CASES

ENERGY PROFILE: AKLAVIK

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University of Saskatchewan

AKLAVIK

Figure 1 Aklavik, NWT from the air (Northwest Territories Tourism, 2019)

March 2020

Energy Profile

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Aklavik

ENERGY PROFILE

REGULATION AND GOVERNANCE

Ownership Structure

This section describes the current energy ownership structure for generation and distribution, including any private, public, cooperative, players, roles, responsibilities, and authorities.

The eight communities of the Beaufort Delta region have no existing or nearby transmission infrastructure to connect to. This includes the community of Aklavik (Figure 2). The nearest transmission infrastructure is the Snare and Taltson grids to the distant south. As a result, the comparatively small community loads and large distances between communities preclude interconnecting any transmission infrastructure between communities or to neighboring regions.

Figure 2 Map of Canada with Aklavik, NWT location

The current Aklavik renewable and non-renewable energy generation structure is owned by the Northwest Territories Power Corporation (NTPC). NPTC controls the solar generation in the Ground Mount building, the variable speed generator (VSG) and the Biomass Boiler Plant at the school that is under construction (Government of Northwest Territories, 2018). NTPC along with Northwest Territories Energy (NTEnergy) are owned by NT Hydro (Figure 3), which in turn is 100 percent owned by the Government of Northwest Territories (Northwest Territories Power Corporation, n.d.).

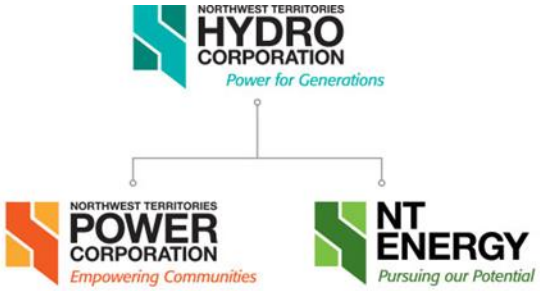

Figure 3 Energy Ownership Structure in NWT

Institutional Arrangements

This section describes the current rules, regulations, or standards that enable or constrain energy transition. This includes options or restrictions on community ownership of generation and/or distribution; targets or restrictions on renewables integration; rate structures; etc.

Territorial Level

The Government of Northwest Territories (GNWT) publicly lists all its Acts and Regulations on its official website (Legislation of the Northwest Territories). The Acts are the laws approved by the Legislative Assembly, and the Regulations are laws that are authorized by an act and issued by the administering departments or public bodies. The Regulations are the rules used to carry out the Acts, providing the implementation details. Details on how Northwest Territories (NWT) legislation provides or fails to provide support for renewable energy in Aklavik are listed below.

Petroleum Products and Carbon Tax Act and Regulations

In August 2019, the GNWT introduced changes to the Petroleum Products Tax Act to implement the NWT Carbon Tax (Northwest Territories Gazette, 2019). The Act, which is now called Petroleum Products and Carbon Tax Act and Regulations, charges a carbon tax on all fuel sold in the NWT (Petroleum Products and Carbon Tax Act, 2019). The objective of this law is to discourage the use of fossil fuels in order to reduce greenhouse gas emissions.

The NWT Carbon Tax will charge $20/tonne of greenhouse gas emissions (GHG) for gasoline, motive diesel, non-motive diesel, railway, heating fuel, propane, natural gas and naphtha. The initial rate will increase annually until 2022 when it will reach $50/tonne. Carbon taxes start at a minimum of $0,035/litre,

considering the tax for each litre of Butane in 2020, and can reach up to $0,137/litre, considering the litre of Diesel in 2022 (Figure 4). In Aklavik, considering data from November 2019, the carbon tax represents 2.56% of the price paid for a litre of gasoline.

Item | *N°*	Type of Fuel | *Type de carburant*	September 1, 2019 – June 30, 2020 *Le 1er septembre 2019 et se terminant le 30 juin 2020*	July 1, 2020 and ending June 30, 2021 *le 1er juillet 2020 et se terminant le 30 juin 2021*	July 1, 2021 and ending June 30, 2022 *le 1er juillet 2021 et se terminant le 30 juin 2022*	July 1, 2022 and thereafter *le 1er juillet 2022 et continuant*
1	Aviation gasoline | *Essence d'aviation*	exempt | *exempté*	exempt | *exempté*	exempt | *exempté*	exempt | *exempté*
2	Aviation jet fuel | *Carburant pour turbo-*	exempt | *exempté*	exempt | *exempté*	exempt | *exempté*	exempt | *exempté*
3	Butane (L)	$0.035	$0.053	$0.071	$0.089
4	Diesel (L)	$0.055	$0.082	$0.109	$0.137
5	Gasoline | *Essence* (L)	$0.047	$0.070	$0.094	$0.117
6	Naphtha | *Naphthe* (L)	$0.051	$0.077	$0.102	$0.128
7	Natural gas | *Gaz naturel* (m^3)	$0.038	$0.058	$0.077	$0.096
8	Propane (L)	$0.031	$0.046	$0.062	$0.077

Figure 4 Northwest Territories Carbon Tax Rate Schedule (2019)

The act also offers **tax rebates and tax-free benefit** to help offset the cost of the territorial carbon. Consumers will receive a full rebate on the carbon tax paid for heating fuel and utility companies will receive a full rebate on the carbon tax paid for fuel used for electrical generation. The NWT Cost of Living Offset (COLO) is the tax-free benefit paid to individuals and families living in the NWT to help offset the cost of the territorial carbon. In 2020, an Aklavik family will receive $104 per adult and $120 per child under the ag e of 18.

The Carbon Tax Regulations also provide a **Grant for Emissions Reduction Projects**, a grant focused in large emitters which are developing projects that will contribute to the reduction of greenhouse gas emissions in the NWT. The Regulations consider as large emitters the companies: Diavik Diamond Mines Inc., De Beers Canada Inc., Dominion Diamond Ekati Corporation, and Imperial Oil Resources NWT Limited. In the current regulations there is no grant that is not focused on these large emitters, independent producers do not have direct support from the regulations for the development of renewable energy projects. According to the GNWT, the NWT Carbon Tax will generate an estimated $16.3 million in 2019 and 2020, which $3.8 million will be invested in initiatives that will reduce GHG emissions (Implementing the NWT Carbon Tax, 2019).

Natural Resources Conservation Trust Act

The Natural Resources Conservation Trust Act establishes **The Natural Resources Conservation Trust Fund**. The purpose of this fund is to promote through education, research and demonstration, the wise use of renewable resources; awareness, enhancement and protection of the environment; and use of the most efficient and most effective methods of trapping wildlife (Government of Northwest Territories, 2016). As defined under section 13, the Natural Resources Conservation Trust Fund Board of Trustees shall provide an annual report to the Legislative Assembly. That includes (c) the recipient and amount of each payment made

from the Fund; (d) a description of the purpose for which each payment was made from the Fund. However, little information is made available as to which projects are receiving resources from this fund.

Community Planning and Development Act and Regulations

This Act defines the guidelines to community planning, and by extension, may provide a framework to support energy planning within a community. However, the act does not define as mandatory the description of future use, practices and possible areas of development related to energy (Government of Northwest Territories, 2013). As the Act does not provide specifications for the community energy sector, the Regulations, therefore, do not support the development of community energy planning (Government of Northwest Territories, 2013). The government of the Hamlet of Aklavik, however, has developed a community energy plan with the support of the Artic Energy Alliance (Hamlet of Aklavik, 2017).

Federal Level

Details on how federal legislation provides or fails to provide support for renewable energy in Aklavik are listed below.

Northwest Territories Devolution Act

This agreement transferred responsibility for public land, water and resource management in the NWT from the federal department of Aboriginal Affairs and Northern Development Canada (AANDC) to the GNWT on April 1, 2014 (Parliament of Canada, 2014). This Act provides the territorial government more control over public lands and resource development. This is important as it provides GNWT with the authority to create their own energy future (Heerema & Lovekin, 2019).

Canadian Energy Regulator Act

This Act regulates certain energy matters within Parliament's jurisdiction and defines rules for the development of pipelines, power lines, and oil and gas exploration, regulates trade in energy products, and ensures transparent and efficient public participation (Government of Canada, 2019). In particular, this Act reinforces Indigenous participation in the evaluation of energy projects, ensuring funding to build capacity and enhance Indigenous participation (Government of Canada, 2019).

Energy Efficiency Act and Regulations

The Energy Efficiency Act provides for the making and enforcement of regulations concerning minimum energy performance levels for energy-using products, as well as the labelling of energy-using products and the collection of data on energy use. The Energy Efficiency Regulations establish energy efficiency standards for a wide range of energy-using products, with the objective of eliminating the least energy-efficient products from the Canadian market (Government of Canada, 2017). Unlike provinces such as, British Columbia, Manitoba, Ontario, Quebec, New Brunswick and Nova Scotia, the GNWT does not have an Acts or Regulations supporting energy efficiency at a territorial level. However, it does have alternative programs that support energy efficiency locally. These programmes are known as "Efficiency Rebates" and are developed in partnership with the Artic Energy Alliance.

Gaps in Institutional Arrangements

This section describes the gaps in the current rules, regulations, or standards that enable or constrain energy transition.

Independent Power Producer (IPP) Regulations

Independent Power Production allows communities to generate renewable energy and feed the local electrical grid. According to data from the Government of Yukon, one of the Canadian territories that has IPP regulations, IPP regulations provide support for utilities and independent power producer, while ensuring that rates remain stable for consumers. IPP supports affordable, reliable, flexible and clean electrical energy (Government of Yukon, 2019). Nevertheless, there is no documented IPP policy, and consequently, no IPP regulation in place in the Northwest Territories. Heerema and Lovekin (2019), states that IPP project proposals are subject to a negotiation with the government and utility. The author also states that while the 2030 Energy Strategy provides some direction for IPP projects, it does not provide adequate support for community-led energy projects. The lack of IPP regulations, therefore, limits the development of community owned renewable energy projects.

Policy Environment

This section describes overarching policies and plans (e.g. climate policies, energy policies, existing energy plans) that provide specific direction, encouragement (or lack thereof) for energy transition, security, or sovereignty. Key conflicts or synergies between energy transition needs/goals and other sectors or land uses that enable or constrain transition are presented.

2030 Energy Strategy

The Northwest Territories 2030 Energy Strategy (Government of Northwest Territories, 2019) is a long-term strategy focused on the development of the energy future in NWT. The strategic objectives include community engagement, targets for the reduction of GHG emission, an increase in the share of renewable energies and an increase in buildings' energy efficiency. The policy aims to "guide the development of affordable, and sustainable energy for transportation, heat, and electricity, support energy efficiency and conservation, and promote renewable and alternative energy solutions for the NWT". **The Energy Action Plan 2018 – 2021** (Government of Northwest Territories) sets the ongoing and yearly new Actions and Initiatives needed for the GNWT and its partners to achieve the Strategic Objectives set out in the 2030 Strategy.

The 2030 Energy Strategy introduces two participation models for Indigenous communities that includes mid-scale and larger-scale projects, not only considering developments up to 15 kilowatts. The 2030 Energy Strategy design funding for the mid-scale and larger projects. This strategy provides two types of grants for projects that aim to reduce GHG emissions: **The GHG Grant Program for Buildings and Industry Program and the GHG Grant Program for Government** (Government of Northwest Territories, 2019). The Government focused program is designed to support greenhouse gas (GHG) emissions reduction projects and initiatives for NWT community governments, municipalities, GNWT departments, and Indigenous governments. This

grant program may support renewable energy projects in Aklavik, as the focus of this grant is on reducing GHG emissions, and it has a strong focus on Indigenous communities.

This strategy also provides an alternative to the gap of IPP policies. The mid-scale participation model considers developments of more than 15 kilowatts, which are community owned and have the potential to receive government grants. As stated in the Strategy, the proposed approach is not the conventional independent power producer model, but it is a solution made specifically for the NWT scenario, where the community receives payments based on the value of diesel fuel displaced by the renewable energy.

2030 NWT Climate Change Strategic Framework

The 2030 NWT Climate Change Strategic Framework outlines how the territory plans to respond to challenges and opportunities associated with a changing climate. The three goals of this framework are related to the reduction of fossil fuel consumption, and consequent reduction of GHG emissions, the dissemination of climate change impacts and the process of building resilience and adapting to this change (Government of Northwest Territories, 2019). The first goal, related to the annual decrease of GHG emissions, is directly related to the energy transition objectives of the **2030 Energy Strategy.** The GNWT (2018) states that the main path to achieve the first goal is through the reduction of fossil fuel use, in particular by reducing diesel consumption for electricity generation. **The 2030 NWT Climate Change Strategic Framework 2019-2023 Action Plan** is also connected and supports the Energy Action Plan 2018 – 2021. This action plan design actions to support the NWT's transition to a lower carbon economy (Government of Northwest Territories, 2018).

NWT Petroleum Resources Strategy

"Alongside the Northwest Territories 2030 Energy Strategy and the NWT Climate Change Strategic Framework, it sets the foundation for how the GNWT will improve energy security, stabilize the cost of living and address the impacts of climate change with clear and positive actions." (Government of Northwest Territories, 2018). The NWT Petroleum Resources Strategy, opposed to the energy transition proposed by 2030 Energy Strategy, aims to improve the petroleum infrastructure and regulatory framework in NWT, along with greater investment in NWT petroleum resources. The purpose is to invest in natural gas, as it is a source that emits less GHG than diesel fuel.

NWT Economic Opportunities Strategy

The last economic strategy was launched by the GNWT in 2013, and it considers both renewable and non-renewable resources as an economic opportunity (Government of Northwest Territories, 2013). One of the objectives of this Strategy is attract major projects and investment to the NWT, it argues that obtaining an oil and gas strategy is crucial to achieve this goal. Despite mentioning renewable energy as an economic opportunity, the strategy fails to provide details on economic strategies for the energy transition

Historic Shifts and Embeddedness

1948	Establishment of Northwest Territories Power Commission, a federal crown corporation
1956	The federal corporation is renamed to Northern Canada Power Commission (NCPC)
1988	Government of the Northwest Territories acquires NCPC from federal government
1989	The Commission is renamed the Northwest Territories Power Corporation (NTPC)
	NWT Public Utilities Board commences partial regulation of the Corporation.
1992	Full regulation of the Corporation by the NWT Public Utilities Board.
1997	Community-based rates established.
2007	The GNWT creates the Northwest Territories Hydro Corporation (NT Hydro). The new corporate structure includes NTPC as one of three NT Hydro subsidiaries.
	Energy for the Future, an Energy Plan for the NWT
2008	Establishment of the Energy Priorities Framework for NWT
2009	Creating a brighter future: a review of electricity regulation, rates and subsidy programs in the NWT
2013	NWT Energy Action Plan 2013 - 2016
2014	Devolution occurs; NWT gains more powers over its land, waters and natural resources
2018	2030 Energy Strategy
	2018 - 2021 Energy Action Plan

Relationships

Grassroots information on communications between energy utilities and community leadership in energy planning, policy setting and decision making could not be found in the Government documents and papers. It is recommended that this information be acquired in interviews with members of the community and local utility, i.e. NTPC.

LOCAL CAPACITY AND INNOVATION

Local capacity and innovation are vital to a successful long-term approach to support secure, affordable and sustainable energy supply and use in the NWT. The GNWT and its partners—including utilities, governments, communities, residents, business, industry and nongovernment organizations—must work together, be innovative, and develop strategies while building capacity to achieve set goals and objectives. The components of local capacity and innovation discussed are the community energy plan, energy champion, human capital, community investments, energy programs and incentives, community energy source potential, and priorities.

Community Energy Plan

This section describes the nature and scope of Aklavik's community energy plan, including community energy goals or objectives, key gaps, date established and most recent update. The Hamlet of Aklavik's process for

creating a community energy plan was to form a group of people who wanted to take action, create a community energy profile, evaluate energy opportunities, write a community energy plan, implement and monitor the plan, and then finally revise the plan. It was noted that energy planning is a cycle that may last for one, three, or five years; during which the community develops and carries out certain projects that make up the energy plan for that time period. And after which, the community reviews the energy plan and reevaluates (Hamlet of Aklavik, 2017).

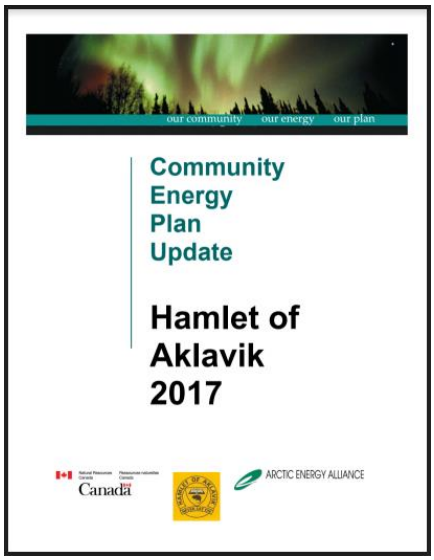

Figure 5 Aklavik Community Energy Plan (2017)

Community Energy Vision

The Community Energy Planning Vision was originally from 2009, however it was found to still be relevant through the 2017 review. It is said to reflect the values of the community, and consists of three components (Hamlet of Aklavik, 2017).

The Hamlet of Aklavik will ensure that the residents of Aklavik have the information they need to make wise choices about their energy use; use energy and water in harmony with the land; and access to clean, affordable and reliable energy are the everyday norm.

Community Energy Goals

Seven strategies were recognized for the purpose of achieving the updated Community Energy Plan (Hamlet of Aklavik, 2017). It was also noted whether a strategy was from the 2009 Energy Plan or it is new to the 2017 Energy Plan as shown below:

> **Strategy 1**: Complete a series of energy efficiency audits and retrofits for non-residential buildings in Aklavik (CEP strategy, 2009).
> **Strategy 2**: Complete a series of homeowner energy evaluation and retrofits (CEP strategy, 2017).
> **Strategy 3**: Winterization and home maintenance workshops and including training for students and help for elders (CEP strategy, 2017).

Strategy 4: Switch all washers and fridges to Energy Star and switch all lights to LED in homes (CEP strategy, 2017).
Strategy 5: Install wood stoves in homes (CEP strategy, 2017).
Strategy 6: Provide solar or solar/wind hybrid systems for bush camps (CEP strategy, 2017).
Strategy 7: Increase local food availability and knowledge (CEP strategy, 2017).

Key Gaps

Two strategies from the 2009 Community Energy Plan were deemed not feasible in some capacity and not moved forward in the 2017 Community Energy Plan update (Hamlet of Aklavik, 2017).

1. **Waste heat capture from the diesel generating facility**
   This was examined but deemed not feasible due to the distance from the power plant to the closest building. It was recognized that when energy prices change, it may be worthwhile to revisit this potential strategy.
2. **Use of alternative energy for buildings**
   The maximum allowable capacity for grid-connected microgeneration Aklavik has been met. Therefore, without discussions to change the allowable capacity available for microgeneration, no additional capacity can be added to the electricity grid.

Recent Updates

The Community Energy Plan was updated March 31, 2017 from its original completion in 2009. It was completed by the Hamlet of Aklavik, Natural Resources Canada and Arctic Energy Alliance (Hamlet of Aklavik, 2017).

Energy Champion

Clean Energy Advisor, Inuvialuit Regional Corporation

Leigh Ann Williams-Jones, Clean Energy Coordinator

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Inuvialuit Regional Corporation

Attn: Innovation, Science & Climate Change

Bag Service #21

Inuvik, NT X0E 0T0

- Responsible for supporting community energy priorities and establishing an inclusive approach to clean growth and energy implementation efforts within the Inuvialuit Settlement Region (ISR). The

Clean Energy Coordinator works closely with local communities, and the Inuvialuit Corporate Group to ensure a coordinated approach to energy development and management in the ISR.

Regional Energy Project Coordinator, Arctic Energy Alliance

Elye Clarkson, Regional Energy Project Coordinator for all of Beaufort-Delta

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Inuvik, NT X0E 0T0

- This role of the full-time regional community energy project coordinator is based out of Inuvik but supports all communities in the Beaufort- Delta region and includes regular travel to Aklavik, Fort McPherson, and Tsiigehtchic.

Project Coordinator, Arctic Energy Alliance

Sheena Adams, Project Coordinator for Inuvik

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Inuvik, NT X0E 0T0

- Planned visits for performing new home energy evaluations for homeowners looking to take advantage of the 'New Homes' rebates available through the Energy Efficiency Incentive Program.
- Delivered presentations on biomass options and other energy saving incentives.

Regional Director, Government of Northwest Territories

Peter Clarkson, Regional Director for all of Beaufort Delta

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Government of the Northwest Territories

Department of Executive

Regional Director

Bag 1

Inuvik, NT X0E 0T0

- In a photo essay by Eilis Quinn on how the natural gas crisis is affecting Inuvik, Northwest Territories Peter Clarkson was quoted saying “We almost need an Arctic community energy policy or plan because it really is a driver on the cost of living in these communities”.

Energy Planning Committee

The Committee that developed the Hamlet of Aklavik’s Community Energy Plan consisted of members of the community, representatives of Aklavik Community Corporation and Hamlet Councillors (Hamlet of Aklavik, 2017). The names and contact information of said Committee members is not available online. This can be found once communication with the Hamlet of Aklavik begins.

Human Capital

This section describes the current technical skill sets in the community in the energy sector (e.g. energy stems design, planning, generation and maintenance). Also, it explains the availability of/access to/support for community training and education in the energy sector (e.g. energy systems design, planning, generation and maintenance).

Current Technical Skills

Variable Speed Generator Manager

In February of 2018 NTPC released that the VSG project successfully commissioned the test unit and that electricity is now being provided to more than 300 NTPC customers in Aklavik using the converter-based platform. The contact information and name of the manager could not be found. This can be found once communication with the Hamlet of Aklavik begins.

Solar Water Heater Manager

A solar hot water heater was installed as a 2009 Community Energy Plan strategy on the swimming pool. The contact information and name of the manager could not be found. This can be found once communication with the Hamlet of Aklavik begins.

Solar Electricity Systems Manager

Solar electricity systems have been installed on three buildings in Aklavik: the recreation complex, the SAO’s residence and the Bed & Breakfast as a 2009 Community Energy Plan strategy. The contact information and

name of the manager could not be found. This can be found once communication with the Hamlet of Aklavik begins.

Community Training and Education

Aurora College Programs:

- Apprenticeship Electrician
- Apprenticeship Housing Maintainer
- Apprenticeship Oil Heat Systems Technician
- Apprenticeship Plumber/Gasfitter Program
- Environment and Natural Resources Technology Diploma

Community Energy Plan

In the energy plan, two points were recognized as being critical to integrate as much as possible into all strategies both short-term and long-term (Hamlet of Aklavik, 2017):

- **Education:** encourage involvement and participation from students at Moose Kerr School
- **Skills and Opportunities:** incorporate training for skills and economic development opportunities in clean energy technology

A community survey was completed through the creation of the energy plan process. There were several results that related to education. For example, when asked "*What would you like to see the community do to reduce energy costs?*", residents answers were more education on conserving energy; have winterization workshops, training for renewable energy installations, and training for wood harvesting. When asked if they would attend sessions or meetings that offered more information on energy conservation or efficiency, 34% of participants responded yes and 47% of participants responded if they had time or were not working.

Community Investments

This section describes recent community investments in energy technology, renewable energy projects, energy efficiency initiatives, or local energy literacy programs over the last 5 years.

Solar Water Heater

A solar hot water heater was installed on the swimming pool as a 2009 Community Energy Plan strategy. The swimming pool was determined to be the only building with a high hot water load; therefore, no other buildings were added to create a central hot water system (Hamlet of Aklavik, 2017).

Solar Electricity Systems

Solar electricity systems were installed on three buildings in town as a 2009 Community Energy Plan strategy. The buildings were the recreation complex, the SAO's residence and the Bed & Breakfast. An additional 55-kilowatt solar farm was installed by NTPC in March of 2017. This made the maximum allowable capacity for grid-connected microgeneration in Aklavik to be met. Therefore, without discussions to change the allowable capacity available for microgeneration, no additional capacity can be added to the electricity system (Hamlet of Aklavik, 2017).

Variable Speed Generator

In February of 2018 NTPC released that the VSG project successfully commissioned the test unit and that electricity is now being provided to more than 300 NTPC customers in Aklavik using the converter-based VSG platform. The VSG was also intended to integrate solar power form a new 55-kilowatt solar array, installed by the GNWT in 2017. The VSG was projected to reduce diesel consumption by approximately 80,000 litres per year which results in a greenhouse gas emission reduction of 210 tonnes. This is achieved through improved diesel generation efficiency.

Energy Programs and Incentives

This section describes the availability of energy programs (e.g. loans, grants, incentives, etc.) for renewable energy projects, energy efficiency, training or capacity building.

GNWT

The GNWT funds programs—delivered by the Arctic Energy Alliance (AEA)—that provide incentives for residents and businesses to use energy-efficient appliances as well as alternative energy sources and technologies.

Capital Asset Retrofit Fund (CARF)

CARF allows for the upgrading of existing GNWT buildings to improve overall energy efficiency. The program helps to reduce energy consumption, operating costs, and greenhouse gas emissions from the operation of GNWT buildings. The CARF program has been in existence since 2007.

Alternative Energy Technologies Program (AETP)

AETP provides funding for communities, commercial businesses and NWT residents to use renewable energy sources such as solar, wind, wood pellet heating, biofuel/synthetic gas and ground source heat pumps.

Energy Efficiency Incentive Program (EEIP)

The EEIP helps homeowners, businesses and nonprofit organizations purchase new, more energy efficient models of everyday products and appliances.

Commercial Energy Conservation and Efficiency Program (CECEP)

CECEP provides up to $10,000 for eligible projects to help NWT businesses conserve energy and improve their energy efficiency.

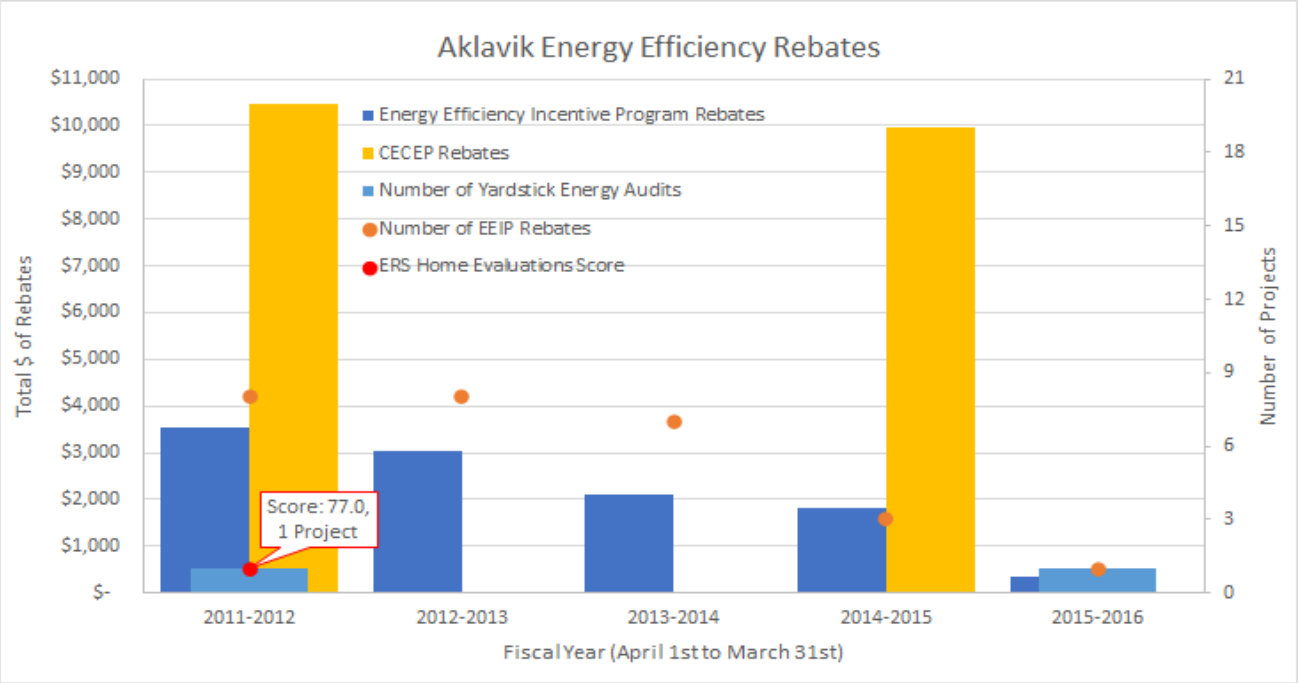

Figure 6 Distribution of Energy Efficiency Projects in Aklavik (Arctic Energy Alliance, 2015)

Community Energy Source Potential

This section describes the physical potential based on solar radiation; hydro resource; geothermal; wind resource; sustainable biomass harvest; coal reserve, etc.

Potential Future Strategies

Three potential energy sources were recognized in the potential future strategies section of the Community Energy Plan as shown below. All of which were based on *"Exploration of alternative energy development (wind, solar, hydroelectricity)"* as a result of a 2009 CEP strategy (Hamlet of Aklavik, 2017).

- **Strategy 5:** Conduct a wood pellet/wood chip boiler feasibility study
    - It was recognized that there are a number of NWT communities where wood pellet boilers are used to heat buildings or a group of buildings in a district heating set-up and that the communities should look at the lessons learned from other NWT biomass systems and monitor their progress to deem feasibility for Aklavik.
- **Strategy 6:** Conduct a wind potential study
    - It was noted that there haven't been any formal wind studies done in Aklavik, but based on a report titled "Assessing the potential uptake for a remote community wind incentive program in Canada", by Tim Weis and John Maissan, published in 2007, the wind potential in Aklavik is "fair". However, it was recognized that this data is not from actual site data and there could potentially be some very good sites that community members know about that have much better potential. Therefore, Fred Behrens was noted to have been talking with wind expert J.P. Pinard out of Whitehorse who has conducted many wind potential studies in the NWT.

- **Strategy 7:** Conduct a micro-hydro potential study
    - It was suggested that a feasibility study be undertaken to look at the potential of a micro-hydro in the Peel channel of the Mackenzie Delta, right beside the community. It was noted that some studies and tests have been done in Whati, Lutsel K'e, Deline and Fort Simpson and the findings from these potential projects should be collected and summarized. It was also recognized that the GNWT advises that "Hydro projects can take over 10 years to develop and require a substantial amount of upfront, at-risk investment. Therefore, it was noted that undertaking baseline monitoring, environmental and engineering work can shorten the development timeframe and position northern governments to take advantage of hydro development opportunities as they emerge. It was noted that this work is also linked with the NWT Water Stewardship Strategy, and that gaining a greater understanding of NWT rivers supports both the conservation and development objectives of northern governments. It was also noted that NTPC assessed some hydro options and summarized whether certain technologies were "proven Northern application" or a "emerging potential."

Priorities

This section describes key energy priorities over the near-term and long-term (e.g. build service capacity, reduce cost of service, reduce GHGs, renewables transition, induce economic development, energy sovereignty, etc.).

Seven strategies were recognized for the purpose of achieving the updated Community Energy Plan. The strategies also included information related to the funding, capital cost estimate, savings estimate, emissions savings, payback, if there was other funding available, potential funding and payback with funding options. There were also seven strategies recognized as potential future strategies. All present and future strategies were noted as being from the original 2009 Community Energy Plan or the 2017 Community Energy Plan as shown below. Two key components were also noted as points to integrate as much as possible into all strategies both present and future (Hamlet of Aklavik, 2017).

Points to Integrate as much as Possible into all Strategies

- **Education:** encourage involvement and participation from students at Moose Kerr School
- **Skills and Opportunities:** incorporate training for skills and economic development opportunities in clean energy technology

Present Strategies

Strategy 1: Complete a series of energy efficiency audits and retrofits for non-residential buildings in Aklavik (CEP strategy, 2009).
It was noted that by monitoring energy use and determining how much energy the building uses for heating, lighting, and water can be used to screen buildings for energy upgrades. And that upgrading existing buildings makes sense where the cost of upgrading is less than the cost of replacing a structure. Therefore, it was noted that the next step is to estimate the savings, costs of upgrades and materials for each building, as this type of information is typically provided in an energy audit report. It was recognized that the building upgrades

will require final cost estimates based on the quotes from contractors and suppliers; and that the final step is to complete the upgrades and to monitor energy use post-retrofit.

- Budget For: community government buildings only
    - NRCan Funding: yes
    - Capital Cost Estimate: $107,000
    - Savings Estimate ($/year): $50,000
    - Savings (GHG tonne CO2/year): 64
    - Payback: 2.1
    - Other funding available? Community Government Retrofit
    - Funding Potential: $35,000
    - Payback with Funding: 1.4

Strategy 2: Complete a series of homeowner energy evaluation and retrofits (CEP strategy, 2017).

It was noted that a home energy evaluation provides an assessment of an existing home's energy efficiency through heat loss calculations, heating appliance assessment and a blower door test. It was recognized that the evaluation is undertaken according to the standards of Natural Resources Canada's EnerGuide Rating System; and that the evaluation includes a report which outlines potential energy efficiency upgrades and their estimated savings, and funding potential. Therefore, it was noted that based on AEA's experience, many homeowners likely do not have the cash or borrowing power to take advantage of the ERS program and follow up on recommendations; and, if they do have the money, lack the capacity to find and retain a contractor to undertake the work; therefore this project could include follow-up work organized together as one project and funding could alleviate the barriers by homeowners. It was noted that some examples of a work scope for energy efficiency upgrades could be replace wood stoves, replace electric water heaters with fuel fired water heaters, install low-flush toilets, replace weatherstripping, install LED light bulbs, replace refrigerators and washers with Energy Star refrigerators, install combustion air if needed.

- Budget For: 20 households
    - NRCan Funding: yes
    - Capital Cost Estimate: $94,000
    - Savings Estimate ($/year): $15,500
    - Savings (GHG tonne CO2/year): 37
    - Payback: 6.1
    - Other funding available? ERS and EEIP
    - Funding Potential: $28,000
    - Payback with Funding: 4.3
- Budget For: all privately owned houses (~60 households)
    - NRCan Funding: yes
    - Capital Cost Estimate: $282,000
    - Savings Estimate ($/year): $46,600
    - Savings (GHG tonne CO2/year): 111
    - Payback: 6.1
    - Other funding available? ERS and EEIP

- Funding Potential: $83,000
- Payback with Funding: 4.3

Strategy 3: Provide winterization and home maintenance workshops and including training for students and help for elders (CEP strategy, 2017).

It was recognized that the goal of a Winterization Workshop is to provide basic knowledge and skills to winterize a house – weather stripping, stopping leaks, covering windows with plastic, etc. - and have the participants practice these skills; and that AEA has offered short-term workshops for high school students and as part of their training, the students assist community Elders by winterizing their homes. Therefore, it was noted that the students earn school credit for their work and the Elders' homes are winterized. It was also noted that Home Maintenance Workshops have a similar goal – to provide basic knowledge and skills to maintain a home in good condition and identify ways to increase energy efficiency; and that this could include cleaning and/or replacing furnace filters, lightbulbs, caulking, etc. and learning about ways to increase energy efficiency

- Budget For: workshop at school for students + materials for implementation of measures in 20 homes (elders +)
  - NRCan Funding: yes
  - Capital Cost Estimate: $29,000
  - Savings Estimate ($/year): $2,200
  - Savings (GHG tonne CO2/year): 4
  - Payback: 13.2
  - Other funding available? No?
  - Funding Potential: $0
  - Payback with Funding: 13.2

Strategy 4: Switch all washers and fridges to Energy Star and switch all lights to LED in homes (CEP strategy, 2017).

It was recognized that there have been very few EEIP rebates given for Energy Star washing machines and refrigerators in Aklavik in the past year and the assumption is that few of the appliances in town are actually Energy Star; and by purchasing Energy Star appliances, people save money year after year and have lower electricity, water and pump-out bills. Energy Star washing machines allow clothes to be dried more quickly as a front-loading washer removes more water in the spin cycle. Also, that light Emitting Diodes (LEDs) use up to 80% less energy than incandescent bulbs, last longer than CFLs and incandescent bulbs, and LEDs have no mercury, and work well when it is cold. It was noted that therefore, Aklavik could be the first community to be completely Energy Star and LED in their residences; and that thought would need to be taken as to whether this program would be applied to all private homeowners, some private home owners or all houses in Aklavik (including NWTHC).

- Budget For: switch 20 households' fridges + washers (~20 households)
  - NRCan Funding: yes
  - Capital Cost Estimate: $60,000
  - Savings Estimate ($/year): $4,600
  - Savings (GHG tonne CO2/year): 10

    - Payback: 13.1
    - Other funding available? EEIP
    - Funding Potential: $12,000
    - Payback with Funding: 10.5
- Budget For: switch all private homeowners' fridges + washers (~60 households)
    - NRCan Funding: yes
    - Capital Cost Estimate: $180,000
    - Savings Estimate ($/year): $10,600
    - Savings (GHG tonne CO2/year): 25
    - Payback: 17.0
    - Other funding available? EEIP
    - Funding Potential: $36,000
    - Payback with Funding: 13.6
- Budget For: switch all private homeowners to 100% LED lighting (~60 households)
    - NRCan Funding: yes
    - Capital Cost Estimate: $13,000
    - Savings Estimate ($/year): $6,900
    - Savings (GHG tonne CO2/year): 22
    - Payback: 1.9
    - Other funding available? EEIP
    - Funding Potential: $6,400
    - Payback with Funding: 0.9

Strategy 5: Install wood stoves in homes (CEP strategy, 2017).

It was recognized that there is significant interest in having wood stoves installed in Aklavik. Aklavik and AEA conducted a wood stove project in 2010; and that another, similar project could be initiated for homeowners who were not able to take advantage of it the first time. It was noted that these projects are typically done in a partnership and depending on what the community wishes to focus on, often includes local training components during install and certification of the wood stoves; and that suggestions for workshops included how to harvest, cut and season cord wood, and chimney-sweeping.

- Budget For: purchase and installation in 20 households
    - NRCan Funding: no
    - Capital Cost Estimate: $120,000
    - Savings Estimate ($/year): $31,000
    - Savings (GHG tonne CO2/year): 86
    - Payback: 3.9
    - Other funding available? EEIP
    - Funding Potential: $15,000
    - Payback with Funding: 3.4

Strategy 6: Provide solar or solar/wind hybrid systems for bush camps (CEP strategy, 2017).
This strategy was to train one (or more) community members to order and install small solar or solar/wind hybrid systems at the bush camps of residents of Aklavik. It was noted that installing these systems could reduce generator use in several people's camps.

- Budget For: Small solar set-up at 5 camps + training of 1 person
    - NRCan Funding: no
    - Capital Cost Estimate: $69,000
    - Savings Estimate ($/year): $2,100
    - Savings (GHG tonne CO2/year): 3
    - Payback: 33.0
    - Other funding available? AETP + ASETS
    - Funding Potential: $27,000
    - Payback with Funding: 20.1

Strategy 7: Increase local food availability and knowledge (CEP strategy, 2017).
This strategy was to increase local food growing and harvesting in the community; and to potentially have a greenhouse next to the power plant to capture waste heat from the generator and to use it to heat the greenhouse. It was noted that partnering with organizations hosting gardening workshops and food collection workshops with Elders to increase local food harvesting could form part of this strategy.

- Budget For: Greenhouse, use waste heat from NTPC generator, workshops, etc.
    - NRCan Funding: no
    - Capital Cost Estimate: N/A
    - Savings Estimate ($/year): N/A
    - Savings (GHG tonne CO2/year): N/A
    - Payback: N/A
    - Other funding available? ITI
    - Funding Potential: N/A
    - Payback with Funding: N/A

Potential Future Strategies

Strategy 1: Include energy use considerations in all community planning exercises (CEP strategy, 2009).
It was deemed by council that this is occurring and should continue to occur. It was noted from the 2009 CEP: "Energy use is affected by each decision made by the individuals or the community in Aklavik. Areas in which the Hamlet and the Council are lead decision-makers - such as land-use plans and purchasing - can have a significant impact on energy use both in the short-term and in the long-term. Evaluating the potential impact of decisions on energy use and energy costs can help the Hamlet realize its vision." It was recognized that to accomplish this action, the Hamlet will need to formalize a process where consideration of both immediate and long-term impacts on energy use and energy costs are considered in the decision-making processes.

Strategy 2: Implement an energy efficient building standard for new homes (CEP strategy, 2009).
From the original plan it was noted that: New homes are designed to last for many years - and the best and most cost-effective time to improve energy efficiency of the building is during the design and building phase. There are many building design standards and codes that are used across Canada to certify the improved energy performance of a building. EnerGuide for Homes is a standardized tool used for measuring performance. Buildings that achieve between 80 and 90 on the EnerGuide rating system are considered very efficient (by comparison, most building standards result in an EnerGuide score of between 68 and 72. A score of 80 means the building uses about 25% less energy compared to a new building that receives 68-72). Some municipalities, like the City of Yellowknife, are requiring that all new homes in their jurisdiction be built to EnerGuide 80 because the added cost of more efficient buildings is minimal, and the energy savings are significant. The challenge for a smaller community is that limited resources make it uncertain how to effectively follow through on this action and how to enforce the standard once in place.

Strategy 3: Implement an energy efficient building standard for new non- residential buildings (CEP strategy, 2009).
It was noted that demanding energy efficiency terms in an RFP will ensure that quotes are given for high efficiency buildings; which means that the building will cost a lot less to operate (heat, light, etc.) and will produce less greenhouse gas emissions. It was recognized that although the building may have a slightly higher initial cost, the reduced operating cost will more than compensate for that if the building is well designed (from AEA's Energy Efficiency in Request for Proposals for New Buildings Guide). It was noted that similar to #2, the challenge for a smaller community is that limited resources make it uncertain how to effectively follow through on this action and how to enforce the standard once in place.

Strategy 4: Work with stores to improve the selection of EnergyStar appliances and LED lights available to community residents (CEP strategy, 2017).
It was recognized that this project would involve working with the Northern and Stanton's to have EnergyStar appliances available and to help get a larger variety of LED bulbs into both stores; and that there is currently an LED point of sale rebate available on LED bulbs at the Northern. It was noted that this project could also result in mandating that only EnergyStar appliances and LED bulbs be sold in Aklavik.

Strategy 5: Conduct a wood pellet/wood chip boiler feasibility study (CEP strategy, 2017).
It was recognized that there are a number of NWT communities where wood pellet boilers are used to heat buildings or a group of buildings in a district heating set-up and that the communities should look at the lessons learned from other NWT biomass systems and monitor their progress to deem feasibility for Aklavik.

Strategy 6: Conduct a wind potential study (CEP strategy, 2017).
It was noted that there haven't been any formal wind studies done in Aklavik, but based on a report titled "Assessing the potential uptake for a remote community wind incentive program in Canada", by Tim Weis and John Maissan, published in 2007, the wind potential in Aklavik is "fair". However, it was recognized that this data is not from actual site data and there could potentially be some very good sites that community

members know about that have much better potential. Therefore, Fred Behrens was noted to have been talking with wind expert J.P. Pinard out of Whitehorse who has conducted many wind potential studies in the NWT.

Strategy 7: Conduct a micro-hydro potential study (CEP strategy, 2017).
It was suggested that a feasibility study be undertaken to look at the potential of a micro-hydro in the Peel channel of the Mackenzie Delta, right beside the community. It was noted that some studies and tests have been done in Whati, Lutsel K'e, Deline and Fort Simpson and the findings from these potential projects should be collected and summarized. It was also recognized that the GNWT advises that "Hydro projects can take over 10 years to develop and require a substantial amount of upfront, at-risk investment. Therefore, it was noted that undertaking baseline monitoring, environmental and engineering work can shorten the development timeframe and position northern governments to take advantage of hydro development opportunities as they emerge. It was noted that this work is also linked with the NWT Water Stewardship Strategy, and that gaining a greater understanding of NWT rivers supports both the conservation and development objectives of northern governments. It was also noted that NTPC assessed some hydro options and summarized whether certain technologies were "proven Northern application" or a "emerging potential" (CEP strategy, 2017).

VULNERABILITIES AND SECURITY

The off-grid nature of Aklavik combined with the cold climate and geographic remoteness presents unique energy security issues that impact the community. This section outlines what energy security means to the community and describes the vulnerabilities of the community's energy system. The areas of vulnerability discussed are power disruptions, fuel supply, infrastructure, renewables integration and economic vulnerability.

Energy Security

The document review did not uncover any definition of energy security for the community of Aklavik. Neither was any definition of energy security found for the Beaufort Delta region. Academic literature contains definitions of energy security for arctic regions including rural Alaska and northern Russia that experience energy situations similar to the Beaufort Delta region that could be applied to Aklavik (Hossain et al., 2016; Kiushkina & Antonenkov, 2019), but it is still necessary to obtain a community-specific definition to have a complete understanding of the vulnerabilities that need to be addressed in building a community energy plan. The definitions applied in rural Alaska and northern Russia respectively are, "A situation in which people have reliable access to socially acceptable energy generation or provisioning services, at a level sufficient to conducting a sustainable life," (Hossain et al., 2016) and, "This is the state of protection of service areas against external and internal threats caused by territory isolation and remoteness from centralized power supply sources, which enables ensuring fuel-and-energy sector diversification and favourable conditions for operation and energy self-sustainability of local power industry facilities meeting modern requirements to

power quality with account for harsh climatic conditions and preventing emergencies in case of power supply interruptions" (Kiushkina & Antonenkov, 2019).

A community-specific definition for Aklavik can be developed through interviews with community residents, community leaders, the GNWT Fuel Services Division who provide fuel to the community and NTPC staff.

Power Disruptions

This section describes the timing, duration, frequency of, and reasons for power outages, changes in power disruptions trends over the past 10 years and outage implications for the community of Aklavik.

Outages and Power Disruption Trends

The sole electrical utility for the Beaufort Delta region is the crown corporation NTPC. NTPC classifies outages into eight categories by their cause (Northwest Territories Power Corporation, 2010):

- Loss of production caused by equipment failures or breakdowns,
- Loss of supply due to problems with the transmission or distribution system,
- Scheduled outages due to disconnection for construction, maintenance or repair,
- Lightning strikes to transmission or distribution systems,
- Adverse weather such as rain, ice storms, snow, winds, extreme temperatures, freezing fog or frost,
- Human elements such as incorrect use of equipment, settings or installation maintenance; switching errors or sabotage,
- External interference such as birds, animals or foreign objects, and
- Unknown where there is no apparent cause.

In its annual reports, NTPC provides leading causes of outages for the year along with reliability indices such as the System Average Interruption Frequency Index (SAIFI) and System Average Interruption Duration Index (SAIDI) for its entire customer base, but the information is not available on a community level (Northwest Territories Power Corporation, 2019a). While the majority of North American utilities are required to report reliability information - including electrical outages - to the North American Electric Reliability Corporation (NERC), because NWT is not connected to the rest of the North American electrical grid, NTPC does not have this requirement. Instead, reliability performance is regulated by the NWT Public Utilities Board (PUB) (Natural Resources Canada, 2016). However, reliability performance information collected by the NWT PUB is not publicly available.

Another possible source of reliability performance data is the Canadian Electricity Association (CEA). The CEA collects reliability performance data from participating member organizations across the country including NTPC, and provides pooled data to the public in an annual report available for a fee (Canadian Electricity Association, n.d.). However, it is unknown if the data NTPC provides to the CEA is detailed at the community level and even if it is, the unpooled data for NTPC is not publicly available.

Outage Implications for Aklavik

Little information is available regarding how power outages affect Aklavik residents. It is unknown whether the community relies upon electricity for heat, but heating oil (diesel fuel used for heating) is available to the community that can be used in the event of a power outage.

Gaps in Data Availability

Data that still needs to be collected surrounding power disruptions are:

1. Current power outage data for Aklavik,
2. Trends of power outages in Aklavik over the past 10 years, and
3. Outage implications for the community.

Current and historic power outage data can be obtained from NTPC through a formal request. In the event NTPC denies the request, the information may also be obtained from the NWT PUB, though they may not have access to the same wealth of data. Additionally, the CEA could be contacted to determine if they have community-specific data and are willing to share it. Information on outage implications for Aklavik can be obtained through interviews with community leaders and residents. Additionally, outage implication data may be obtained from Aklavik's emergency response plan. If the community has one, requests can be made to community leaders to view it.

Fuel Supply

This section describes the access to and reliability of fuel supply for power generation and heating, as well as the reasons for any disruptions in the fuel supply chains.

Fuel Services Division

Under the Fuel Management Services Agreement, the GNWT Fuel Services Division (FSD) manages the purchase, transport and storage of fuel in 20 off-grid communities on behalf of NTPC until the contract expires on March 31, 2021 (Gwich'in Council International, 2017; Northwest Territories Power Corporation, 2019a). Furthermore, under this agreement, FSD also handles the maintenance of bulk fuel storage tank farms owned by NTPC. Though the actual Fuel Management Services Agreement document could not be located, it is highly likely that Aklavik is one of the 20 communities named for servicing. The price of fuel under this agreement depends on the market price, the cost of transport, the GNWT fuel tax rate and the amount of fuel purchased by NTPC in a given year.

While the agreements mentioned above explain who manages the fuel supply logistics for electricity generation, it is unknown whether FSD handles the delivery of fuel to the community that is used for other purposes such as heating.

Delivery Route

No specific information is available regarding the community's fuel supply chains. Some products are shipped by rail from Alberta to Hay River, NWT, and then transported by barge along the Beaufort Sea from Hay River to individual communities (Government of Canada, 2019). The GNWT Marine Transportation Services delivers to Aklavik once per year during the sailing season. The estimated arrival date for the 2020 year is still

to be determined, but the final cargo acceptance date was set for July 4 (Government of the Northwest Territories, 2020).

Gaps in Data Availability

1. It needs to be verified whether Aklavik is one of the 20 communities serviced by FSD under the Fuel Management Services Agreement,
2. The supply chain for fuels used for purposes other than electricity need to be identified,
3. The exact shipping routes for fuels need to be determined, and
4. Information about fuel supply disruptions needs to be collected.

Item 1 can be confirmed through discussions with FSD staff or NTPC staff. Information on the fuel supply chain, delivery routes and fuel supply disruptions can be obtained through interviews with FSD, local community leaders and local fuel distributors. The local fuel distributors will be identified through interviews with community leaders.

Infrastructure

This section discusses the condition of energy infrastructure, its current and future capacity, maintenance requirements and major threats to energy infrastructure.

Age and Condition of Existing Energy Infrastructure

Little information is given on the age and condition of energy infrastructure in Aklavik. The information available pertains to recent developments, where new energy assets have been installed or old ones have been renovated that was gleaned from NTPC's website and recent energy initiatives reports from the GNWT (2018, 2019):

- 2017
  - 55 kW of solar panels were built in the community
- 2018
  - A VSG was installed to integrate the 55 kW of solar built into Aklavik's grid
- 2019
  - Construction commenced on a biomass boiler in Moose Kerr School

Capacity of Existing Infrastructure to meet Current and Future Energy Needs

NTPC keeps "a reserve margin large enough to compensate for the loss of the largest generating unit during the system peak" (Natural Resources Canada, 2016). This criterion - commonly known as N-1 - means that capacity of backup generation is sized such that the electrical system can sustain the loss of its largest generating unit without disrupting the electrical supply. More specifically, NTPC backup units are 110% the size of the corresponding primary unit (Northwest Territories Power Corporation, 2010). According to this criterion, Aklavik has sufficient back-up power available for when a generator fails, but it provides no information about whether the community is under load restriction. The average annual electrical load is 363 kW and the installed electrical generation capacity is 1356 kW, suggesting that there is sufficient capacity to

meet the load (Northwest Territories Power Corporation, n.d., 2019b). However, because the peak annual electrical load is unknown, one cannot conclusively say that existing infrastructure is sufficiently satisfying the community's energy needs. Information around the existing capacity of distribution infrastructure and the capacity of infrastructure to satisfy future energy needs could not be located.

Access to Maintenance

NTPC states they do not have technical staff based in every community due to prohibitive costs and that there may be some delays reaching communities in the event of equipment failure (Northwest Territories Power Corporation, 2010). As mentioned in the Fuel Services Division section, if Aklavik is one of the 20 communities named in the Fuel Management Services Agreement, then FSD manages the maintenance of the fuel tank farms.

Major Threats to Infrastructure

According to NTPC's 2018-19 annual report, adverse weather and foreign interference (external objects such as tree branches, trucks, or animals) are the leading external causes of outages across the territory, but no information is available on the major threats experienced by Aklavik's infrastructure specifically (2019a).

Gaps in Data Availability

The gaps surrounding Aklavik's energy infrastructure are:

1. The age and condition of infrastructure that was not installed or renovated recently are unknown,
2. Little information is available on the capacity of existing infrastructure generation and distribution infrastructure to meet current and future energy needs,
3. Minimal information is known regarding maintenance routines and access to spare parts, and
4. Little information has been found on major threats to Aklavik's energy infrastructure.

Most of this information can be gained from NTPC through formal data requests and interviews with staff. Fuel tank farm maintenance procedures can be determined through interviews with FSD staff. Additionally, interviews with community leaders could provide some information on when major energy assets were installed and how well the infrastructure is serving existing energy needs.

Renewables Integration

This section addresses the ability to integrate renewable energy technologies (RET) into the existing energy system and discusses technical limitations and capital commitments that constrain the ability to transition to or invest in renewables.

Utility and Community Attitude Toward RET

As demonstrated through some of the recent RET installations in Aklavik, the community and NTPC are both open to incorporating RETs. In phase II of their 2016-19 general rate application, NTPC states that utility owned renewable generation is considered when a diesel power plant is due for replacement, and has

introduced a net metering program allowing customer owned solar installations less than 15 kW to be connected to the electrical grid (2017).

Technical Limitations

RET installations connected to the grid are limited by NTPC to 20% of a community's average annual electrical load. This is done to "protect customers from higher electricity rates and an increased number of outages" that could result from grid instability and inefficient generator cycling associated with high levels of RET penetration (Northwest Territories Power Corporation, 2018). For Aklavik, the allowable RET capacity is 73 kW and between current and planned net metering, government and utility owned installations, all 73 kW have been accounted for (Northwest Territories Power Corporation, 2019b). Therefore, no additional RET installations can be connected to the electrical grid. While a reason for the renewables penetration cap is given, little explanation is provided regarding why 20% was selected as the maximum rather than a higher or lower value.

Gaps in Data Availability

No information is available regarding ongoing capital commitments of the community and NTPC that constrain the ability to transition to or invest in RETs. This information can be obtained from interviews with community leaders and NTPC staff.

Economic Vulnerability

This section discusses the state of key industries and economic sectors in the community and how it is opening or closing opportunities for energy choices.

The little information that could be located on this topic is derived from Aklavik's Community Economic Sustainable Development Plan (Mahairi et al., 2009). One of the initiatives outlined in the plan is the creation of a sawmill within the community. A sawmill would support the implementation of a biomass energy system and supply the community's heating needs. No other information on the economic vulnerability of Aklavik could be found by document review. This information can be obtained through interviews with community leaders to identify Aklavik's key economic sectors, and interviews with employers and employees who work in those sectors.

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