

Tanana  
Chiefs  
Conference

122 1<sup>st</sup> Avenue  
Fairbanks, AK 99701  
907-452-8251  
[www.tananachiefs.org](http://www.tananachiefs.org)

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## Cover Page

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**Technical Contact:** Dave Messier, 122 1<sup>st</sup> Ave Fairbanks, AK 99701, 907-452-8251 ext. 3479 [dave.pm@tananachiefs.org](mailto:dave.pm@tananachiefs.org)

**Project Partners:** Interior Regional Housing Authority  
Cold Climate Housing Research Center  
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Dave Messier  
[Dave.pm@tananachiefs.org](mailto:Dave.pm@tananachiefs.org)

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## 2. Executive Summary

Tanana Chiefs Conference (TCC) is the traditional tribal consortium for the 37 federally recognized Tribes and villages of Interior Alaska. TCC is based on a belief in tribal self-determination and the need for regional Native unity. TCC is a non-profit organization that works toward meeting the needs and challenges for more than 10,000 Alaska Natives (mostly Alaskan Athabaskans) in Interior Alaska.



Figure 1. Interior Alaska

With support from DOE-OIE's Inter-Tribal Technical Assistance grant, TCC's goal was to expand and build on the solid foundation of work that the existing TCC Energy Program established through the creation of the Interior Athabascan Energy Network (IAEN). More specifically, the IAEN was designed to create a network of village-based energy champions across the interior and hold quarterly teleconferences and annual in-person meetings. Among the greatest impacts of the IAEN were the creation and support of realistic, community-based energy projects that

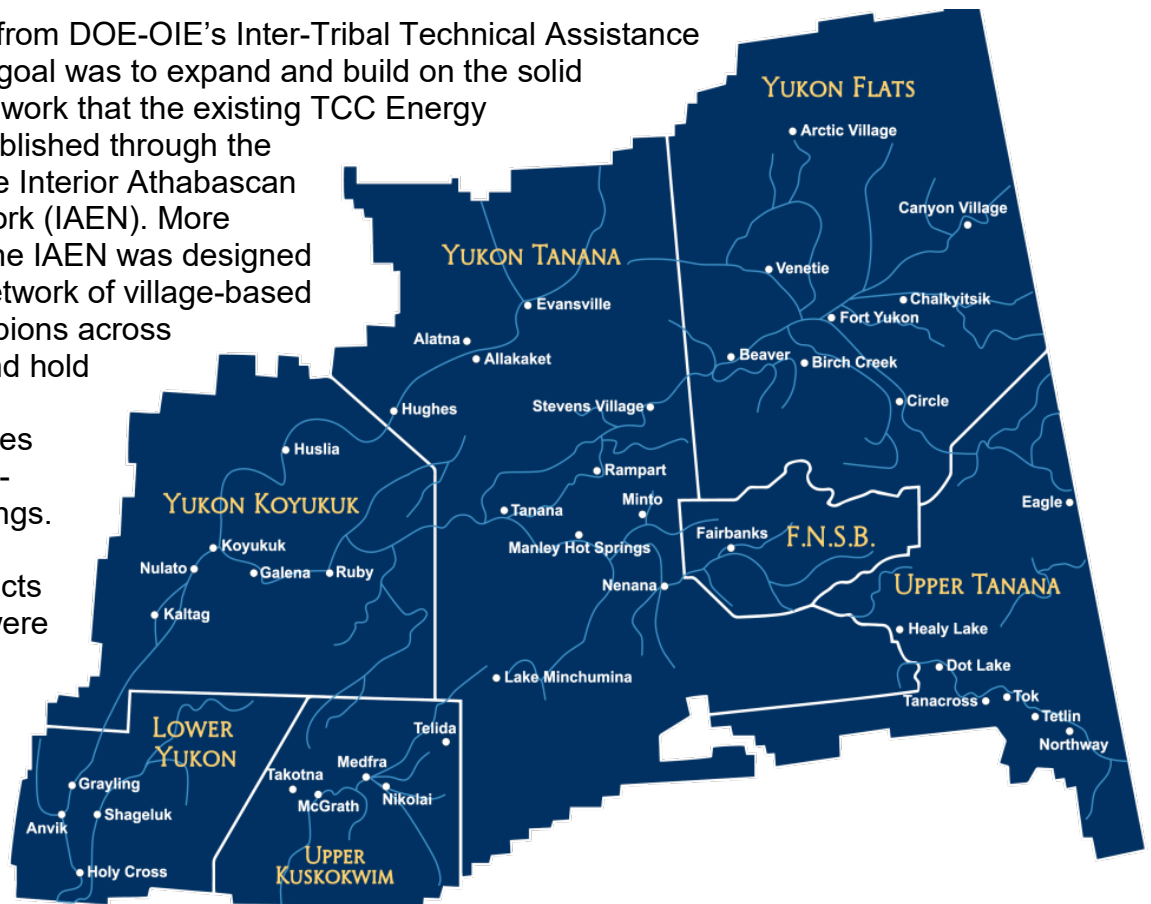


Figure 2. The Forty-Two Tribal Communities that TCC Serves

produced tangible results such as fuel savings and skills and capacity development among local staff as well as establishment of an energy team that included TCC staff, Tribal participants, technical consultants, and support agencies.

The DOE-TA funding allowed us to provide technical assistance to our Tribal communities to develop energy projects, and to foster a network consisting of Tribal

community members and energy experts that has strengthened the ability in the region to troubleshoot energy issues, develop meaningful projects, envision a clean energy future, and to share project successes and challenges. The funding from DOE was a catalyst for growth, has created opportunities for learning and knowledge sharing, and has led to the development of cost saving energy projects. Most importantly, the DOE project allowed energy champions around the region to share their knowledge, experiences, and expertise to create place-based solutions and has forged inter-Tribal relationships that will continue to be an asset for years to come.

Through information exchange that occurred at our IAEN annual meetings and other events, this technical assistance grant award has spurred a spinoff project that is focused on establishing a collaborative of independent utilities that work together to solve energy problems and share services to operate and maintain their electric utilities. We have identified at least 10 and possibly 12 communities that are interested in collaborating in managing their utilities to reduce costs and increase reliability. As well, by identifying and supporting Community Energy Champions in the Interior villages and adding capacity to the TCC Energy Program, we were able to create actionable community energy plans, develop specific projects, and increase local capacity, skills, and literacy around clean energy initiatives.



*Figure 3. First annual IAEN Meeting held in Fairbanks in 2017 with representatives from all TCC villages present*

### **3. Project Objectives**

The project objectives involved creating a Network of Energy Champions and Stakeholders in the Interior region of Alaska and a clearinghouse of information on the

TCC website regarding energy projects for use by residents of the Interior and elsewhere. The overall technical assistance project also involved the creation of multiple Community Energy Action Plans – ten were produced over 5 years. With DOE-OIE support, this initiative also created at least 5 energy-related videos over 5 years and, most importantly, a general increase in energy capacity within Interior Alaska villages.

Original project objectives were as follows:

Objective 1 – Establish regular quarterly meetings for Energy Champions and Stakeholders.

Objective 2 – Create a clearinghouse of information on energy projects and opportunities.

Objective 3 – Work with partners to develop Community Energy Action Plans (at least 8) that outline real and tangible steps to increase energy security.

Objective 4 – Create at least four informational videos on energy project in the region.

Objective 5 – Build/develop human capacity related to energy efficiency, renewable energy, utility management, and coordination.

Objective 6 – Develop specific and detailed Interior-Alaska rural building codes and energy use intensity (EUI) for new construction of buildings.

## **4. Description of Activities Performed**

### **Project Kickoff**

The project grant from DOE was awarded in October 2016. Early activities included hiring an Energy Specialist at TCC in March of 2017, traveling to villages in the region, creating marketing materials for the IAEN and distributing IAEN materials in-person at the TCC Annual Convention.

### **Annual Regional Meetings of the Interior Athabascan Energy Network**

To meet ***Objective 1 – Establish regular quarterly meetings for Energy Champions and Stakeholders***, TCC developed regular IAEN meetings. TCC hosted annual meetings with the villages and their representative from the tribes in the region. Those annual meetings were held in-person at TCC in Fairbanks, Alaska until Covid-19 shut down village travel. Additionally the group met quarterly via teleconference, although this was also hampered during Covid because of limited internet bandwidth and increased demand on all villages' internet systems with increased reliance on remote telecommunications.

IAEN Energy Meetings and Teleconferences were an opportunity for tribal representatives and the TCC team to meet and discuss project opportunities, community needs, funding announcements, community priorities, and energy challenges. Camaraderie developed between villages that face the same struggles

while solutions and replication of technologies were made possible by these technical exchanges. TCC was able to provide agency support and technical support to aid in energy project prioritization and decision making. Overall the meetings proved to be a breeding ground for relationship building, capacity building, project identification, and incremental technology improvements. By connecting communities to technical and institutional resources, this led to many projects that were developed and funded, with fuel and cost savings now being realized along with enhanced community resiliency and energy security.

Themes that often came up in meetings included local capacity, solar electricity, energy efficiency, and biomass district heating systems.

A brief summary of the annual meetings are below.

- **1<sup>st</sup> Annual IAEN Energy Meeting** – January 2017 – the well-attended meeting (over 50 people) was hosted in Fairbanks and included state and federal organization participants and many participants from tribes in the region.
- **2<sup>nd</sup> Annual IAEN Energy Meeting** – Spring 2018 – The second annual meeting had around 40 participants in attendance including industry professionals and many participants from tribes in the region. The general discussion at the meeting included energy projects across the TCC region. We added a weatherization and efficient housing construction report to the teleconference with the goal to broaden the reach and interest of additional entities.
- **3<sup>rd</sup> Annual IAEN Energy Meeting** – Winter 2019 – The third annual meeting was held at the Cold Climate Housing Research Center in Fairbanks, AK. The event included meetings and presentations from both energy experts and tribal participants covering solar, energy efficiency, high performance buildings, ground source and air source heat pump technologies, and more. The event was held in cooperation with other agencies.
- Both the 2020 and 2021 meeting were tabled due to Covid-19 and replaced with regular outreach to our tribes and assistance in how ARPA funds could be used to facilitate energy goals for each community.

To meet ***Objective 2 – Create a clearinghouse of information on energy projects and opportunities***, TCC archived and catalogued energy information for the region. Much of the information was produced directly with support from this DOE funded project while we were also able to include past reports and feasibility studies that were collected and archived at TCC. Consolidating all of this information under “one roof” was supported by this DOE TA project and is now an ongoing effort with long-term benefits beyond the time horizon of the original grant award.

The following is a list of energy information that TCC has archived that is available to Tribal communities in the region, currently by request. The long-term goal is to host much of this information on our website and make it open and publicly available. The Energy Clearinghouse/Archive for Interior Alaska Villages Includes:

- Over 200 energy related reports (feasibility studies, economic analyses, energy audits, etc) for the 42 communities in the region, organized by community.
- Community Energy Action Plans – for 10 communities in the region including Birch Creek, Minto, Nikolai, Grayling, Tanacross, Anvik, Evansville, Arctic Village, Beaver, and Rampart.
- Trip Reports and Utility Action Plans for the independent utilities in Beaver, Hughes, Koyukuk, Rampart, Ruby, Stevens Village, Arctic Village, Birch Creek, Nikolai, and Venetie
- Engine Maintenance logs for all of the independent utilities in the region.
- Engine manuals for independent utilities in the region.
- Power pool contact list for independent utilities in the region.
- TCC Outreach and Issues log for communities in the region.
- Case Studies documenting Project Successes were produced for:
  - Koyukuk Biomass Project (2017)
  - Fort Yukon Grid-Tie Solar PV Project (2018)
  - Kaltag Clinic Solar PV (2019)

To meet **Objective 3 – Develop Community Energy Action Plans (CEAPs) in at least 8 communities**, TCC and our energy consulting team developed CEAPs in 10 communities.

The Community Energy Action Plans are energy planning documents that are created in coordination with the community. The plans identify needs, opportunities, and a clear path forward via recommendations and next steps to allow for a simple roadmap for the community to follow to develop specific projects that both make sense from a financial and technology perspective but also align with the communities' values and priorities.

Beyond delivering a report, TCC and our energy consulting team assisted communities in executing action items in the plans to advance identified projects, such as diesel generator replacements, troubleshooting solar PV and biomass projects, conducting economic feasibility studies of specific technology options, and pursuing funding for energy savings initiatives. The participating communities and the year in which the CEAPs were completed are shown below:

1. Birch Creek CEAP (2018)
2. Minto CEAP (2018)
3. Nikolai CEAP (2019)
4. Grayling CEAP (2019)
5. Tanacross CEAP (2021)
6. Anvik CEAP (2021)
7. Evansville CEAP (2021)
8. Arctic Village CEAP (2021)
9. Beaver CEAP (2021)
10. Rampart CEAP (2021)



The long-term nature of the TA funding allowed for systemic planning and improvement of the CEAPs over time, as well as the opportunity to see some of the early CEAPs impact planning efforts on-the-ground implementation activities over time. This speaks to the value of the 5-year funding cycle, which is relatively unique within federal grant support, and very valuable for tribal capacity development.

To meet **Objective 4 – Create at least four informational videos on energy projects in the region**, TCC created six videos that are either generally informative/instructional or a case study that details a particular project. Below is a list of the videos produced.

1. Biomass Operations (Instructional/Informative Video) - 2017
2. Galena Biomass District Heating (Case Study Video) - 2018
3. Solar Electric (Informative Video) - 2018
4. Northway Solar PV (Case Study Video) - 2019
5. Ruby Heat Pump (Case Study Video) – 2021
6. Utility Collaboration (Informative Power Pool Video) – 2021

These videos are publicly available to view online; many have been shared on TCC's website or social media sites. The goal of the video series was to get communities excited about the project opportunities and successes from other villages and to provide informative videos around technology types as to demystify some of the technologies being utilized in the region. Lastly, the utility collaboration video was created to garner support around the concept of utilities working together to decrease costs and improve reliability of their power utility while working together. We have been focusing on the stand-alone utilities, i.e., those that are owned and operated by a single village with no larger institutional infrastructure (other than TCC's Energy Program) to rely on for technical assistance or procuring equipment. We have found these stand-alone utilities to be the most vulnerable and the ones that could benefit the most from intentional collaboration, creation of economies of scale, and additional technical assistance and management.

To meet **Objective 5 – Build/develop human capacity related to energy, efficiency, renewable energy, utility management and coordination**, TCC provided many instances of technical assistance for projects, provided outreach, community assistance, developed case studies, worked on developing a utility collaborative in the region, worked closely with powerplant operators and energy champions in the region, provided targeted troubleshooting and training of Tribal energy staff, and much more. These efforts are detailed below.

#### **Developing capacity through Tribal utility collaboration (“Regional Power Pool”)**

Through the IAEN quarterly teleconferences, annual in-person meetings, and TCC site visits to communities, an evolving theme evolved: the need for support in rural, Tribal, independent utilities. There are 11 very small independent utilities in the TCC region including: Hughes, Arctic Village, Beaver, Birch Creek, Chalkytsik, Koyukuk, Nikolai, Rampart, Ruby, Stevens Village, and Venetie. Each of these communities is under 250 people and typically generates less than 500,000 kWh annually.



While electric utilities in Alaska's urban centers benefit from an interconnected system serving many customers, these independent utilities face the same responsibilities with limited resources. Because of the challenges associated with their isolated location and small size, these utilities and other rural Alaskan electric utilities:

- Depend heavily on diesel generation
- Have high electric rates
- Face dangerous and costly situations during power outages
- Struggle to develop and maintain a utility workforce
- Are burdened by regulatory-required reporting with limited staff

Although TCC currently provides energy support services to help its communities address these challenges on some level, it became obvious that a dedicated regional organization would enable the most direct path to transitioning to renewable energy, reducing energy costs, improving reliability, and empowering utility workforces.

The DOE grant was a catalyst to bring these conversations to the regional "table" and spun off as a project that will continue beyond DOE funding. In 2019, TCC assisted the Native Village of Hughes to apply for BIA Tribal Energy Development Capacity (TEDC) grant funding to explore the concept of developing a utility collaboration; the project was funded and included technical partners that we worked with under the DOE TA grant, namely Woven Energy and DeerStone Consulting.

The first year of BIA TEDC funding allowed TCC, Hughes, and the other independent communities to assess regional opportunities to develop a tribal utility collaboration utilizing granular data from each utility that included costs, revenues, bulk fuel purchase amounts and prices, line loss, and other measures. The result of this first year of planning was a clear understanding of what the opportunities were for collaboration, the amount of financial impact that could be realized with economies of scale, and proposed organizational structures were defined for consideration by the utilities.

A second round of BIA TEDC funding was recently awarded. This second year will allow Hughes, TCC, and the independent communities to work towards developing a business plan to create an independent utility collaboration. The goal at the end of year two is to have a charter, bylaws, member commitments, an operating plan, and management policies and procedures drafted to "stand up" the organization and begin to provide services and create economies of scale.

With DOE funding, the power pool communities were also given the opportunity to sign up for a trial with the 60 Hertz software, a Computerized Maintenance Management System. 60Hertz is a microgrid services company based in Alaska whose goal is to reduce diesel use and energy costs in Alaska Native communities. They developed an O&M software tool to respond to the circumstances of islanded diesel microgrids and to assist power plant operators to better operate and maintain their utilities, especially the diesel generation assets. The software is an application, accessed through a tablet. The

software creates a real-time link between operators and the organizations supporting them. The goal is to reduce equipment failure and costly repairs through improved O&M, planning, and compliance. The following communities signed up to trial the software: Beaver, Birch Creek, Hughes, Nikolai, and Venetie. Limited internet capacity hindered the progress of this effort, but it nonetheless provided good baseline data and input for how to improve the process as we move forward with the broader utility collaboration.

### **Local powerplant capacity development through site investigations, powerplant audits, and one-on-one operations and maintenance assistance.**

The independent utilities in the region were invited to participate in a powerplant audit and powerplant operator outreach and training site-visit that were conducted by our contractor DeerStone Consulting. A series of day-trips to each of the communities allowed engineers with energy and powerplant backgrounds to audit each of the power plants, provide hands-on training with the powerplant operators, and provide a needs/opportunity analysis that led to a list of recommendations for projects or improvements to the power utility infrastructure, operations, or maintenance procedures. One of the unique components of these trips was the ability to cross pollinate power plant operators; we were able to identify strong powerplant operators in our spring 2021 trips that led to those powerplant operators being invited on subsequent trips, essentially helping their neighboring powerplant operators and developing inter-tribal relationships. This has enhanced the development of a network of powerplant operators that can call on one another for assistance. This was both a unique process and a direct result of TCC's and DeerStone's flexibility and knowledge of the local landscapes in terms of identifying the most committed operators and supporting them in a leadership position. This was a huge success and with additional TA funding we would replicate and expand this peer-to-peer activity.

The DeerStone team traveled to the following communities:

- Beaver (May 2021)
- Hughes (May 2021)
- Koyukuk (May 2021)
- Rampart (May 2021)
- Ruby (May 2021)
- Stevens Village (May 2021)
- Arctic Village (July 2021)
- Birch Creek (August 2021)
- Nikolai (August 2021)
- Venetie (August 2021)

Each of these 10 participant communities received a detailed trip report that described the activities during the site-visit and identified additional needs that should be addressed. Examples of the observations and outcomes of the Birch Creek and Arctic Village trips are summarized below.

### **Birch Creek Trip – Observations and Outcomes**

The team traveled to Birch Creek to evaluate the powerplant and provide support to the powerplant operator. The fuel system clock gauge was recalibrated, minor O&M items were addressed, and the operator was assisted. Some of the work led by the operator and supported by our team included tightening a loose cooling fan on one of the engines, changing oil, fuel filters and air intake filters, which were past their scheduled change-out time.

Some issues identified for future repair included upgrades to the fuel storage and transfer piping, a broken power production meter in need of replacement, keeping engine maintenance logs up-to-date. The team recommended spare parts and tools be provided; other follow-ups are detailed in the trip report.

### **Arctic Village Trip – Observations and Outcomes**

The team traveled to Arctic Village to evaluate the functionality of four solar PV systems that had been previously installed on residential homes but were not being properly monitored. They were able to install communication modules on two PV systems to conduct on-site and remote monitoring (this was not possible prior to the site visit), troubleshoot power meters on PV systems that were not recording PV production properly, and troubleshoot a solar system on the washeteria that had been upgraded improperly and was not generating current. The team conducted a detailed power plant assessment and provided training to the powerplant operator in which they identified several items that were reducing fuel efficiency, while supporting an upcoming effort with the Alaska Energy Authority to install new diesel generators and telecommunication equipment in which AEA needed advance data and equipment inspections to facilitate their efforts. The team also oversaw installation of meter rings and seals on residential meters, and worked with the local utility clerk to improve their Power Cost Equalization reporting. The team produced a detailed trip report with photos that described their work in the community and provided additional action items that would benefit the community energy situation. This report was provided to TCC and the community for reference and follow-ups.

### **2017 General Tribal Community Technical Assistance**

- New Biomass Project in Tanacross: During a scheduled tribal outreach meeting an opportunity was identified to assist Tanacross with completion of their Biomass heating system. TCC energy staff assisted Tanacross with a loan to complete their biomass heating system and selected a contractor with Tanacross to complete the work. The system is fully operational and now heats their clinic and combined multi use facility.
- New Biomass Project in Huslia: Huslia 1<sup>st</sup> Chief and Indian Country Energy and Infrastructure Working Group (ICEIWG) member Carl Burgett identified a need for a tribal biomass project in the community and TCC Energy staff assisted the community with the development of the Huslia Biomass project which is now heating the Huslia water plant, clinic and school.

- Solar PV in Northway: Northway Village had been working with TCC prior to the IAEN grant to aide in the development of a solar PV project to reduce energy consumption on tribal buildings. TCC was able to assist the tribe with the development of a project and lead the installation of the first known solar-battery system in the state to allow a commercial building to store electricity produced from solar power during the day and use that electricity throughout the night. This project was funded in 2017, completed in 2018 and revised to include batteries in 2019. TCC Energy program helped the community expand the project with TA support from DOE-OIE.



*Figure 4. Solar PV Install in Northway*

- PCE Training Program – As a result of the regular utility collaborative meetings that the TCC IAEN program organized, a number of our communities expressed an interest and need in the development of a PCE training program. TCC held PCE trainings in 2017, 2018 and 2019 in partnership with the Alaska Energy Authority and our tribes to improve small village-based utility utilization of the PCE program.
- Anvik Biomass – TCC had assisted Anvik Tribe with the construction of a community scale biomass project in 2016 and thanks to the DOE IAEN award was able to follow up with the tribes in 2017 and 2018 on steps to improve the overall efficiency of the system. This included the replacement of pumps to high efficiency models and reworking the heat distribution system in the Anvik city office.
- Minto Biomass – During one of the first IAEN meetings the Minto tribe approached TCC about methods to improve their biomass supply chain – TCC was able to work with the AEA to assist the tribe with an operations plan, with the completion of their building and with the development of a wood storage facility for biomass that would be fed into their biomass boilers.
- Chalkytsik – In 2018, as a result of one of the IAEN remote utility meetings, TCC energy staff assisted Chalkyitsik with the replacement of 2 of their diesel generators using EPA DERA funds. The replaced generators were both more efficient and cleaner burning than the units they replaced.



Figure 5. Diesel Generator Replacement Project in Chalkyitsik, AK

## 2018 General Tribal Community Technical Assistance

- Minto CEAP and Community Scale Solar PV – Minto Village Council approached TCC about the potential to develop a high penetration, community scale solar PV system. TCC worked with the community to develop a Community Energy Action Plan – CEAP. From this TCC engaged Alaska Village Electric Cooperative (AVEC), the local utility and largest in rural Alaska, to identify specific steps needed to complete this type of project. We then worked with NREL and DOE OIE on the completion of a Re-Opt model to show the potential benefits. TCC Energy staff brought in TCC grant writers to develop an ICDBG funding proposal to upgrade the Minto powerhouse and distribution system from single phase to 3 phase as a preliminary step to an eventual solar PV project.
- Birch Creek CEAP and utility assistance – As a result of the IAEN led utility working group meetings Birch Creek requested assistance from TCC with the development of a CEAP. After meetings with the tribal administrator and Council TCC assisted the community with the replacement of 2 of the community's diesel generators and with getting the community back into the PCE program, of which they had lost eligibility because of lack of compliance. TCC worked with partners to get 2 new diesel generators installed in the powerhouse, fix broken metering and improve operator skill level in the community.
- Hughes – During one of our an IAEN powerplant meetings Hughes Village requested assistance converting their system from single phase to 3 phase generation and distribution to be ready for a large solar PV system the community was planning. TCC staff worked with Gray-Stassel Engineering and Alaska Energy Authority to ensure that a new diesel engine being installed was capable of providing 3 phase power, then helped the community secure funding and managed a 3-phase conversion project with the city of Hughes to upgrade the Hughes distribution system and switchgear from single phase to 3 phase.
- Chalkyitsik – Continued to support Chalkyitsik Village Council as their utility worked through issues associated with the fuel supply to their new diesel generators. Their older generators had been more robust and less sensitive to

the contaminated fuel. As we switched to higher tiered engines the bulk fuel tanks needed to be cleaned and purged of water and a new filtering system had to be installed in the powerhouse. TCC facilitated this project.

- Rampart – the community had various power issues with their diesel generators that were installed as part of an EPA DERA program. TCC energy staff worked with the community to size and spec a switchgear capable of allowing for generator syncing and switching during oil changes at the powerhouse. TCC energy staff also assisted the community in spec'ing out a replacement generator for their powerhouse.
- Holy Cross – Holy Cross tribe and ANTHC had requested TCC's assistance with a USDA High Energy Cost Grant (HECG) proposal to bring waste heat from the powerhouse to the water treatment plant and the city office. TCC applied for funding on behalf of Holy Cross to the USDA program and managed the project to complete this work.
- Arctic Village and Holy Cross – TCC assisted the tribal housing authority in Arctic Village with the construction of 2 solar PV systems on the roof of two of their buildings. In addition, TCC worked with ANTHC and the Holy Cross tribe and city to contract the construction of a solar PV system on the roof of the new Holy Cross Tribal office and the city of Holy Cross Water plant.
- Galena – Facilitated the renovation of a large warehouse bay in building #1769 to house needed equipment for the local biomass harvesting operation SEGA. Led the design for envelope renovations on the facility as well as the mechanical system additions needed to heat the space with the community biomass heating system
- Region wide energy efficiency standards – after exhaustive work with the Interior Regional Housing Authority (IRHA) to get them to commit to a 6 star standard for all new construction we received a light commitment rather than a formal MOU that IRHA would work toward this agreed upon standard. IRHA tribes often request more than the housing authority can provide in remote village and the housing authority is stuck trying to provide as many high efficiency, quality homes as possible while maximizing local hire and limited funds. Although a formal commitment was not made, the housing authority did have a competition in their Mindone subdivision to see which crew could make the tightest, most energy efficient house – one using a REMOTE wall system and the other using an Arctic Wall system.
- 60 Hertz partnership – Due to the TCC IAEN coordinators work, TCC was approached by a new tech startup 60 Hertz who worked with our powerplant operators through the utility subcommittee to develop a software maintenance program that could be rolled out to facilitate improved maintenance on rural power systems. TCC provided logistical support for the conversations, brought

60 Hertz out to a number of communities for beta testing of the product and purchased some of the hardware needed to further develop the maintenance system in interior villages.

### **2019 General Tribal Community Technical Assistance**

- Alaska Vocational Technical Center (AVTEC) Power Plant Operator Level 2 & 3 Training – TCC worked with Village powerplant staff from Ruby, Nikolai, Rampart, Koyukuk and Birch Creek as well as TCC employment and training staff to get trainees lined up to attend the level 2 and 3 trainings offered at AVTEC in Seward by the Alaska Energy Authority.
- Northway – Commissioned a lithium-ion battery storage project in the community to allow Northway to take advantage of higher levels of solar energy that the PV system was producing and that were being sent back into the local electric grid, owned by Alaska Power & Telephone, i.e, optimizing solar PV performance and cost savings for the community instead of for the utility.
- Utility Subcommittee – On behalf of Hughes Village, the Tribe applied for and was awarded a BIA TEDC grant to facilitate the development of an inter-tribal electric cooperative to provide better service to remote powerplant operators serving our utilities. Provided technical support for Birch Creek, Rampart, Nikolai and Hughes on power plant issues during this time.
- Northway – completed an energy audit of the main community building to assist the tribe with a more efficient and appropriate heating system for their main community hall and office buildings. Paired the community with a local mechanical engineering firm and heating contractor to redesign the heating system.
- Galena- supported the installation of a 26 kW grid-tied solar PV array on the side of a large warehouse that houses the Galena Biomass system which is offsetting electricity used by the community based biomass operation to heat the local boarding school facilities.
- Holy Cross - led the renovation of the Holy Cross School district mechanical system and exterior envelope improvements at the request of the Holy Cross tribe. The school is the largest energy consumer in the community of Holy Cross.
- Huslia High performance building – Assisted the community of Huslia with the completion of their 3,000 sq-ft multi-use city building in 2018. The facility was built to TCC's energy efficiency standards and is a model for village efficiency. TCC energy staff supported the design and performed air tightness testing and thermal imaging while construction was in progress to ensure the building construction was held to our efficiency standards.



- Performed energy audits for Nulato tribal buildings for DOE grant application. Also led an Energy efficiency training in the community of Nulato where 10 local tribal members received training on energy efficiency and weatherization work. Completed ventilation work on one tribal member's home in the community of Nulato which had mold issues due to a lack of ventilation.
- Rasmussen Grant- Continued partnership with 60 Hertz and rural utility working group. Applied for \$25k grant to allow 60 Hertz and their powerplant software to be rolled out in additional TCC communities. This covered the on-boarding of all interested TCC communities in using the program to improve diesel generator maintenance.
- Venetie/Koyukuk – Applied for and received funding for work in both Venetie and Koyukuk's powerhouses from EPA DERA program to increase efficiency and reduce negative air quality in the community around the powerhouse. Utilized VW Settlement funding and EPA DERA funding to replace 4 engines in the two communities.
- Ruby – Supported the installation of the region's first geothermal Ground Source Heat Pump (GSHP) in the community of Ruby on a high efficiency building designed to TCC's energy efficiency standards. Also paired the installation of the GSHP with a 10kW solar PV array and 2 x 10kwh lithium ion batteries so that the solar system would not negatively impact the phase imbalance on the local utility lines.
- Nikolai – worked with the community of Nikolai to complete a CEAP, which led to assistance with their local utility, specifically a line loss mitigation study which was completed by TCC contractor Attention to Detail Power Solutions. The work identified in the line loss report substantially improved their utility financials.
- Hughes – during utility subcommittee meeting it was identified that barge-offloaded fuel could save the community over \$1/gal on heating fuel and gasoline. TCC worked with the city of Hughes to develop an ICDBG application for the construction of an 80,000 gallon bulk tank farm expansion project to facilitate barge delivery of bulk fuel instead of flown-in fuel, which is the standard operating procedure.



*Figure 6. Hughes 80,000 gal bulk tank farm*

## **2020 General Tribal Community Technical Assistance**

- Supported Hughes bulk fuel Tank Farm Construction
- Troubleshoot energy storage issues with Northway and Ruby
- Provided technical support for Birch Creek, Nikolai and Hughes on Power Plant issues
- Assisted Birch Creek, Ruby, Nikolai and Rampart with sending their power plant operators to AVTEC training in Seward.
- Performed energy audits for Nulato tribal buildings for DOE grant application
- Assisted Nulato with DOE grant application.
- Worked with 60Hertz on implementing CMMS in rural power plants.
- Hosted a two-day blower door air tightness testing and AKwarm software training event with Interior Regional Housing Authority.
- Conducted troubleshooting for powerplants in Ruby, Hughes, Koyukuk, Birch Creek
- Assisted with troubleshooting of PV array in Northway
- Worked with Nulato to scope out future PV projects
- Facilitated meetings with TCC powerplant communities and consultant Woven Energy
- Assisted Nikolai with troubleshooting issues
- Facilitated the operation of the solar PV arrays in Ruby and heat pump system
- Assisted with power pool conversations and the installation of replacement generators in Venetie and Koyukuk
- Facilitated meetings with Beaver regarding future power pool
- Continued to assist various communities with energy planning

- The TCC Energy Specialist (assistant to the Energy Program Manager) was let go for issues dealing with performance of the position - DeerStone consulting was then contracted for work on the IAEN project.
- VEEP LED lighting project materials were ordered

### **2021 General Tribal Community Technical Assistance**

- Worked with the Alaska Energy Authority on revisions to the Venetie powerplant design
- Assisted with the securing of funds for new powerplants in Nikolai and Rampart
- Assisted Tanacross's solar PV project
- Responded to remote generator needs in Beaver, Stevens, Hughes, Arctic Village and Nikolai
- Contracted out a number of street and parking lot installations
- Completed Tanacross CEAP
- Completed Anvik CEAP
- Reached out to setup additional CEAP with Evansville
- Progress on videos for final DOE Deliverables
- Developed path forward for remainder of grant funding with DOE
- Initiated contracts for line loss assessment in Fort Yukon
- Worked with Gwicha Zhee (GZ-Fort Yukon) utility on line loss education
- Assisted Hughes with generator replacement technical assistance specifying new engines
- Worked on Tanacross solar PV project for Tanacross village council
- Facilitated meetings with Galena regarding 1.2MW solar PV array that was in progress but previously stalled out
- Oversaw completion of Koyukuk/Venetie powerhouse upgrades
- Manley Hot Spring Generator replacement contract signed with funding from EPA DERA
- Oversaw LED lighting upgrades in Nenana and Tok
- Worked with GZ Utility on communication to key accounts to reflect changes to their billing from previous inaccurate meter reads
- Worked with Arctic Village Housing Authority and ANTHC on remotely trouble shooting respective PV arrays in Arctic Village
- Travelled to Hughes to look at lines and present at TCC/Hughes joint housing summit
- Conducted site visits and completed CEAPs for several communities

### **Grant Writing and Project Development**

TCC Identified project development activities in the Scope of Project Objectives which included applying for project funding for energy projects. Often the Tribal communities we work with need assistance in putting together the technical components of grant applications. The TCC team and our subcontractors were able to assist energy project development by creating technical components related to project development including high-level feasibility analysis, workplans, equipment selection, and cost estimating that fed into grant applications.

TCC assisted communities such as Holy Cross in developing a Solar PV grant application; we also assisted a number of communities in applying for EPA Diesel Emissions Reduction Act (DERA) funding; we supported Hughes in securing two cycles of funding from BIA TEDC to develop a utility collaboration concept for the region, and assisted communities in applying for other funding opportunities for specific projects.

TCC assisted communities with conducting line loss assessments after many communities reported significant line loss issues. Venetie, Hughes, Fort Yukon and Arctic Village were communities that received these line loss assessments. These assessments were used to identify near term line loss reduction projects, which are direct energy efficiency improvements of the entire system.

Many projects would not have been developed or built without this DOE grant to be able to leverage for project development activities in coordination with communities, Tribes, and utilities. Projects were realized, power reliability increased, and costs decreased as a direct result of the DOE funds that were used to help cover project development costs.



*Figure 7. Solar PV Installation in Holy Cross*

### **Other Publications & Presentations**

- 2016-November: DOE OIE Tribal Energy Program Review (Denver, CO) - Presentation
- 2016-December: Kodiak Forum (Kodiak, AK) - Presentation
- 2016-December: BIA Providers Conference (Anchorage, AK) - Presentation
- 2017-March: DOE ICEIWG – Presentation
- 2017-May: National Tribal Energy Workshop (Washington, DC) – Presentation
- 2017-May: Article on Tier-3 Diesel Emissions issue written/published in the TCC Council newsletter

- 2017-August: Interior Villages Power Collaborative Feasibility Study
- 2017-October: Koyukuk Biomass Project Case Study – Published in Print and on TCC Website
- 2017-November: DOE OIE Tribal Energy Program Review (Denver, CO) – Presentation
- 2018-March: TCC Annual Convention (Fairbanks, AK) – Booth & Presentation
- 2018-April: Rural Energy Conference (Fairbanks, AK) – Booth & Presentation
  - TCC used DOE grant funds to assist 30 participants from the region's villages to travel to Fairbanks to attend the conference.
- 2019-March: TCC Annual Convention (Fairbanks, AK) – Booth & Presentation
- 2019-May: DOE OIE Tribal Energy Program Review (Washington, DC) – Presentation
- 2019-July: Northway (Tribal Hall) & (Laundromat / Water Sewer Garage) Solar Operation and Maintenance Manual – a manual to assist the community with the ongoing operations and maintenance of their two solar PV systems was created by TCC.
- 2019-August: Northway Energy Audits (Tribal Hall and Tribal Council Building) – Energy Audit
- 2019-November: DOE OIE Tribal Energy Program Review (Denver, CO) – Presentation
- 2020-February: TCC Energy Program presented to TCC Company Event – Presentation
- 60 Hertz MOU
  - MOU agreement with 60Hertz, an Alaskan company developing a software based solution to help implement a maintenance program for micro-grid electric utility power generation equipment. The MOU led to communities signing up to use the computerized maintenance management software, training for all power plant operators utilizing the system, and ongoing support for those operators from the 60 Hertz team and additional training and support from DeerStone Consulting to assist targeted communities in getting more value from the 60 Hertz software.



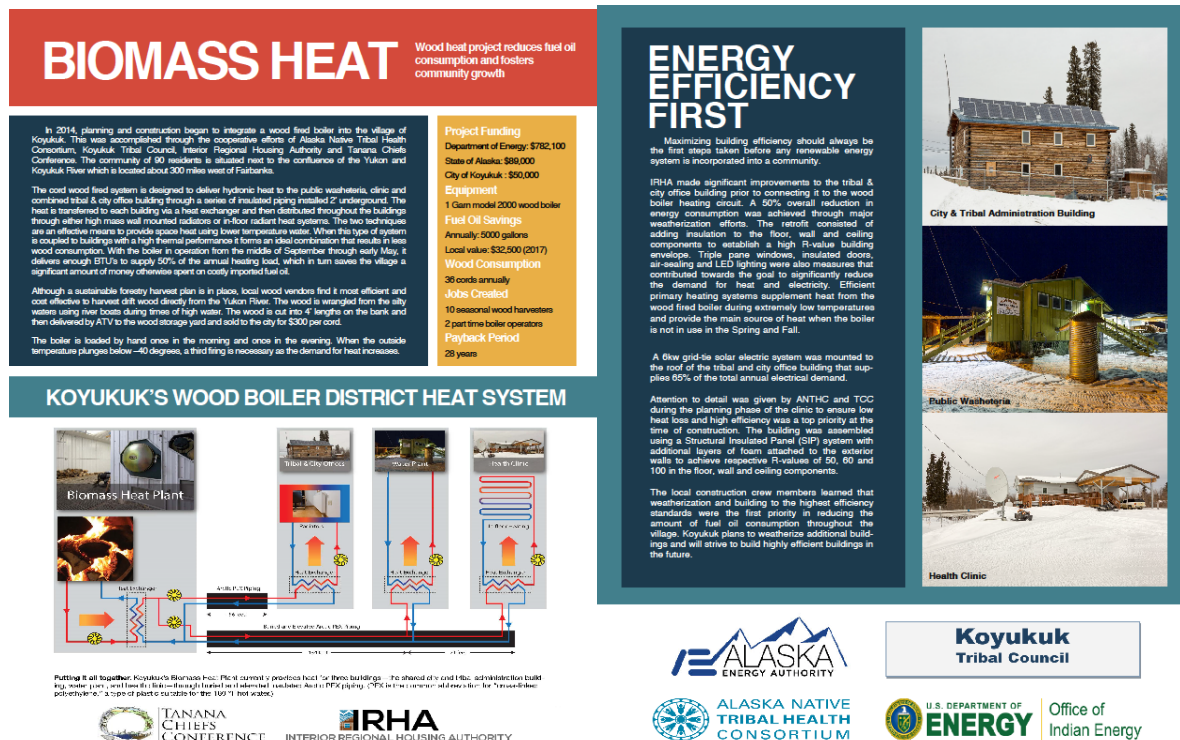


Figure 8. TCC Case Study on Koyukuk Biomass Project

To meet **Objective 6 – Develop specific Interior-Alaska rural building codes and energy use intensity (EUI) for construction of few buildings**, TCC worked with CCHRC and IRHA to create a 6+ Star Minimum Energy Rating Housing Standard.

The TCC team worked in collaboration with Cold Climate Housing Research Center and Interior Region Housing Authority to establish minimum standards for new residential construction in the Interior region. Interior Alaska experiences extreme seasonal temperature variability with winter temperatures as low as -65 °F and as high as +99 °F in summer. Both the highest and lowest temperature records for the state were set in the Interior, with 100 °F (38 °C) in Fort Yukon and -80 °F (-64 °C) in Prospect Creek. During any given winter one can experience extended cold snaps of forty below zero that can be followed by unseasonable warmth with temperatures above freezing due to chinook wind effects. Energy costs in the region are also very high and residents in the region pay approximately 3 times the national average on energy for their home (heat and electricity primarily), along with overall increased demand because of poorly insulated homes and high heating degree days.

The goal of the partnership was to establish 6-star energy rating standards or higher for all future construction of homes by the Housing Authority. The coordination with CCHRC and IRHA included regularly scheduled roundtable discussions in 2017-2018. IRHA adopted the 6-star rating on housing scheduled for construction in 2018 and beyond.

The result of the project was the creation of 6-Star energy standard housing designs that were developed in coordination with IRHA, the local housing authority, and used for subsequent planned housing development projects around the state.

### **Challenges / Issues**

The TCC Energy Program hired a full-time assistant position to help conduct much of the work that was planned under the DOE TA project. However, the hired person did not meet performance expectations which led to a lack of capacity on the team to provide meaningful, planned work on the project, with most of the work falling back on the Energy Program Manager who was also leading other Tribal energy initiatives for TCC. Eventually the assistant person was terminated from the position, but backfilling the position was fraught with issues due to COVID and lack of qualified applicants. Eventually the funds from DOE that had been planned to support a direct-hire TCC employee was utilized to contract out more of the work as opposed to self-performing the work.

The geographic size and non-interconnectedness of the TCC region made it very challenging to serve 42 rural communities. It was difficult to have close contact with all communities which was made even more challenging with impacts of the pandemic and lack of travel ability. What was made even more apparent is that our communities need upgraded communications. Many lack cellular service and adequate access to high-speed internet. These issues were made very apparent during the pandemic. While the rest of the world went to distance learning, Zoom meetings, and relied heavily on technology and connectivity, much of rural Alaska lacked access to transition to this “new normal.” The reality in rural Alaska was very different: they need support to eliminate barriers to access.

## **5. Conclusions and Recommendations**

Technical assistance that leads to meaningful project development is needed in Indian country. This is long, slow, incremental work that requires a long-term perspective and persistence. Programs like this DOE TA program are invaluable and should be continuously funded as they are the underlying foundation to much of the visible, “above ground” work that is measured in renewable energy projects, kWh and Btu’s and dollars saved.

As DOE provides technical assistance, they should continue to work with the entities that received funding under this program, their partners, their subcontractors, and the communities that built capacity during this program. Through this funding DOE was able to build capacity throughout Alaska. It should be noted that not just individual Tribes, but even TCC—an organization with a budget in excess of \$200 million—was impacted by turnover, local capacity constraints, and of course larger issues such as Covid. The multi-year funding support provided by this grant allowed us to pivot in mid-stream, hire contractors as needed, and maintain momentum to continue to build capacity and support projects.



Coordination among tribal partners across Alaska is important. The network that these DOE TA projects created was powerful, created a platform for knowledge sharing, and developed capacity in different organizations across the state. This all fed into successful deployment and follow-through on tribal energy projects within our region.

Community champions and their capacity development is an important outcome that needs further nurturing. Alaska rural power utilities are a unique issue—a standalone microgrid that requires specialized skills and technical solutions within a complex tribal landscape. Nurturing local leaders, technicians, and energy champions is necessary to create place-based solutions which are essential to not only maintain current infrastructure but to get creative in problem solving into the future.

## **6. Lessons Learned**

DOE's funding under this initiative was an essential component of our overall tribal support efforts that continue to yield results even after the grant award has concluded in the form of CEAPs, improved diesel efficiency, solar PV and battery and biomass projects throughout the region, and numerous powerplant operators with enhanced skill sets. Flexible, multi-year funding like this project provided was invaluable for what is typically non-grant-funded work. Project development activities, and soft costs of coordinating with agencies and communities in the region is not usually a cost that can be covered under a grant, but is necessary for determining feasibility, project economics, community buy-in, and related "up front" activities. TCC has typically funded a single position through the TCC Energy Program; this funding was a force multiplier and allowed the TCC Energy Program Manager to provide strategic direction to an additional employee for a portion of the grant timeframe and a team of contractors, consultants, and partners to assist communities in capacity building and meaningful project development.

An incredible amount of work occurred under this initiative, and many projects were developed as a result of the technical assistance provided. Technical assistance funding with local control allowed our communities to develop place-based solutions, community energy champions were able to be involved in conversations about project development, and funding stayed closer to the communities that were being served and was used to develop local capacities.

One of the legacies of this project will be the amazing network that was developed with contractors, agencies and among neighboring communities. TCC will continue to encourage inter-tribal utility collaboration though it will be limited without additional funding. We will be continuing the early development of this inter-tribal utility entity with round 2 of BIA TEDC funding, but beyond that, we will be pursuing additional support and attempting to make the work cover its own costs through fuel savings and operational efficiencies, but this will be limited simply by the small communities and expensive logistics for providing goods and services throughout Interior Alaska. Continued DOE support would allow for ongoing local capacity development as well as additional renewable and energy efficiency projects to be deployed to enhance energy security and reduce costs.

This grant provided the ability for TCC to provide direct technical support to our independent power utilities by providing funding for the unplanned events like an electricity outage at forty degrees below zero. Then follow ups post emergency to make sure that the powerplant operator had the tools and resources to keep from experiencing another outage. We were able to help communities make short term and long-term plans that hold the promise of transitioning from simply responding to daily challenges to intentionally planning transformation of community energy infrastructure to sustainable, low carbon systems.