Minto Village Council

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Minto, Alaska Lakeview Lodge START Program Weatherization and Rehab Project Final Report

A project to Retrofit and Weatherize the Minto Lakeview Lodge

Project Location: Minto, AK 99758
Duration of Project: June 1st 2014 – Sept 30th 2015

Tribe submitting report: Minto Village Council

Award Number: DE-EE0006368

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Executive Summary

Minto Village Council applied to the Alaska START (Strategic Technical Assistance Response Team) Program in the spring of 2013 and was selected in the summer of 2013. Minto Village Council acts as the governing body for the community of Minto and manages most of the services in the community including transportation and the village water/sewer system. The goal in becoming a START community was to help the tribe and the community address the high cost of energy and to save the tribe money as it struggles to provide vital services for all community members. The START program facilitated a movement in the community to improve the village's energy situation. It brought important community stakeholders to the table to discuss possible energy solutions and provided funding for the community to help weatherize the largest energy consumer, the Minto Lakeview Lodge.

Figure 1. IRHA, Minto Village Council and DOE Tribally Energy Staff members standing in front of the almost complete Minto Lakeview Lodge in fall 2014. From left to right Annie Silas (IRHA), Jesse Joseph (IRHA Electrician), Kim Carlo (IRHA C.O.O.), Melanie Titus (Minto Village Council Book keeper) Laurie Baker and grandson (Former Minto Village Council Member). Gareth Baker (Minto Village Council Member), Pilar Thomas (Former DOE Tribal Energy Deputy Director), Bessie Titus (Minto Village Council Tribal Administrator), Givey Kochanowski (DOE Tribal Energy Alaska Coordinator), Chunky Edwards (Former IRHA Construction Foreman)

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Project Overview

In the summer of 2013, Minto Village Council was accepted into the Dept. of Energy START (Strategic Technical Assistance Response Team) Program to help the community reduce their high costs of energy. Heating fuel in Minto at that time was ranging from $4.50/gal to $6.50/gal and electric rates in the community were around $.60/kWh. The tribe had recently signed a check made out to a local Fairbanks company, Chena Power for $35,000 for the purchase of a wood fired boiler to heat their 10,000 sq ft building, the Lakeview Lodge. The Lakeview Lodge was and is very much the center of the community, but it had not received any significant energy upgrades since it was constructed in the early 1980's with outdated building practices. The walls in the lodge were thin and the air leakage was significant. Some of the offices literally could not be used because they were too cold during the winter months.

During the early summer of 2013, energy specialists from the Alaska Energy Authority, the Dept of Energy Tribal Energy Program, The Denali Commission, Alaska Energy Authority (AEA), Alaska Housing Finance Corporation (AHFC), National Renewable Energy Laboratory (NREL), Interior Regional Housing Authority (IRHA) and Tanana Chiefs Conference (TCC) came to Minto and hosted a community meeting to identify and prioritize the community's energy needs.

Figure 1 Old View of the Minto Lakeview Lodge from the same aspect as Figure 1 *before* Renovation. Note the stains on the building from 30+ years of frost buildup as the heat from inside the building met the extreme cold temperatures on the outside

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An array of options for the community were discussed including renewable energy, energy efficiency, community infrastructure needs and the high cost of heating and electrifying the Lakeview Lodge. After collecting information on all of the community's options over the next few months, the tribal council selected the 10,000 sq ft Lakeview Lodge as their main focus for the project funds. The Lodge is home to the main tribal offices, elders nutrition program, IGAP program, school lunch program, tribal operations, tribal transportation and the Indian Child Welfare Act (ICWA) program. It was agreed IRHA would put together a proposal for the project, the DOE would contribute $250k for weatherization and energy efficiency and the tribe would match the DOE share with $113,158 from a state of Alaska Capital Improvement Project (CIP) and donated in-kind staff time. The final product would be a complete weatherization of the lodge and hopefully a 30-50% reduction in energy costs.

Figure 2. This was one of the older doors on the lodge, insulated around the frame but still with numerous air leaks around the entire frame and UV rays are reducing the effectiveness of the insulation

Work was planned during late 2013 and early 2014 and completed during the summer of 2014. During the winter of 2014/2015 the tribe was seeing reduced heating and electrical bills. Very little information regarding the pre-renovation heating load of the building exists, but according to the individuals responsible for delivering fuel to the Lakeview Lodge, the heating load of the building was reduced dramatically. The tribe and community are very happy with their updated, more affordable base of operations and would like to thank the Department of Energy Tribal Energy Program and the State of Alaska for their assistance with and funding for this important project. It should be noted that the DOE and

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State of AK funding through the START grant has leveraged an additional $200k Village Energy Efficiency Program (VEEP) grant and a $273k Renewable Energy Fund (REF) biomass project grant that the community is now working to complete.

Figure 3. Mold and rot visible throughout the building's crawl space from various leaks and moisture issues. The building's knee walls were failing in some points when work was started but the knee walls would be shored up and repaired over the course of the project

Objectives

The main objective listed in the approved Statement of Project Objectives (SOPO) is to reduce energy costs on the building by between 30-50%. Although the electrical use in the building has not declined dramatically we believe the fuel use has been reduced by between 30-50%.

Other objectives of the project included spreading the message of energy efficiency throughout the community. This objective has certainly been achieved. Since the

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community wide energy meeting in 2013 there has been a lot of work moving the community toward greater energy independence and sustainability. In the tribally run transportation garage and fire hall, the tribal transportation director hired tribal members and led the construction of a small rocket stove that is being fired 3-4 times per day and is greatly reducing the fuel costs in that building.

As part of the START program, conversations and outreach were completed with village residents and individuals were provided with energy efficiency education and LED lighting for some homes. This has helped encourage the continuation of energy efficiency conversation in the small, close-knit community.

Figure 4. Minto Village Council members in the newly renovated Minto Lakeview Lodge under LED lighting and with new triple paned windows throughout the building

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As a result of the START award, the community applied for and was granted funding from the state of Alaska VEEP program to complete additional weatherization and upgrades to the Minto fire hall. This work was completed during the summer of 2015 and at the time of this report the fire hall is nearly complete and ready to begin housing the only fire truck in the community.

An additional result of this project was that the tribe also applied for and was granted funding to complete the construction of a small biomass boiler that is being designed to heat the Lakeview Lodge and adjacent Minto Village Clinic. The grant funds came from the state of Alaska Renewable Energy Fund in the amount of $273k and they are working with the Alaska Native Tribal Health Consortium (ANTHC) to determine the best project management approach to complete the construction of the biomass system that will service both buildings.

Figure 5. Aerial view of the Minto Lakeview Lodge (Right) and Minto Clinic (Left) and the approximate location of the biomass boiler slated for construction summer 2016 which will heat both buildings with locally sourced cord wood

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The fact that this project is moving forward underscores the significance of the START award. When Minto was selected as a START community, they were prepared to install an undersized biomass system that would have had the same problem as the fossil fuel heating system, an inefficient building that was leaking air and heat into the outside world and running inefficiently. The tribe is now following the mantra of "Efficiency First!" weatherization of the Lakeview Lodge has been completed, the energy use was reduced significantly and the tribe is now able to install a system that will supply heat to both buildings affordable and efficiently.

Description of Activities Performed (Including Photos and Graphs)

The Lakeview Lodge was constructed in the early 1980s or late 1970s when oil was cheap and building science was not focused on long-term energy use. Oil prices were less than $1/gal in those days and the main focus was to construct a building, not to construct a building that would operate efficiently over the next 30 years. Between the time the Lakeview lodge was constructed and the time the building was weatherized, almost no renovation to the exterior of the building or the building's heating system occurred.

Before the weatherization and rehabilitation of the Minto Lakeview Lodge, the windows were all original, the siding was original and many of the light fixtures we believe were original. Leaks and improper drainage over the years also took their toll on the building foundation and crawl space. The work that IRHA performed on the building is listed here:

1. Excavate foundation walls and replace rotting timbers with new foundation knee walls, appropriately sealed with a water proofing membrane
2. Re-slope the drainage away from the building
3. Remove and rebuild the fire-escapes that are on either side of the building
4. Remove the t1-11 siding from the walls of the building and inspect insulation, fill in gaps in the insulation and air seal around the existing, unsealed vapor barrier and electrical connections with new fiberglass insulation
5. Re-install T1-11 siding and add 4 inches of rigid foam insulation to the exterior of the building, fur out with furring strips and add new metal siding to the building. This brought the R-value of the wall from an R-19 to what we estimate is at least an R-41
6. Replace all single and double pane windows throughout the building with smaller triple pane windows, repair drywall on the inside of the building and insulate the exterior of these spaces
7. In the attic space, clear existing insulation, air-seal all electrical penetrations in the ceiling drywall and re-insulate the ceiling bringing the total R-value in the attic from an estimated R-21 to between an estimated R-70 - R-100

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8. Install new exterior doors and arctic entryways on all of the exterior entrances to the building
9. In the crawl space, all leaky plumbing connections were repaired and existing circulating pumps, 32 total, were replaced with ECM circulating pumps. These pumps use significantly less electricity and have an auto adapt function so they turn off in the summer when they are not in use
10. Straighten the knee walls in the crawl space and shim them as needed, replace rotten wood
11. Tune up and clean boiler and add a large Grundfos Magna circulating pump to reduce energy use
12. Convert all lighting both interior and exterior throughout the building to LED lighting using retrofit kits and new wall packs on the building's exterior
13. Convert switches throughout the building to occupancy sensors so that lights will turn off automatically when not in use
14. Install smoke detectors where needed and GFCI outlets in the kitchens and bathrooms to bring electrical system up to current building code

Overview of Data

The data collected during the project is shown and discussed briefly in this section. It should be noted that data collection was completed by a variety of people during the START program and that previous administrations at the tribe were not as focused on energy use or data collection, so minimal heating data was collected from actual records before the retrofit work was done. The data was assembled based on conversations with various tribal representatives, using estimates from reports that had been done on the building and using conversations from the individuals who delivered fuel.

The data in the first graph below shows the electrical usage in kWh use and cost to the tribe in dollars ($) for the years 2012-2014 during the months of January-September. These months were selected because those are the months of 2015 that data is presently available for at the time this report was drafted. The reduction in energy use for this period of time was about 7% based on numbers before and after the retrofit work was done.

The NREL modeling shows a larger expected reduction in energy use of closer to 20%. We believe the difference between estimated and predicted was caused by 3 main factors.

First - inaccurate data was used in the NREL modeling to predict yearly electrical use of the Lakeview Lodge.
Second - the model did not predict that a number of circulating pumps that were not previously working would begin working and thus consume energy.

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Third – the model did not predict that increased comfort in the building would lead to greater use of the space and thus greater energy consumption.

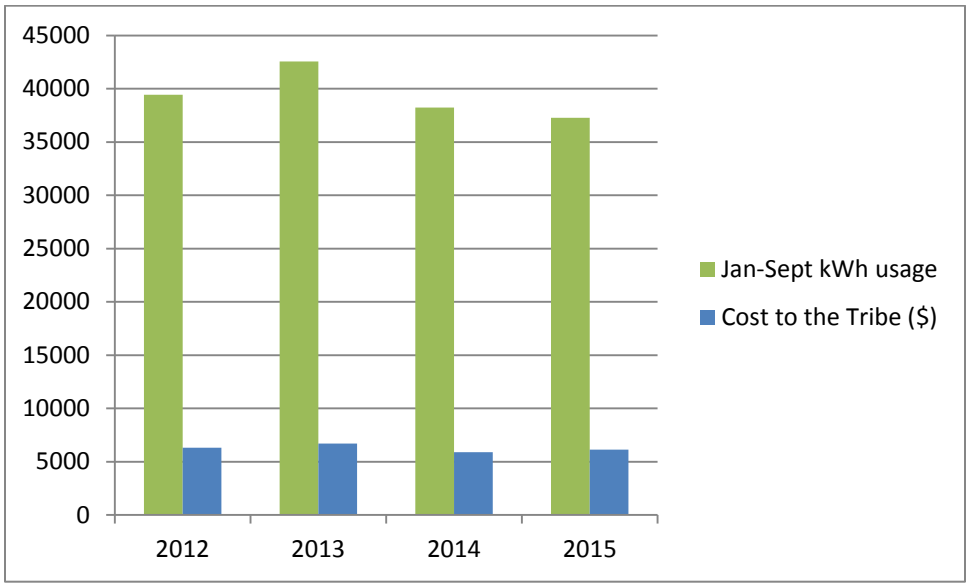

Figure 6. Electrical Use Graph Showing Cost ($) and kWh usage from Jan-Sept of 2012-2015, a slight reduction of around 7% over previous years averages was observed.

The fuel data is graphed below and shows a number of scenarios. Dark Blue shows the estimated fuel use before the retrofit of roughly 10,000 gallons and a presumed cost to the tribe of $55,000. This information is based off conversations with tribal members and a prefeasibility assessment that was done for wood heat in the Lakeview Lodge and clinic. The NREL modeling used the square footage of the building, the boiler and hydronic system and information on the local climate to predict that weatherization and upgrades to the lodge would reduce fuel usage in the building from 10,000 gal of fuel per year to 7700 gal of fuel per year, this is shown in Red. At a cost of $5.50/gal that would be a savings of $12,650 per year. The tribe believes that a savings of close to 2300 gallons per year is realistic and represents the actual savings.

Information collected from the tribe's book keeper is shown in teal in the graph below and only details *total annual fuel consumption of 1,473 gal of fuel for the Lodge*. The records also show a cost of $4.80/gal for a total winter-time cost of $7,070. This would indicate a **reduction in fuel use of 86% which we believe is unrealistic based on the size of the building and the improvements that were made**. It is more likely that the record keeping at the tribe was missing some of the fuel that has been delivered to the lodge.

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It is believed that the Lodge has decreased its fuel consumption dramatically since the weatherization upgrades because the individuals who deliver fuel have noticed a sharp drop in fuel consumption at the lodge. TCC, Minto Village Council and IRHA plan to continue to monitor the fuel usage at the lodge throughout the winter of 2015/2016 and verify that the tribe is seeing significant sustained reductions in fuel consumption. These entities would be happy to report results to the DOE as they become available.

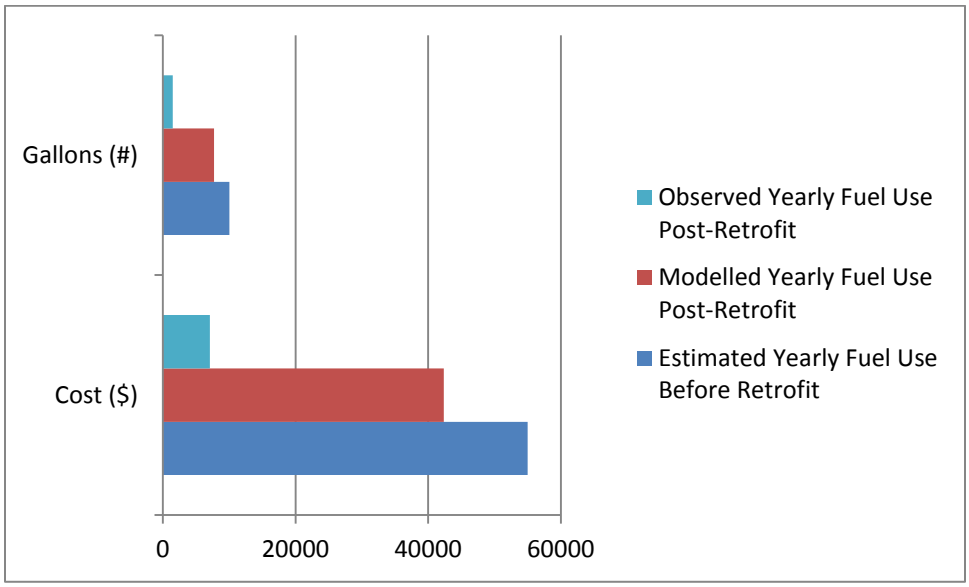

Figure 7 This Graph shows the *estimated* fuel use pre project, the *modelled* fuel use post project and the *documented* fuel use post-project. We believe the actual post project fuel use lies somewhere closer to the modelled fuel use but still represents a reduction of 2300 gallons

Conclusions and Recommendations

Conclusions

The Minto Village Council and the community of Minto would like to express a sincere thanks and appreciation to the Dept. of Energy Tribal Energy program for selecting Minto as a START community. The community would also like to thank the contractor, Interior Regional Housing Authority for their work on the building, the Minto Tribal Council's past and present members, and all of the community members who were hired to work on the building. The focus on Minto's energy situation that resulted after the START project was started has had a very beneficial impact on our community.

Financially, being selected as a START community has brought in $723k worth of grant funding to our small community ($250k START, $273k REF Biomass, $200k VEEP grant)

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and has collectively saved the tribe thousands of dollars in energy costs. This funding has put local residents to work, created numerous jobs and helped move the community toward a more sustainable future.

In addition to the energy savings **occupant comfort level in the building has increased dramatically.** This is believed to be the result of repairing zone valves, circulating pumps and multiple thermostats and the improvements to the building shell. As a result of this project, 4 offices that were previously unusable due to extreme cold during the winter months are now usable and functional. This has allowed tribal operations staff and other programs to expand their space and take advantage of the newly available offices. Although the large reduction in electricity use that was anticipated has not been observed, it is believed that this was a result of increased building use due to higher occupant comfort level. It is also believed that replacing some of the non-working circulating pumps caused the building to consume more electricity.

It is important to note that at the same time the building was weatherized, a commercial grade range hood over the cook stoves was installed to bring the building up to current fire code compliance. Although the above mentioned items have increased the electrical use in the lodge, because of the energy efficiency upgrades, the tribe has seen a 7% reduction in energy use from the average of 2012-2014 as compared to 2015.

Recommendations

Much of the recommendations are issues with the process rather than the outcome of the START award.

- Have the DOE offer an "owners rep" that knows the realities of working in rural Alaska for the project to help the tribe determine which energy efficiency measures make sense and which do not
- Be aware of the tight construction schedule that exists in Alaska and help the tribe meet important deadlines for reporting and shipping materials
- Paperwork to begin the grant took a lot of time and energy and it is believed that more assistance from the DOE would help us streamline the process
- Mid-project meetings facilitated by the DOE would help the tribe stay organized and help the project move forward in an efficient manner
- For energy efficiency projects specifically helping the tribe install cost effective, easy to use energy monitoring tools on the building would streamline future data collection. It would also make sharing the data from energy savings with our community, simple and easier

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Lessons Learned

The tribe learned many lessons on project management and energy efficiency from this project, some lessons learned have been outlined below.

1. It is important to ensure all staff members are on board with responsibilities before committing to a project of this scope and size.
2. For projects that occur during overlapping council election cycles, it is important to educate new council members to keep them up to speed with projects that are ongoing. This includes the purpose of the project, estimated outcomes, timelines and responsibilities
3. Putting a plan in place early on in the project timeline to make sure that responsibilities and meeting times are planned to review changes in the scope are clearly identified. Keeping contractors in communication with the grant recipient in respect to the scope of work is vital.
4. It is important to have an "owners rep" involved in the process, somebody who is on the side of the tribe in this case, but is familiar with the work that will need to be completed.
5. Energy bills in general are important to have to track the before and after use. The electric bills were available but the heating bills before the project were unavailable making before/after comparisons difficult. The tribe is now doing more work with tracking heating and electric bills.

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