Outbreak @ crawlspace below Boiler/Laundry Room.

## CONCLUSIONS AND RECOMMENDATIONS

Although there were many hurdles we had to overcome throughout the project, the energy efficiency measures will have a major impact on the reduced consumption of energy at both facilities.

The Yanmar Co-Generator energy upgrade was a good idea in theory but ultimately I feel that the funding would have been better used in the energy efficiency related items of work rather than on energy upgrades. Those involved with the grant in the beginning were blinded by the potential of the system without looking at the costs to feed, run, and maintain the system in a remote village with no connected roadway. Securing propane contracts, shipping contracts, and purchasing isotanks should have been the first priority before charging full steam ahead with the purchase and installation of the Yanmar.

Like most upgrades to existing buildings, we uncovered a significant number of issues not related to the energy measures. Namely, there was an extreme amount of mold, rot, and deterioration to the buildings. Not only were we able to complete the energy efficiency measures but we were also able to identify issues of major concern to the building owner. Had these issues not been identified, the issues would have grown to unmanageable levels. We were able to catch these issues before they ballooned out of control.

For future energy grant opportunities, we recommend a focus on energy efficiency measures and renewable energy systems. In a village with no connected road systems, any petroleum based generation of heat and/or electricity is cost prohibitive. Further, to realize true energy independence, Tribe's should be looking at solutions that don't rely on petroleum based products. Not only is there a monetary benefit, but also a social benefit to lessen our reliance on petroleum.

## LESSONS LEARNED

There were a number of lessons learned during the period of funding; turnover can have drastic effects on priorities, unproven technology no matter how good it sounds on paper is not always a good idea, and doing retrofits on existing facilities will uncover numerous issues not readily seen.

Quite frankly, the biggest lesson learned during this grant opportunity was the need for stable employees/grant managers to be grounded in reality and dedicated to the completion of the grant. There was extreme turnover in grant managers and each brought their own ideas as to what this funding was supposed to handle. Turnover is to be expected in any organization but there was 4 people over 4 years who had attempted to manage this grant.

There seemed to be confusion as to who owned this grant and there were decisions made by the cost-share partner organization in the beginning to purchase and install a YANMAR co-generation unit which was not in the best interest of the intent of the grant. On paper, this system looked ideal for the facility in question and it appeared that the YANMAR would be able to completely replace the utility providing electricity. However, the sequence of planning did not take place in the correct fashion when analyzing the total costs to run and maintain. We quickly learned that renting Isotanks, shipping propane, and delivering propane locally to the unit was more costly than anticipated. This essentially showed us that this concept was not economically feasible and we scrapped any further petroleum fired co-generation units that had been proposed.

Lastly, major issues were uncovered as we began our energy efficiency measures at both buildings.

At the Community Center, we discovered that there was unknown raw sewage discharge into crawl space, small pest problems living in insulation, un-capped wet well that was an extreme danger to life or animals and people, broken plumbing fittings with grey water discharge into crawl space, deteriorating subfloor under hot water heater, dryer vented directly into crawl space, and there was a drainage issue where water was actually being diverted into the crawl space creating an even more saturated environment leading to mold, fungus, rot, and deterioration of wood members.

At the Kwaan Plaza, we completed LED lighting, occupancy sensors, and thermostat setbacks. When those were completed we then realized that the existing heating system's zone valves were almost entirely burnt out, with only 1 of 4 zones in operation. This caused us to develop a red lined statement of project objectives and submit for DOE approval to address the burnt out zone valves.