PEMBINA institute

Power purchase policies for remote Indigenous communities in Canada

Research on government policies to support renewable energy projects

Prepared for the World Wildlife Fund (WWF) Canada

Version A

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Contents

List of Figures

List of Tables

Executive summary

Motivation and goals

This report is motivated by an opportunity to successfully support Canada's remote Indigenous (First Nation, Métis and Inuit) communities in finding community economic development opportunities through developing their own clean power projects, while reducing near total reliance on diesel power plants. These plants come with harmful economic, social and environmental impacts, many of which are reinforcing a need for change because they are unsustainable and do not reflect traditional ways of northern Indigenous life.

The report uses a policy approach to supporting clean power projects in Canada, seeking to understand effective policies for clean power purchase, and how and by whom they are currently implemented. Policy research focused on price-based mechanisms including feed-in tariffs (Standard Offer Programs), Request for Proposals (Call for Power), Production Incentives and Contract for Differences. Also incuded are Renewable Portfolio Standards and Net Metering. The main goals of this research are:

1) *What* government or utility policies have supported and enabled Indigenous communities to develop clean power projects; and
2) *Why* and *how* government policies came to be, and what were the dominant motivations behind their conception. This includes understanding underlying challenges and barriers, and identifying key opportunities.

Background and scope

Nearly all of Canada's remote Indigenous communities rely on diesel power plants for electricity; produced and delivered by small, local microgrids. In a few instances, small-scale hydro and some clean power plants have already offset diesel power. Publicly owned utilities serve most of these communities, as mandated under provincial or territorial legislation. Status-quo costs, subsidies and investments for diesel power plants are entrenched in these laws, making it difficult to come up with solutions that generally benefit all involved stakeholders.

Developing economically sound clean power alternatives to diesel power plants is especially difficult in northern Canada because of the remoteness and harsh weather condition. But with this challenge comes several opportunities for provincial / territorial

governments to work together with respective utilities and the federal government to develop policies that benefit, first and foremost, remote communities.

This research is intended to provide information and guidance to provincial and territorial governments and their utilities to continue to develop and introduce more effective clean power purchase policies. It also offers suggestions to the federal government in how it could play a complementary role in strengthening provincial and territorial efforts. Because 67% of all diesel fuel use in power generation occurs in Yukon, Northwest Territories and Nunvavut, specific emphasis is placed on policies in these jurisdictions.

Mandate

As Canada and the world transitions to clean power generation as part of addressing climate change and reducing reliance on fossil fuels, remote Indigneous communities are often not part of the development journey. This exclusion is tied to the lack of policy and program support and the complexities of providing power in remote regions of Canada, but may be addressed with new governance and policy approaches. Indigenous leaders, already calling for advancements of Canada's clean energy commitments made at COP 2016 in Paris, join a more recent statement by the Governments of Canada and the United States to tackle climate and energy through Arctic leadership, including addressing diesel reliance in remote communities. These calls add to Canada's federal government election promises, and existing pan-Canadian efforts to improve conditions in Indigenous communities. All of this is a clear mandate for new, innovative and perhaps, creative approaches to developing clean power purchase policy in Canadian remote communities.

Key observations and trends

Less than 5% of the over 250 remote communities in Canada that are connected to microgrids powered by diesel power plants have developed their own clean power projects. Most of the successful projects are quite small (typically less than 10 kW) and are supported by net metering policies. This means that financing projects depends on changing electricity rates. Most net metering projects are on buildings with high electricity rates such as community halls and government buildings.

When including clean power projects currently under development, the percentage of communities that have access to some clean power increases to only 7%. Ontario has seven clean power projects in as many communities and B.C. has four. The Northwest

Territories has one newer clean power project and the Yukon government is in discussion with one Indigenous community on developing a wind project. Table 1 summarizes the power purchase agreements in the various jurisidictions researched.

Table 1: Jurisdictions that have remote Indigenous communities with power purchase connections

Jurisdiction	Approximate # of remote Indigenous communities	# with PPAs (including net metering connections)	Project types
BC	25	4 current 3 developing	Micro-hydro Solar Biomass
Alberta	7	0 current	N/A
Saskatchewan	1	0 current	N/A
Manitoba	4	0 current	N/A
Ontario	25	7+ current 2+ developing	Assumed solar
Quebec	19	0 current	N/A
Newfoundland and Labrador	16	0 current	N/A
Yukon	21	0 current 1 developing	Wind
Northwest Territories	26	1 current	Solar
Nunavut	25	0 current	N/A

The power purchase policies used are either a varition of a SOP or net metering. The different policies were either formalized thorugh legislation, or prescribed through government policy statements. Although general information is available on the policies, specific PPA contract information is almost always confidential and not accessible. The research did not find examples of other types of price-based power purchase mechansims for clean power in remote Indigenous communities.

Asides from policies directly supporting clean power purchase, there are a few noteworthy government grant programs that have been instrumental in advancing clean power projects. These include the B.C. Rural Community Electrifician Program, the

Northwest Territories Community Renewable Energy Program and (Alaskan) Renewable Energy Fund.

There are three basic approaches governments and their utilities have taken in developing power purchase policies:

1. **Creating an enabling regulatory environment –** Government acts and regulations which delegate authority to utilities can create an enabling but not compulsary environment for power purchase agreements. The legistlated acts and regulations do not necessarily target remote communities, and in some cases actually exclude them because of power connection and reliability and other obligatory requirements. The B.C. Clean Energy Act is a good example of an enabling environment; it encourages BC Hydro, the provincially owned public utility, to work with remote communities to develop clean power projects.

2. **Government-driven policy (and/or program implementation)** – Governments may encourage and guide the development of clean power projects but not necessarily achieve this through legislation. NWT and Yukon are good territorial examples that have developed strategy documents for biomass, solar and wind that support clean power projects. Yukon has gone one step further by developing policy that specifically supports IPP projects. However, because of reliability and power connection requirements (as per regulatory requirements), the policy excludes remote communities from participating.

   Governments may also take a leadership role without supporting policy statements. NWT's public utility NTPC has signed one PPA with a remote community without legislative obligations. The contract was signed as a result of diligent consultation with the Indigenous community which was keen on developing the clean power project.

   Net metering policies and programs – these may be defined by both utilities and governments. All three territorial governments offer net metering contracts, or equivalent compensation through customer billing. In many cases the rate received for clean power is higher than via PPA contracts.

3. **Utility-driven policy (and/or program implementation)** – Northern Ontario's H1RCI is the only public utility to offer a formalized IPP program in Canada. REINDEER program specifically targets clean power in Indigenous remote communities. Based upon Ontario's grid-connected SOP program, it offers very specific PPA contract rates and terms, addressing the needs of remote

communities where Ontario's integrated grid programs, FIT and microFIT, were inapplicable.

PPA contract rate design

Power purchase policies resulting in a PPA signed between a utility and a remote community IPP are almost always based on the avoided cost of diesel to the utility; meaning that utilities will purchase electricity from clean power projects soley based on what it would cost the utility to purchase the diesel fuel and generate the electricity. Ontario REINDEER program rates are specific to each community (since provincial transportation costs vary greatly), averaging close to $0.40 / kWh. However, the Canada average PPA rate for remote community clean power is around $0.30 / kWh. Two actors stand out for going above and beyond the standard avoided cost of diesel calculation: BC Hydro and NTPC; where both considered other benefits of clean power. BC Hydro uses a "capacity payment" adder, an acknowledgement of less wear and tear on diesel generators. NTPC's one PPA contract is based on avoided cost of diesel plus a 5% "top-up", similarly acknowledging less diesel generator operation and maintenance costs.

However, even the improved rates and terms offered by BC Hydro and NTCP are not enough to make a clear economic case for clean power projects in remote communities and further capital support was needed from government. A guaranteed revenue requirement at current rates is not enough to attract private financing to projects, especially considering the challenges and complexities of developing projects in harsh and remote regions.

Main drivers for IPP policy success

Five common drivers stand out that are influential to governments and utilities in developing IPP policies.

1. **Energy strategies and acts –** Many governments, as part of overall efforts around climate change mitigation, environmental improvements and clean economy transition, have developed energy strategies. Strategies inherently open the door for defining mandates or goals related to energy targets, renewable energy generation, increased energy diversification and local economic development. Jurisdictions including B.C., Alberta, Manitoba, Ontario, Quebec, Yukon, NWT and Nunavut all have energy strategies. Some specifically

include remote communities and the evolution of their energy systems from diesel power systems to renewable resources.

Many government clean energy strategies are grounded in existing legislation, typically energy acts and regulating bodies. In order to execute the strategy, these acts sometimes require amendments or additional legislation. The resulting law provides a mandate and legal means for government to establish targets and implement policies. Targets help guide decision making and funding commitments at the bureaucratic level of government.

2. **Foster and develop relationships with Indigenous communities** – The B.C. Clean Energy Act, SaskPower's Aboriginal Procurement Plan and Manitoba Hydro's Corporate Strategic Plan are all examples of plans that have directly stated goals of improving relationships with and opportunities for Indigenous communities — some directly with clean power projects and others with economic development and business goals.

3. **Decrease environmental impacts associated with diesel fuel combustion** – Governments and utilities are acknowledging the environmental and cost risk associated with continued fossil fuel use. Environmental costs include GHG emission, local air quality and costs associated with diesel fuel spill cleanups. These factors are making a strong case and justification to reduce fossil fuel use by the implementation of IPP policies. These goals are highlighted by BC Hydro, H1RCI, Newfoundland and Labrador, Yukon, NWT and Nunavut governments.

4. **Utility mandate for safe and reliable electricity** – Most government energy plans and acts include mandates to provide safe, affordable and reliable power. With the advancements in renewable energy technologies including small-scale hydro, solar PV and small wind turbines, utilities are gaining experience and understanding of how these systems offer robust and safe alternatives to large diesel generators. When combined with smaller and more efficient diesel generators and coupled with energy storage, it is possible for clean power to safely and reliably power a remote community. Northern and remote projects including Labrador's Ramea wind-diesel project and NWT's Colville Lake solar-battery projects are examples that successfully demonstrate this.

5. **Local economic development / job creation / economic diversification** – Local economic development, skill and trade development and job creation are a significant driver to advance clean energy policies. This is apparent in power purchase policies put forth by Alaska, Ontario, Quebec, Yukon and Nunavut.

Community energy projects generate more jobs and economic impacts than connection to an integrated grid.

Challenges and barriers

Dominant challenges and barriers may be categorized from a **policy and legislative,** and **cost and financing** perspective.

Policy and legislative challenges and barriers

It is possible that government acts and regulations could actually prohibit publicly owned utilities from purchasing power from IPPs although this is not the norm. Traditionally, legislation established regulated monopolies for these utilities, prescribing how they conduct business and how to recoup costs. For remote communities wanting to invest in clean power, this traditional approach involving a single public utility may not be desired, nor most effective. An example legislation that confines power generation to a single public utility is Nunavut's Qulliq Energy Corporation Act — it was designed to regulate an existing utility, and legislative changes would be required to open up power generation beyond the utility.

Governments and utilities that only offer PPA prices based on avoided cost of diesel showcase a lagging perception that clean power projects, and inherently the technologies that they incorporate, are not reliable or sufficiently robust in contrast to conventional diesel power plants. This perception impedes positive clean power project economics, even while the cost of diesel fuel and its associated environmental impacts increases the consequences to climate and traditional northern economies and ways of life. These impacts that are often not internalized in the decision-making process of new energy infrastructure investments. The benefits of clean power projects should not be bound to simple capital cost economic consideration, and instead be guided by full assessment of societal net benefits and costs, including a shadow price for carbon pollution. This is called a Levelized Cost of Energy. Thinking beyond standard economics will open the door to innovative thinking and creativity that is needed to advance policies for power purchase procurement.

Cost and financing challenges and barriers

The avoided cost of diesel approach to setting clean power prices does not offer adequate financial incentive for private sector and communities to develop clean power projects. This is especially true when compared against business-as-usual diesel power

plant investments. Limited support for diesel alternatives is exacerbated by unacknowledged downstream subsidies for diesel fuel systems and electricity, and lack of understanding of full operational and maintenance costs of diesel power plants, as compared to hybrid or full clean power plants. Costs and benefits respectively include new capital cost of clean power, and avoided costs of depreciating diesel power plant assets, lifetime operation and maintenance cost reductions, avoided fuel and shadow prices for carbon pollution (in following to a change in policy perspective, as above). The net costs reflect a shift in conversation of energy costs. These avoided cost (benefits) of integrating renewable energy, or "hybridizing" of diesel power plants, are examples of just a few elements that are externalized when setting a clean power price.

A national carbon price, while currently being considered by the federal government, will support the economics of clean power systems by increasing the avoided cost of diesel. Current lack of such carbon policy does not inhibit incorporating a price in the avoided cost of diesel calculation. Many public and private companies already incorporate a shadow price in their investment decisions, knowing that a carbon price is likely in the future.

Even with power purchase policies offering a sufficient and guaranteed revenue stream, raising the necessary capital from banks and private developers is challenging for remote Indigenous community projects. PPAs do not completely resolve this barrier. Communities can strike joint ventures with partners to help alleviate some concerns to lenders, but more is needed to further develop local capabilities, streamline project logistics, etc. A thorough assessment of project risks, and actions to address them, will help raise the necessary capital to build clean power projects in remote locations.

Figure 1 summarizes the main challenges and barriers for adopting power purchase policies.

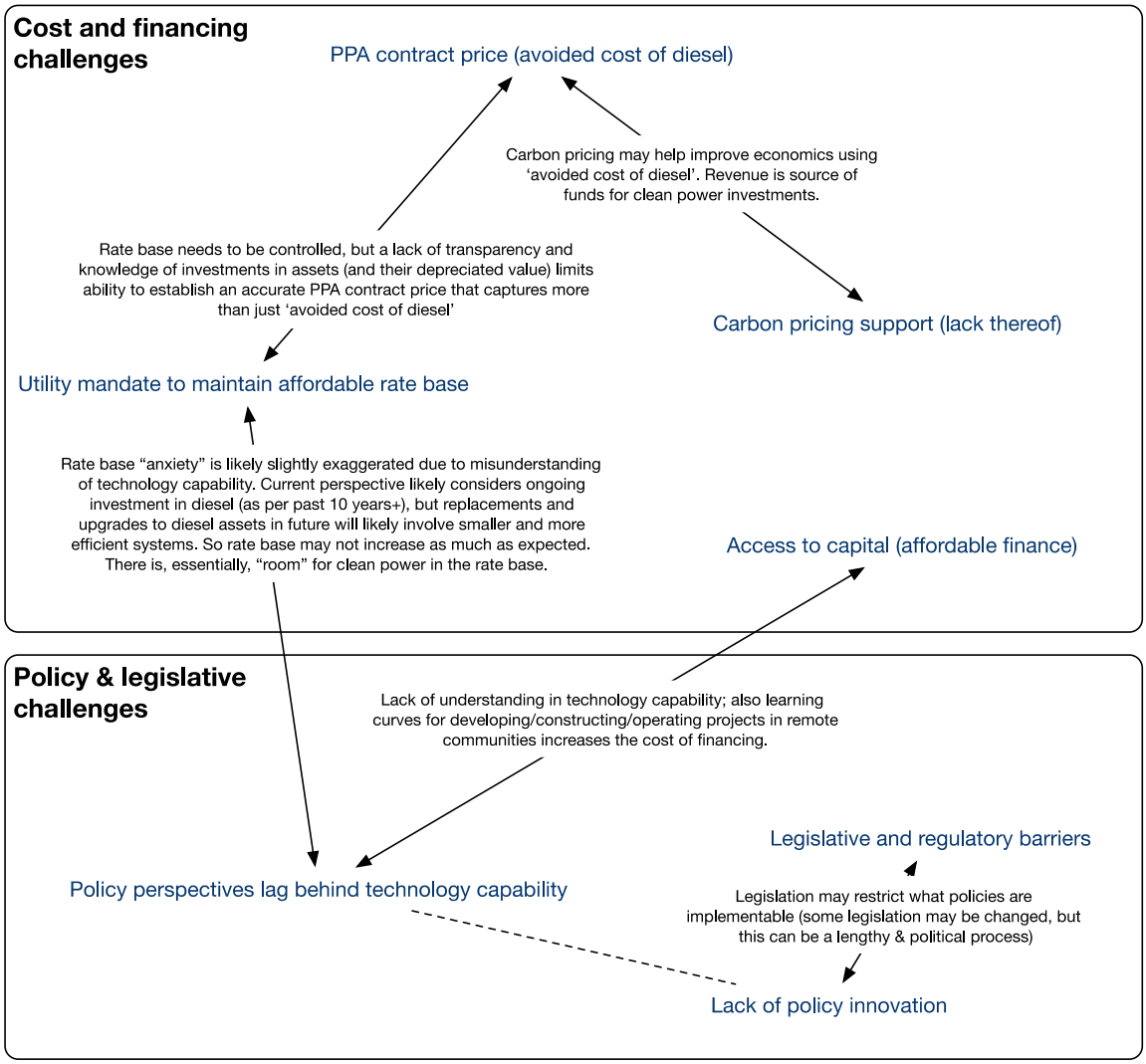

Figure 1: Challenges and barriers for adopting power purchase policies

Opportunities and discussion points

Clean energy opportunities in Canada for grid-tied communities (municipalities and Indigenous communities) are abundant; governments and utilities have developed IPP policies that support communities in developing financially viable projects through the negotiating of a power purchase agreement with fair contract rates. Examples of leading jurisdictions and their policies include B.C.'s Call For Power, Ontario's Feed-in Tariff program (and subsequent Large Renewable Procurement), and Nova Scotia's Community Feed-in Tariff program.

With only a limited number of power purchase policies developed for remote indigneous communities, there are substantial opportunities to advance clean power production in this neglected sector of society. Experiences from B.C. and NWT showcase remote Indigenous communities that are now apart of the clean economy: forging new businesses and partnerships, receiving revenues from clean power projects they built and increasing skills and jobs for community members.

Setting the clean power purchase price

The standard approach to power purchase price setting in remote communities — using an avoided cost of diesel averaging $0.30 / kWh — is not sufficient to finance clean power projects. This serves only as a starting point for further discussion and commitments. Looking forward, setting prices require innovative thinking, and financial support from federal ministries in collaboration with territorial and provincial governments and utilities. Innovations include:

- Pricing carbon pollution associated with diesel fuel combustion
- Recognizing clean technology capabilities and shifting policy perspectives
- Recognizing full costs and beneifts (using Levelized Cost of Energy for making investment decisions)

It is understood that increasing the price paid for clean power (while this transition occurs) requires the increased cost to come from somewhere. Typically this is done through an increase to the rate base for all customers in the jurisdiction. However, the rate base is also regulated, requiring legislative changes to allow for additional investment. Finding ways to introduce these policies without significant increase or no increase of the rate base requires careful consideration. Options include:

- Recycling revenues from carbon pricing initiatives
- Re-allocating diesel fuel subsidies
- Re-investments from avoided costs to diesel power plant upgrades and repairs, and operation and maintenance cost savings

Governments and utilities may need to explore policies and programs that include other approaches, not just SOPs and net metering. While offering net metering for clean power to remote customers is a good first step, other options include using Request for Proposals, Contract for Difference, Production Incentives and Renewable Portfolio Standards (and employing a REC market). Territorial and provincial governments, for many of these, can design complementary policy and programs together. This avoids conflicts such as cross-subsidies; avoiding conflicting interests and ensuring fair

distribution of clean power benefits. In addition, policy makers should consider policy options that complement PPAs aready being developed.

Power purchase policy options

Power purchase may be supported at the federal level in coordination with provincial and territorial governments. Approaches include directly supporting PPA contracting, or complementary mechanisms that improve project economics. These are:

- Purchase of environmental attributes of clean power through long-term contracts for RECs. Purchase may help satisfy future federal government mandates for renewable power purchase (regardless whether a mandate is in place, this direct funding method is a feasible option). Instead of communities selling RECs on an individual basis, utilities can work with territorial and provincial governments to aggregate REC sales.
- Scheduled procurement of clean power from IPPs with funding to bridge gap between avoided cost of diesel and true cost of clean power covered, among others, by avoided diesel power plant cost, carbon pricing, re-allocation of diesel subsidies and providing federal grants or green bonds.
- A production incentive or flat premium that adds to the full clean power purchase price may be paid out by federal government long-term contracts. This approach is easiest, but perhaps not the most effective, as it could unfairly bias some communities over others. An alternative, using Contracts for Difference, is a long-term contract for the difference in clean power cost and the avoided cost in the remote community. This latter approach accounts for diesel costs in each specific community.
- Alternatively, mirroring several SOP-type programs offered to integrated grid communities, utilities may establish SOPs with specific criteria and restrictions at true cost of clean power for each community. Ontario's REINDEER Program is a good starting point for how such a program could function.

Considerations in addition to power purchase policies

Guaranteed and sufficient revenue from a PPA is not the complete solution. The Alaska RE Fund, B.C. RCEP program and Northwest Territories Community Renewable Energy Program are excellent examples of programs that have helped catalyze clean energy projects for remote Indigenous communities, regardless of PPAs and IPP policies. These programs help transition ownership, further develop local capabilities and develop local community economies.

Governments may mandate additional criteria and offer targets for clean power production, as legislated in B.C. and supported by policies in Alberta, Ontario and Quebec. And, Yukon specifically supports IPP projects with a carve-out target and at least 50% of all projects must incorporate a share of Indigenous ownership. Mandates also offer a government 'hands-off' approach to supporting clean power projects, because the power purchase price results from competing project developers rather than government rate schedules or contracts. Considerations for inclusion in these mandates to support clean power in remote communities:

- Include communities in project development, and mandates for Aboriginal procurement
- Enable IPPs to sell power to utilities (if this is not already possible)
- Establish renewable energy targets, specifically for remote communities that are not connected to the integrated grid. In addition to percentage targets, these may include reduced fuel consumption, carbon pollution, diesel spills, noise, etc.
- Create criteria for partial (or whole) community ownership of clean power projects, for more and better local jobs and social development.

Leadership

Multiple levels of government have shown leadership in advancing clean power in remote communities of Canada, and when including Alaska, the North American Arctic regions. Leadership must be emboldened and include all levels of government:

- **Nunavut** has shown interest in looking at alternatives, given the recent federal effort for examining the economic, environmental and social costs of diesel power generation.
- **Northwest Territories** and NTPC have worked together to support advancement of clean energy technologies in Colville Lake, while NTPC signed a first PPA with Lutsel K'e community's solar energy project.
- **Yukon's** IPP policy is a territorial first that sets a target for percentage of electricity supply to be met by IPPs and at least half of all projects incorporate some share of Indigenous ownership.

1. Introduction

1.1 Background

Of the 292 remote communities across Canada, 257 get their electricity from stand-alone microgrids because they are not connected to any provincial or territorial electrical grid. These microgrid systems produce electricity and distribute the electricity to community infrastructure, buildings and homes. Most of these microgrids in Canada are diesel-based: large electrical generators burn diesel fuel to produce the electricity. Some remote microgrids are serviced from natural gas and small-scale hydro but this is not common. Relying on diesel means that large quantities of fuel must be transported every year to these remote communities to support these legacy fossil fuel systems.

The majority of these remote communities in Canada are serviced by crown-owned utility companies that are mandated under legislation by provincial or territorial governments to provide electricity to these communities. Communities that receive their electricity from crown utilities have limited autonomy and control to provide alternative energy connection policies that would support other forms of electricity production — specifically renewable and clean energy sources. They are at the whim of their crown utility and lack the opportunity to participate in the clean energy transition Canada and the world is embarking on as one tool to fight climate change.

However, in recent years, a few provincial and territorial governments and their crown utilities have implemented policies and programs that support independent clean electricity production. Some have been formal programs and some have been informal; none the less, these policies have catalyzed a few remote communities to develop their own clean power projects and connect to their utilities' microgrids.

This leadership from governments and utilities that have implemented clean power production policies is a positive step, but more is needed. Although there is growth in renewable energy deployment and integration with diesel-laden microgrids using a variety of mechanisms, further government policy, regulatory change and innovation by utilities and governments is required to further this transition. This is especially true for remote Indigenous communities where diesel electricity provisioning is entrenched in the status quo business-as-usual approach and opportunities for other forms of power production are limited.

1.2 Research goals and objectives

This research report on effective power purchase policies is one of several deliverables into the WWF project *Sustainable Energy Solutions for the Canadian Arctic*. This project has a goal of implementing up to three large-scale renewable energy projects[1] in Nunavut and the Inuvialuit Settlement Region (ISR) of the NWT by 2020.

The main research goal of this research is to understand successful examples of power purchase policies and associated regulations that governments and utilities have implemented that have enabled clean power projects in remote communities, and to use this information to inform our thinking for advancing renewable energy projects in Nunavut and NWT. Because the majority of remote communities in Nunavut and NWT are Indigenous communities, this research is focused on power purchase policies relevant to remote Indigenous communities.

The main objectives of this policy research are to:

- research and document *what* government and utility policies / programs have enabled Indigenous communities (and partners) to produce renewable power and sell this power to utilities
- understand *why and how* government and utility policies / programs were implemented and what were the motivations and drivers behind their conception.
- research the various ownership models available to Indigenous remote communities that would enable renewable power projects to be developed
- present these findings to WWF and the Energy Summit held in Iqaluit in September 2016.

1.3 Motivations

Continued reliance on legacy diesel systems presents a tremendous opportunity to transition away from these systems to clean energy technologies. Using the natural resources of the land and the energy found in the sun, wind, water and earth is at the heart of Indigenous values and beliefs. Reducing dependency on fossil fuels by switching to clean energy will enable these communities to be involved in reducing global greenhouse gases (GHG) in the fight against climate change. Indigenous communities in northern Canada are at the forefront of the effects of climate change

[1] Large-scale refers to the percentage load penetration of the microgrid. For this project, WWF has identified a target penetration between 30% and 40%.

and will be some of the most impacted citizens in Canada: changing temperatures, precipitation patterns, the melting permafrost, changes in flora and fauna.

Indigenous communities across Canada have long been neglected in areas including energy, housing, health, social issues. Transitioning to community-owned clean energy can create a positive return on investment — economic, social and community. In turn, these revenues can be directed to other critical social areas such as housing, education, youth and health. Designing, developing and operating locally owned clean energy systems creates jobs within communities, keeps money in the community, ensures local energy sovereignty and can strengthen community ties.

The Truth and Reconciliation Commission (TRC) commitments from the federal government have connections to the way energy is provided for Indigenous communities. Indigenous leaders have been calling for advancements in clean energy policy as it relates to Canada's Paris 2016 commitment.[2] The Government of Canada responded with a joint statement with the U.S. on climate, energy and Arctic leadership[3] and a commitment to cooperation.

Successful policies to advance clean energy systems in Canada will not just reduce diesel fuel use, but should be equitable and provide Indigenous communities new business opportunities around developing projects in their traditionally territories. These business opportunities will improve the social conditions in communities and bring environmental and economic returns — and the returns created from transitioning to clean energy systems can stay in the communities and lead to other benefits.

It is our hope that the information from this research can systematically be used by provincial and territorial governments and the Canadian government to develop and implement policies to advance a continental clean energy strategy for remote communities.

[2] Jatin Nathwani and Colin Andersen, "Indigenous communities must be part of the global green energy revolution," *Globe and Mail*, Apr. 27, 2016. http://www.theglobeandmail.com/report-on-business/rob-commentary/Indigenous-communities-must-be-part-of-the-global-green-energy-revolution/article29762478/

[3] Prime Minister of Canada, "U.S.-Canada Joint Statement on Climate, Energy, and Arctic Leadership," March 10, 2016. http://pm.gc.ca/eng/news/2016/03/10/us-canada-joint-statement-climate-energy-and-arctic-leadership

1.4 Scope

This research focuses on power purchase policies and the regulations developed by governments and utilities for remote communities in Canada with special attention to remote Indigenous communities. Research will also include carefully selected international examples that have relevant remote community power purchase policies.

Power purchase policies

This research focuses on provincial / territorial government and utility policies that have resulted in clean power projects and power purchase contracts between governments / utilities and remote Indigenous communities (and partners).

The most common examples of power purchase policies are set up as Power Purchase Agreements (PPAs). These are a price-setting instrument whereby independent power producers generate renewable energy and sell this to utilities through a PPA contract. Other types of power purchase policies, including demand-setting instruments, are discussed in more detail in Section 2.3.

This research also briefly looks at how the federal government has played a role in the past and can play a policy role in supporting renewable energy purchase for remote Indigenous communities.

Although typically not viewed as a power purchase policy that results in clean power projects or large procurement of power, net metering programs are also discussed in this research where applicable. Net metering policies encourage smaller-scale distributed generation systems but do not typically cover the larger-scaler renewable energy systems that are of interest in this research.

There are some excellent examples of large renewable energy projects that grid-tied Indigenous communities have developed using provincial / territorial government power purchase polices. This research however is focused on the subset of policies currently available for remote (off-grid) Indigenous communities. This research is also not focused on government fiscal policies (taxation), environmental policies (environmental impacts, performance regulations), financial policies (except for the case of Alaska which has implemented a granting programs for remote renewable energy systems that is worthwhile to include), technical and capacity-building assistance (training, awareness, skill development) or other policies capable of supporting the advancement of clean energy systems in Indigenous communities.

Regulation

This research summarizes the various government Acts and Regulation that were introduced into law through legislation to enforce or encourage power purchase policies.

1.5 Definitions

Table 2 summarizes some key definition terms used throughout this report.

Table 2: Key definitions

Term	Description
Remote community	A community in Canada that is not connected to any provincial- or territory-wide electricity transmission grid. For the purpose of this work, a *remote community* can also be referred to as an *off-grid* or *isolated* community.
Indigenous remote community	A remote community comprised of First Nation, Métis or Inuit peoples of Canada.
Microgrid	An electricity generation station and distribution system that provides electricity to a remote community.
Public utility / publicly owned utility	An electric utility that is owned by the province or territory it resides in. Publicly owned can also be referred to as crown-owned or government-owned.
Power Purchase Agreement	A legally binding contract between two parties; one that generates electricity (seller) and one that purchases electricity (buyer). PPA are known by other names including Electricity Purchase Agreement.
Independent Power Producer	A non-utility entity that owns its own electricity generation system and sells the electricity it produces to utilities and end-users. An Independent Power Producer could be a for-profit company, First Nation Economic Development organization, municipality, non-profit organization or cooperative, or a combination (joint venture) of these.
Act	An Act is a bill which has passed through the various legislative steps in government and has become law.
Regulation	Regulations are issued by various levels of government departments and agencies to carry out the intent of legislated Acts.
Legislation	Legislation is the act or process of making or enacting laws.
Avoided cost of diesel	The cost to utilities to purchase and transport diesel to remote communities (sometimes based on diesel generator efficiency). When utilities develop PPAs with renewable energy systems that reduce the amount of diesel consumed, contracts are typically based on this avoided cost of diesel. Avoided cost of diesel in this document does not include other operation and maintenance costs, capital deprecation of diesel systems or anything else.

2. Background information

2.1 Remote communities in Canada

There are approximately 300 remote communities across Canada with a population of approximately 190,000. About 170 of these communities are remote Indigenous communities, comprised of 127,000 First Nation, Métis or Inuit people of Canada.[4] The provinces / territories with the highest number of Indigenous remote communities are the Northwest Territories (26), Nunavut (25), Ontario (25), British Columbia (25), Yukon (21), Quebec (19) and Newfoundland and Labrador (16). There are a few remote communities in Alberta and Manitoba, and none in Saskatchewan and the eastern provinces (except Newfoundland and Labrador and one remote island community in Nova Scotia). Figure 2 provides a general distribution of remote communities in Canada.

Figure 2: Remote communities in Canada

Source: NRCan[5]

[4] Aboriginal Affairs and Northern Development Canada and Natural Resources Canada, *Status of Remote/Off-Grid Communities in Canada* (2011). https://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/canmetenergy/files/pubs/2013-118_en.pdf

[5] NRCan, "Remote Communities Database." https://www2.nrcan-rncan.gc.ca/eneene/sources/rcd-bce/index.cfm?fuseaction=admin.home1

Like any community, remote communities require energy for heating, electricity and transportation. Most energy systems in remote communities are provided by a microgrid and are dominated by diesel generation systems which comprise diesel generators, fuel storage, fuel delivery systems, automated controllers and the electricity distribution system. Collectively, remote communities in Canada consume more than 90 million litres of diesel fuel every year.[6] Based on 2011 data, Figure 3 pictorially represents where in Canada the majority of the diesel fuel is consumed specifically for electricity generation. All three territories in Canada use the most diesel, with Nunavut topping the list at 40 million litres of diesel per year. Ontario is the province with the highest consumption, approximately 20 million litres of diesel per year.

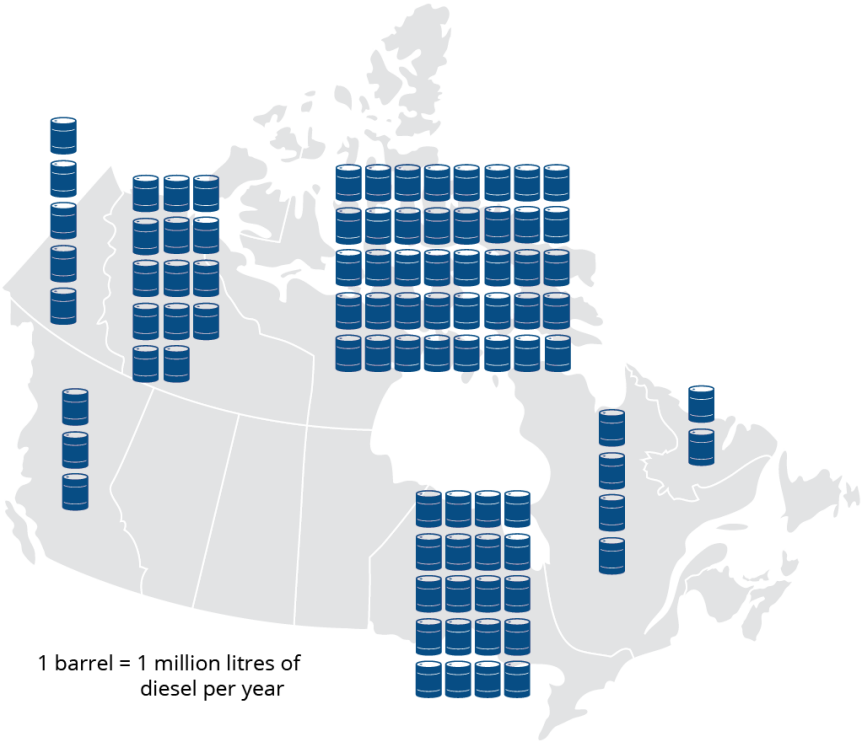

Figure 3: Diesel fuel consumption in remote communities

Data source: NRCan[7]

These diesel systems have been used for decades and are entrenched in remote communities. They offer power reliability but otherwise have several negative environmental, economic and social impacts.

[6] *Status of Remote/Off-grid Communities in Canada 2001*, 10.

[7] Ibid.

Environmental impacts

- Systems are quite inefficient (generally operating between 25% - 35% efficiency).
- Generators produce GHG emissions and other air emissions including particulate matter when diesel fuel is combusted.
- Fuel must be transported sometimes great distances to remote communities by road, air and barge; further GHG emissions are associated with transportation.
- Land and water are exposed to potential diesel fuel spills, both during transportation and in storage.

Economic impacts

- Even though fuel and electricity is subsidized by federal and provincial / territorial governments, energy costs in remote communities are high.
- Transportation via winter roads, barge or air increases the cost of energy.
- Systems are capital-expensive, and operation and maintenance costs are also high.
- Energy costs are volatile considering changing commodity prices in diesel fuel and varying transportation costs.

Social impacts

- Diesel generators are dirty and noisy.
- Air emissions contribute to health problems.
- Blackouts or rolling brownouts can occur if diesel generators break down or require maintenance. This is a concern if electricity is used for heating in winter.
- High energy costs can be a deterrent for new businesses as they contribute to high operating costs.
- No local economic opportunity when energy systems are all externalized to utilities; most revenue leaves the community.

2.2 Power purchase policies

Policies that enable and support clean power purchase in both regulated and deregulated electricity markets are called “power purchase policies”. They are mechanisms exercised by governments that support the independent generation and selling of power by a third party (commonly referred to as Independent Power Producer

(IPP)) to a utility[8] through a legally binding contract. A Power Purchase Agreement (PPA) is by definition "a contract between two parties; one which generates electricity (seller) and one which purchases electricity (buyer)."[9] These government-backed, legally binding contacts are an instrumental component in supporting the business case for IPPs, as it facilitates a solid economic case for renewable energy projects, attracting investment capital and decreasing risk.

PPAs usually have a fixed length term with guaranteed rates. A PPA contract typically defines all the commercial terms including power purchase commence date, schedule of electricity delivery, power quality, penalties, rates, contract length and termination clauses.[10]

2.3 Different types of power purchase policies

There are several different types of power purchase policies that can be introduced by government. These types of policies come in various forms, reflecting the government's approach to regulating the power sector. In Canada, with the exception of Alberta, power generation, transmission, distribution and sale of electricity to customers is regulated by government, typically through a regulating authority or commission. In 1996, Alberta began the deregulation process of power generation and re-sale.[11] Instead of government (directly or indirectly through a delegated authority) selling electricity, private generators sell their electricity on the market, and retailers buy large quantities of power that they resell to consumers. More common is a regulated approach, where government designate one or more publicly owned utilities to produce power and sell this directly to customers. This does not prohibit any of these utilities from purchasing power from private generators, but does prescribe the prices they may pay for such power.

The main types of power purchase policies are broadly described in Figure 3. Key differentiation in policy approaches are the use of government to drive the settlement of price for electricity purchase (price-setting) versus market competition to balancing electricity supply and demand (demand-setting). While in most jurisdictions the

[8] The utility could be either publicly owned or a private utility that has the legislated right to distribute, sell power and also purchase power from an IPP.

[9] Wikipedia, "Power purchase agreement." https://en.wikipedia.org/wiki/Power_purchase_agreement

[10] Ibid

[11] Alberta Utilities Commission, "Alberta's energy market," 2016. http://www.auc.ab.ca/market-oversight/albertas-energy-market/Pages/default.aspx

government tends to set a price, some others have prescribed a specific demand for clean power and then allow market competition to result in an acceptable price.

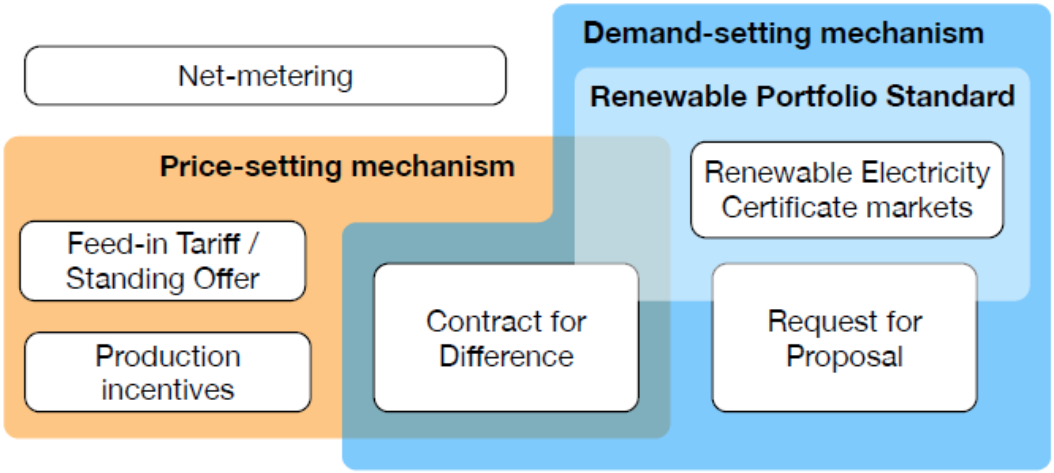

Figure 4: Different power purchase policies

Price-setting mechanisms include feed-in tariffs / standing offer programs, contract for difference and production incentives. Variations of all three options exist, but the primary aim of each is to provide certainty of price over the duration of the power project and associated PPA.

Demand-setting mechanisms include contracts that are settled as part of a scheduled procurement process for power, such as a request for proposal (RFP); they may also include a contract for difference. An RFP, also known as a "call for power" in some jurisdictions (e.g. B.C.), is a directed procurement for a fixed amount of power.

The renewable portfolio standard is a unique policy instrument that is employed in both price- and demand- mechanisms and can include renewable energy certificates. The policy is described in more detail below — including a variation that could be applied in northern, remote jurisdiction with smaller and more distributed loads.

This research also includes net metering policy, which, while it is not specifically designed to procure clean power and connect to the distribution grid, encourages local clean energy production. A net metering policy is a small-scale distributed energy generation policy and may credit bills or otherwise pay a fixed price for excess electricity that is not used on-site by the customer.

2.3.1 Feed-in tariff / standing offer program

A feed-in tariff (FIT), often referred to as a standing offer program, establishes a fixed price for electricity production for eligible projects. In large-scale power markets, a FIT may involve a fixed payment of a premium above the electricity market price, where utilities set the price of electricity by means of a rate schedule.

Ontario took a leading role in Canada through its Green Energy Act (2009) and launched its FIT program designed to achieve targets for renewable energy generation from projects 10 to 500 kW in size.[12] A second microFIT program targets projects 10 kW or less (behind-the-meter, similar to a net metering policy). While the original FIT was launched with very high rates, resulting in a "rush" for solar projects in Ontario, subsequent revisions of the program have created a sustainable, yet competitive, environment for community-scale clean power projects. Recent revisions to the program include reduced prices to reflect trends in lower costs, encouraging wider community and Aboriginal participation and streamlining processes.[13]

Nova Scotia's Community FIT (COMFIT) was designed to encourage clean power project development by guaranteeing a rate per kWh of electricity generated. Applications to the COMFIT were restricted to municipalities, community economic development investment funds, co-operatives, non-profits, universities and First Nations.[14]

A FIT policy is relevant for remote clean power purchase because the mechanism ensures a predictable and sufficiently high rate per kWh of clean energy from community projects.

2.3.2 Production incentive

A power production incentive looks like a PPA agreement, like those resulting from Ontario's FIT program, but a production incentive does not directly involve a contract or selling of power. Instead, the incentive offers a fixed dollar-per-kWh subsidy, or an "adder," that stands on its own or complements an existing PPA and the electricity sold through it. While the incentive is paid via contract, the IPP has the right to sell power to

[12] Independent Electricity System Operator, "FIT Program," 2016. http://fit.powerauthority.on.ca/fit-program

[13] Ontario Ministry of Energy, "Feed-in Tariff Program Two-Year Review," 2015. http://www.energy.gov.on.ca/en/fit-and-microfit-program/2-year-fit-review/

[14] Government of Nova Scotia, "COMFIT ," 2016. http://energy.novascotia.ca/renewables/programs-and-projects/comfit; Government of Nova Scotia, *Community Feed-inTarriff Program Facts* (2016). http://energy.novascotia.ca/sites/default/files/comfit_facts.pdf

whoever chooses to buy. Because the adder is on top of existing mechanisms, it is also a price-based mechanism.

A recent example of a production incentive employed in Canada was NRCan's 2007 ecoENERGY for Renewable Power program, which offered $10 per MWh generated from qualified renewable resources. The program had huge uptake, was fully subscribed and help catalyze the wind industry in Canada; however, it was cancelled in 2013.[15] A previous program called Wind Power Production Incentive Contribution allocated funds to qualified Canadian clean power projects through to 2017.[16] The United States Environmental Protection Agency has very recently launched a Clean Energy Incentive Program, designed to help jurisdictions and First Nation tribes invest in renewable energy generation.[17]

2.3.3 Request for proposal (call for power)

A request for proposal (RFP), also called a call for power in some jurisdictions, is an approach where the utility procures new clean power directly from project proponents who submit bids in a competitive tender process that sets a fixed contract price for electricity over a project's lifetime. Developers who offer the best project win the power purchase contract. In most instances the lowest price determines the best bid, but other criteria may also be used to differentiate projects, such as environmental impacts, jobs creation, community ownership and/or involvement.

B.C.'s Clean Power Call is an RFP process that ran from 2008 to 2010 with BC Hydro awarding 25 contracts for clean power. The process targeted 5,000 GWh of clean power generation from several larger projects with limited terms of negotiation.[18]

Ontario's Independent Electricity System Operator (IESO) also recently launched the new competitive process for procuring large renewable energy projects larger than 500 kW called the Large Renewable Procurement. This RFP process has offered close to 500

[15] Natural Resources Canada, "ecoENERGY for Renewable Power," 2016. http://www.nrcan.gc.ca/ecoaction/14145

[16] Natural Resources Canada, "Wind Power Production Incentive Contribution Program," 2016. http://www.nrcan.gc.ca/plans-performance-reports/rpp/2015-16/17057

[17] U.S. EPA, "Clean Energy Incentive Program," 2016. https://www.epa.gov/cleanpowerplan/clean-energy-incentive-program

[18] BC Hydro, "Clean Power Call: Background & Development," 2016. https://www.bchydro.com/energy-in-bc/acquiring_power/closed_offerings/clean_power_call/background.html

MW of clean power contracts, more than 300 MW of which include Aboriginal participation.[19]

Purchase of clean power via an RFP process results in secure, reliable contracts with governments, providing an easy pathway towards affordable financing of clean power projects in remote communities. A competitive process also needs to ensure that contracts are not awarded to only one community — with the best renewable resources, or otherwise best positioned to win contracts. This would leave other communities, equally in need of clean power, without projects.

2.3.4 Contract for difference

A contract for difference (CfD) is a variation on an RFP, whereby the government pays a premium to clean power producers based on a price difference calculated between the price settled by a procurement process, as per RFP, and the price otherwise received by the producer. The CfD is not a contract for power but rather a government premium above business-as-usual prices received. Unlike a production incentive, in a CfD the premium is calculated from the price difference. For example, given a settled price (also called "strike") of $0.50 per kWh, then clean power from a project otherwise receiving $0.15 per kWh obtains a CfD premium of $0.35 per kWh. This mechanism provides full revenue certainty for renewable projects.

To date, no North American jurisdiction has implemented a CfD program; these are more common in Europe. The U.K. provides a classic and recent example through its Electricity Market Reform laws that guarantee a generator the strike price for their project relative to an average market price for electricity. The CfD plans to support large-scale projects up and over 300 MW each.[20] Most recently, the Alberta government is considering a CfD option as part of its Climate Leadership Plan commitment to renewable energy.

CfD could work well for remote communities, offering a premium that is based on existing prices paid for clean power (instead of production incentives that are straight premiums).

[19] IESO, "Large Renewable Procurement," 2016. http://www.ieso.ca/Pages/Participate/Generation-Procurement/Large-Renewable-Procurement/default.aspx

[20] Government of U.K., "Electricity Market Reform: Contracts for Difference," 2016. https://www.gov.uk/government/collections/electricity-market-reform-contracts-for-difference

2.3.5 Renewable portfolio standard

The renewable portfolio standard (RPS) is a clean power mechanism that sets a demand – unlike FITs which set a price per kWh. By setting the demand, market forces are expected to create sufficient supply of projects, and the prices for energy generated by these projects are set accordingly. Traditionally, RPS policies come from government and are a call to utilities to acquire a certain percentage of electricity from renewable energy over time. The obligation placed on the utility is used to set a price on clean power. The utility can then invest in its own clean power generation or purchase the renewable energy attributes of power from other utilities or IPPs. Environmental attributes, formalized as renewable energy certificates (RECs), are priced according to the value necessary to fulfill a demand set by the RPS. RECs may be realized by a clean power project in one jurisdiction, and then retired in another jurisdiction, corresponding to use of the renewable energy.

More than half of all U.S. states have successfully enacted RPS policies to support clean power purchase. In Canada, Nova Scotia and New Brunswick have also legislated RPSs. New Brunswick instituted a RPS in 2006 that requires a minimum of 10% of the province's electricity to come from renewable sources by 2016. The province is well ahead of this target, and it projects that 32% of the province's energy will come from renewables by 2016. PPAs are currently in place for 330 MW of wind energy, as well as for a 38 MW biomass energy project.

In Nova Scotia, Nova Scotia Power Inc. (NSPI) is the utility (privatized in the 1990s and now owned by Emera Inc.) that supplies virtually all of the province's generation. NSPI has over the past decade issued tenders to procure power, in particular renewable energy, from IPPs. Nova Scotia recently introduced an RPS to source 25% of its electricity from renewable sources by 2015 (an increase from an earlier target of 10% by 2013). At present, the province is in the midst of initiating a competitive RFP process to procure approximately 300 MW of renewable energy from IPPs.

An RPS is a well-established policy that could mandate government utilities to strategically procure clean power in local communities. The mandate may call for partial ownership of projects by the community, allow limited trading of RECs between communities, and/or be the necessary support needed for IPPs to finance their own clean power projects. Ultimately, the mandate established via an RPS yields a utility obligation for creating more PPAs with IPPs, or alternatively the utility building more projects if this option is more economical.

2.4 Ownership models for independent power production

Clean power projects can feature a variety of ownership structures and business models. These models range from simple sole proprietor ownership (where one individual / company is the sole owner and operator of the project) to more complex arrangements that involve multiple partners, who can be project proponents or other investors who are financing the project.

Clean power projects in remote Indigenous communities usually involve Indigenous governments as proponents and/or owners and operators. How these types of projects are realized may be best described by the community's relationship to the project. Four models are presented in *Aboriginal Power: Clean Energy and the Future of Canada's First Peoples*.[21] Models range from completely driven and owned by the Indigenous community, to a project owned entirely by a developer, company or public utility company. In the latter, the project has an option to either 1) specify rights (of protection, or inclusivity in important decisions for the project), or 2) designate benefits from the project that relate to community needs/wishes. These models are described below; a comparative analysis of all models according to their strengths and weaknesses, opportunities and threats is summarized in Table 3.

2.4.1 Sole proprietor

Renewable energy projects may be owned and operated by community members or businesses.[22] This is the simplest model of ownership, and it means that the owner of the project is legally inseparable from the project itself (including its liabilities).[23] For example, a homeowner could install a solar PV system on their house, and be the sole proprietor of that renewable energy technology. This approach usually works well for small systems, and takes advantage of programs designed to credit clean energy production to the project owner's utility bill (e.g. net metering programs, Section 2.3).

[21] Chris Henderson, *Aboriginal Power: Clean Energy and the Future of Canada's First Peoples* (2013), 76.

[22] Business Development Bank of Canada, "Aboriginal entrepreneur," 2016. https://www.bdc.ca/en/i_am/aboriginal_entrepreneur/pages/default.aspx

[23] Government of Canada, *Sole proprietorship, partnership, corporation or co-operative?* (2016). http://www.canadabusiness.ca/eng/page/2853/

2.4.2 Corporations

A business corporation, such as the community's Economic Development Corporation (EDC), may own and operate a clean power project. An EDC is typically the economic development arm of an Indigenous government that invests in, owns and/or manages businesses that are effectively subsidiaries of the EDC. Typically, the EDC does not directly own or operate the project; this is done through the subsidiary corporation. This corporation is defined as a separate legal entity that can enter into contracts and own property in its own name, separately and distinctly from the EDC.[24] Corporations are tasked with providing a return on the capital invested by shareholders. Shareholders in corporations are not personally liable for the debts, obligations, or actions of the corporation.[25] But if a corporation wants to sell shares to community members (to raise capital), then it has to obtain a "receipt for a prospectus from the securities commission," which adds transaction costs.[26]

When the community is the primary project proponent, it may choose to own the project through its EDC. Most of these are First Nation organizations that have been around a long time in Indigenous communities, and whose success is measured not just by growth of the corporation, or activities and number of projects, but how well they serve the community in terms of economic and social benefits. Their biggest problem is cash flow management and accessing capital for projects. [27]

Alternatively, a community trust model can be used to pool money for investment in clean power projects. For example, the Mississauga First Nation[28] and Garden River First Nation[29] use a community trust to pool funds collected through land claim negotiations. Trusts have been used in land development, where funds collected from philanthropic agents, local government, and community members are collectively invested in land to develop housing accessible to low-income individuals.

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[24] "Invest in Canada: Selecting a business structure."

[25] Ibid.

[26] Ontario Sustainable Energy Association, *OSEA Community Power Financing Guidebook.*

[27] Canadian Council for Aboriginal Business, *Community and Commerce: A survey of Aboriginal Economic Development Corporations* (2014). https://www.ccab.com/uploads/File/Community-and-Commerce-Final-Report.pdf

[28] Mississauga First Nation, "What is a Community Trust?, " 2011. http://mississaugi.com/mississaugitrust/whatisatrust.html

[29] Garden River First Nation, *Garden River First Nation Community Trust.* http://www.gardenriver.org/pdf/Community%20Trust-%20Pamphlet.PDF

In cases where there is not sufficient community capacity to own and operate a project, a business proponent with commercial interest (e.g. a lumber mill, mining operation or renewable energy developer) may be project proponent. This type of corporate ownership model can allow for significant community involvement through consultations, employment opportunities and other forms of engagement. The community may choose to benefit from the project via royalty payments or leasing land or rooftop space — e.g. for a solar PV project.[30] In this model, the corporation takes on most of the risk in developing the project. While this also means that the corporation reaps many of the rewards, communities can still share in the economic gains as defined by the contract relationship.

2.4.3 Partnerships

In a partnership development model, the community partners with a public or private energy utility or a renewable energy development corporation. The share of ownership in the project varies according to funds and financing available to the community. Since the community is a partner in the project, there is much greater involvement in the project and a chance for local project champions to build local capacity in clean power.

In a partnership, partners contribute money, property, labour or skills to a common business venture, and expect to share in the profits and losses of the business endeavour. A limited partnership includes general partners who manage the business along with limited partners who have no management control and contribute only capital. Limited partners are only liable to the business and its creditors in the amount of their investment. General partners have unlimited liability for the debts of the business.[31] A limited partnership requires a legal document that outlines the terms of the partnership. The main benefit of a partnership model is that it reduces project risks, thereby increasing access to affordable financing.[32]

2.4.3.1 Joint ventures

A joint venture is a form of partnership between two or more entities, often to undertake a specific task, like a renewable energy project, for a limited period of time.

[30] Province of Nova Scotia, *Wind Energy in Nova Scotia: A guide for landowners and communities,* prepared by The Pembina Institute and the Ecology Action Centre (2011). https://nsrenewables.ca:44309/sites/default/files/pdfs/wind_energy_guide.pdf

[31] Canada Revenue Agency, "Partnership". http://www.cra-arc.gc.ca/tx/bsnss/tpcs/slprtnr/prtnrshp/menu-eng.html

[32] Canada Revenue Agency, "Sole proprietorships and partnerships," 2016. http://www.cra-arc.gc.ca/tx/bsnss/tpcs/slprtnr/menu-eng.html

While both parties are invested in the joint venture and share revenues, expenses and control, they retain independent ownership over their own businesses.[33] A community's EDC may choose to establish a joint venture arrangement with a clean power project development corporation, or the local energy utility company. Contracts can be complicated, particularly between entities with different organizational structures, and professional advice from lawyers and accountants on tax and liability implications is advisable.[34]

As many of the barriers to community-based renewable power relate to limited access of any one entity to a necessary precondition to renewable energy development (e.g., community trust, financing, expertise, etc.), projects that involve partnerships between entities with access to different resources and expertise can improve the probability of project success.

Joint ventures can be undertaken early or late in the development processes. In several examples below, a community co-op or First Nation engaged a partner after the project design, equity arrangements and logistics of the project had already been determined. Relative share in the project can also change over time. For example, in the Pic River First Nation's Twin Falls hydroelectric project, the First Nation's share of the project will increase until it has achieved full ownership.

2.4.4 Utility ownership

The public energy utility may be interested in owning and operating the clean power project, either by the utility itself, or with a third party through a joint-venture or partnership agreement. This type of project ownership can be very well aligned with the over-arching energy strategy and corresponding goals for clean power in the region. The approach also makes it easier for the project to raise capital, either directly via the public utility, via government support, or via affordable lending — although the public entity has to ensure not to breach debt limitations. Examples of this model can be found in Alaska where many of the clean power projects are funded by local utility companies. Another recent example is the Colville Lake, NWT, solar PV project which is owned and operated by NTPC, the Northwest Territories' Crown utility.

[33] "Invest in Canada: Selecting a business structure".

[34] *OSEA Community Power Financing Guidebook*.

Table 3: Strengths and weaknesses, and opportunities and threats of several clean power ownership models

Model	Strengths	Weaknesses	Opportunities	Threats
Sole proprietor	Simple model for small projects	Not viable to scale for larger projects	Net-metering programs are widely available that offer sufficient rates to customers	Net-metering programs cap total installed capacity for communities, limiting scale
Corporations	Leverage existing ownership structure (e.g. Economic Development Corp.)	Complicated cash flow management and access to upfront capital	Leverage community capacity; Re-invest project returns in community programs/services	Community capacity to lead project development; Community taking on risk
Partnerships	Reduce investment risks by partnering with experienced RE companies	Partnership agreement legal costs; Not all project benefits are returned to the community	RE developers may already have significant experience working on remote projects	Does not sufficiently involve community, risking project complication/failure
Utilities	Align with regional strategy; reduced investment risks; ease of raising capital	Not all project benefits are returned to the community	Utilities are knowledgeable of remote grid and RE integration requirements	May not sufficiently involve community if utility does not actively consult throughout

3. Power purchase policy examples – Canada

This section describes how Canadian provinces have set power purchase policies specific to remote Indigenous communities.

3.1 British Columbia

British Columbia's power sector is government-regulated, and for the most part, electricity infrastructure is owned and operated by BC Hydro and Power Authority. BC Hydro is a publicly owned utility, and is mandated under the B.C. Energy Act[35] to "generate, manufacture, conserve, supply, acquire, and dispose of power and related products."[36] While BC Hydro owns the vast majority of electricity distribution and generation, some areas are serviced by others including Fortis BC, Nelson Hydro and the City of Penticton, all of whom own and operate the electric utility on behalf of the community.

The British Columbia Utilities Commission (BCUC) is the regulatory authority that governs utilities and ensures "customers receive safe, reliable and non-discriminatory energy services at fair rates."[37] The BCUC has "broad discretion to determine what matters it considers relevant and proper in setting rates for BC Hydro."[38] In other words, there is a large amount of leeway given to rate setting. BCUC is set up to function as a quasi-judicial opportunity for customers, representatives and project developers to challenge plans of BC Hydro (and other B.C. utilities).[39]

[35] Energy Act refers to several pieces of legislation including the BC Hydro Public Power Legacy and Heritage Contract Act, Hydro and Power Authority Act, Utilities Commission Act and Clean Energy Act.

[36] BC Hydro, "About BC Hydro," 2016. https://www.bchydro.com/about.html

[37] Ibid.

[38] British Columbia Utilities Commission, *Decision in the matter of BC Hydro and Power Authority and F2009 and %2010 Revenue Requirements* (2009), 26. https://www.bchydro.com/content/dam/hydro/medialib/internet/documents/planning_regulatory/rev_req/rra_f09_f10_decision_and_errata.pdf

[39] Matt Horne, Pembina Institute, personal communication, June 6, 2016.

Since the 1980s, most of BC Hydro's new power is purchased from IPPs, as allowed by the Hydro and Power Authority Act[40], and further motivated by the Clean Energy Act. Enacted in 2010, the Clean Energy Act mandates "electricity self-sufficiency"[41] and encourages clean power production from sustainable, low-emission IPPs through the goal that 93% of power must come from clean or renewable sources.[42]

3.1.1 Context of power in remote communities

There are 25 remote communities in B.C. that are not connected to the province's mainland electricity grid (referred to as non-integrated areas) and rely on local power generation. [43] Prior to 2005, all 25 communities were self-reliant and supported by Indigenous and Northern Affairs Canada (INAC) funding.[44] In 2005, BC Hydro established their Remote Community Electrification Program (RCEP) to help reduce costs and increase the reliability of delivering electricity services to remote communities in its non-integrated area.[45] The program ended in 2013, but during its time, BC Hydro took ownership and operation of 14 community electricity systems.

While the RCEP was successful in achieving its mandate of connecting remote communities to safer and more reliable power generation, and indirectly enabling several clean power projects, the program was ultimately cancelled because of unprecedented high cost of legal fees, administration, and environmental assessments. The remaining eleven remote communities in B.C. without BC Hydro electrification

[40] Government of British Columbia, *Hydro and Power Authority Act* (1996). http://www.bclaws.ca/Recon/document/ID/freeside/00_96212_01#section2; BC Hydro, *BC Hydro Provincial Integrated Electricity Planning Committee Information Sheet #4* (2005), 2. https://www.bchydro.com/content/dam/hydro/medialib/internet/documents/info/pdf/info_iep_pre_reading_4.pdf

[41] "Electricity self-sufficiency" in this context means that electricity is generated within the province.

[42] Government of British Columbia, *Clean Energy Act* (2010). http://www.bclaws.ca/civix/document/id/consol24/consol24/00_10022_01#section2

[43] Indigenous and Northern Affairs Canada, "Off-grid communities," 2012. https://www.aadnc-aandc.gc.ca/eng/1314295992771/1314296121126#comm

[44] In some cases, INAC owns and operates diesel generating stations, while in other cases funds are provided to support locally owned systems.

[45] The non-integrated areas are divided into three geographic regions: Stikine area, Queen Charlotte Islands (Masset and Sandspit) and Bella Coola valley (Bella Coola, Bella Bella, and Anahim Lake). Source: BC Hydro, *Revenue Requirement Application 2004/05 and 2005/06, Volume 1 Chapter 7. Electricity Distribution and Non-Integrated Areas* (2006), 7-40. https://www.bchydro.com/content/dam/hydro/medialib/internet/documents/info/pdf/revenue_requirements_chapter_7_electricity_distribution.pdf

continue to receive financial support from INAC to fund capital replacements, operations, and maintenance of the communities' electricity systems.

3.1.2 Clean power purchase

3.1.2.1 Motivation for change

The Clean Energy Act became law in 2010, and includes dedicated renewable energy legislation with a target of provincial electricity self-sufficiency by 2016 and an overall target of 93% renewable energy generation. A key objective of the Act is a mandate to "foster the development of First Nation and rural communities through the use and development of clean or renewable resources." It also establishes the First Nations Clean Energy Business Fund[46], seeded by up to $5 million of provincial government funds and made available to "facilitate the participation of First Nations … in the clean energy sector."[47]

The Clean Energy Act is the enabling legislation for BC Hydro and other utility companies to pursue an energy diversification strategy in remote First Nation communities. However, the Act does not lay out how this is to translate into remote community clean power projects. There is no complementary policy measure or program that supports any of 14 remote communities in clean power projects (IPP or utility-owned), now serviced by BC Hydro through the RCEP. However, as allowed by the BC Hydro Act, BC Hydro has since established four active PPA agreements (referred to as an Electricity Purchase Agreement (EPA) in B.C.) with IPPs for the purchase of clean electricity from small-scale hydro power plants. These communities are Bella Bella, Bella Coola, Atlin and Sandspit. A further two communities, Hartley Bay and Kwadacha First Nation, are negotiating with BC Hydro for PPAs and subsequent construction of clean power projects. Of the remaining seven communities connected through RCEP, Masset (on Haida Gwaii) is the largest and is the focus of a future clean power project. The remaining six communities are very small and it is not known whether there is interest in pursuing clean power projects in these communities.

While BC Hydro does not have an explicit mandate to support, financially or in capacity, clean power projects (as above), the utility follows several underlying obligations to customers:

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[46] Government of British Columbia, *First Nations Clean Energy Business Fund.* http://www2.gov.bc.ca/gov/content/environment/natural-resource-stewardship/consulting-with-first-nations/first-nations-clean-energy-business-fund

[47] *Clean Energy Act*.

- Providing fair and justifiable electricity supply; the company has a legal obligation to serve its customers with affordable rates
- Ensuring lower cost, wherever possible, comparative to diesel generation
- Reducing GHG emissions and liability of diesel fuel shipments (contamination, etc.)

3.1.2.2 Policy and program details

In absence of a clean power purchase policy or program for remote communities, BC Hydro has drawn on experiences with projects connected to its integrated electricity system in pursuit of remote clean power projects on an ad-hoc basis. This means no formal regulatory process facilitates BC Hydro in clean power purchase from IPPs, but BC Hydro acts according to the Clean Energy Act's prescribed mandate. The utility offers a Standing Offer Program (SOP), launched in 2008, that facilitates the development and connection of clean power projects to the provincial grid but not remote communities. A new derivative program, launched in March 2016, is called micro-SOP and is specifically tailored to First Nations and smaller communities with less than 15 MW generation requirements. The micro-SOP pays a fixed rate for power, approximately $0.10 per kWh, given an agreed-upon contract term by the project developer and BC Hydro.[48] While the program rules do not specifically exclude remote communities from applying, the micro-SOP is incompatible with remote microgrids. This is because the unconditional offer to buy renewable power and the low contract price conflict with the characteristics of remote microgrids where clean power production may need to be restricted to maintain grid stability.[49]

In remote communities, clean power procurement by BC Hydro is motivated through the communities who wants to own and operate a power generation project on behalf of its community members. Hartley Bay, for example, chose to work directly with a third-party partner developer to build the project. Once BC Hydro took ownership of the community's diesel generation and distribution services from RCEP, a PPA contract was signed between BC Hydro and the First Nation community's IPP.

PPA contracts between BC Hydro and the community are arranged on a premise that the project delivers power when it can do so. When it cannot, BC Hydro assumes responsibility of power delivery using existing diesel generation assets. To reduce risk to

[48] BC Hydro, *Micro-SOP Program Rules* (2016). https://www.bchydro.com/content/dam/BCHydro/customer-portal/documents/corporate/independent-power-producers-calls-for-power/standing-offer/micro-sop-program-rules.pdf

[49] James Grant, personal communication, July 6, 2016.

BC Hydro, the contract does not exclude the utility from its obligations for reliable and safe power generation — meaning that a project's clean power may be curtailed to ensure a reliable grid. BC Hydro finds this practice to be "fair and justifiable."[50]

3.1.2.3 Setting the clean power price[51]

While remote First Nation communities typically seek up to $0.60 per kWh in a contract, they are also not willing to accept community power outages. Rather, the contract price is closer to $0.30 per kWh in remote communities serviced by BC Hydro — regardless of clean technology. It is calculated from a combination of a 10-year average diesel fuel commodity price plus the cost of transporting the diesel to the remote community. The final cost per kWh is calculated based on the local diesel generator system efficiency. Communities with smaller generators, and likewise lower energy conversion efficiencies, obtain a higher price per kWh.

Reducing future capital costs from upgrading and replacing diesel generating equipment is not considered when BC Hydro sets the clean power price, because the utility finds it necessary to avoid black or brown outs — as agreed with the First Nation community. Exceptions are made for clean power projects that operate year round (i.e. the clean power producer can follow load nicely for all or a vast majority of the year). In this case, BC Hydro includes a small capacity payment which accounts for not having to turn on the local diesel generator(s). This capacity payment is determined by analyzing historical diesel power plant operations and maintenance data.

As well, contracts often include a "turn-down provision" that requires the clean power project to reduce its generation when demand is low, allowing diesel generators to run at a set minimum rate instead of ramping down or off. Such ramping can overburden diesel generators and cause them to run inefficiently, requiring significantly more maintenance over time.

3.1.3 Opportunities, barriers and next steps

The single biggest barrier to clean power projects is lack of consistent and motivated community champions who are trained in clean power project development. Cost of working in these communities may also be very high. More so, many developers approach communities as "salesmen" with silver-bullet solutions, which require

[50] Ibid.

[51] Ibid.

scrutiny and due diligence. Often the community does not have the local capacity to carefully assess technical options and alternatives.

One concern that is not addressed through existing BC Hydro policy and programs is incentive for communities to reduce demand. Where IPPs produce clean power, they want to maximize associated revenues from BC Hydro. Currently, there are no policies or programs in development on how to incorporate energy conservation and efficiency into remote communities.

3.2 Alberta

Alberta uses a deregulated approach to generation and sale of electricity, while maintaining a regulated approach for transmission and distribution. This mostly deregulated approach to managing the electricity system is much different from the rest of Canada. Whereas in provinces such as Ontario and B.C., the electricity price is regulated by a government commission, Alberta uses a market system to set the price based on supply and demand.

The Electric Utilities Act[52], legislated in 2003, deregulated electricity generation and retailing, and gives the Alberta Utilities Commission (AUC) regulatory authority on how the electricity system operates. This includes regulations for allocation of cost for distribution and transmission tariffs[53] and how the market system operates (including how power is to be generated and sold by IPPs).[54] The Act also defines the duties of an independent system operator that owns and plans new transmission infrastructure investments. This institution, Alberta Electric System Operator (AESO), also manages the wholesale electricity market, known as the Power Pool. To meet the provincial load, the most affordable generators are called upon first, followed by incrementally more expensive bids. Once total supply meets demand, the price submitted by the highest bidder is established as the market price paid to all generators. This means generators who can produce at a lower cost will earn a marginal profit.

[52] Government of Alberta, *Electric Utilities Act* (2003). http://www.qp.alberta.ca/documents/Acts/E05P1.pdf

[53] Distribution and transmission tariffs are passed on, respectively, by utilities and AESO to customers as part of the payable rate, which covers the cost of upgrading, replacing and operating electricity wires, transformers, etc.

[54] The regulated rate option allows customers to pay for electricity without being subject to fluctuations in market prices. This option was designed to help customers transition to a deregulated electricity retail market.

3.2.1 Context of power in remote communities

Alberta has eight remote communities that are not connected to the province's integrated electricity transmission and distribution grid: Chipewyan Lake, Fort Chipewyan, Garden River, Indian Cabins, Narrows Point, Peace Point, Steen River Town and Jasper. Apart from Jasper (served by a combination of natural gas and hydro generation facilities), these are all on or near First Nations reserves, and served by diesel generators.

Distribution companies (utilities without generators) have a duty to make electric energy available to customers in remote communities within their service areas.[55] However, the AUC can designate areas as remote communities if it is not economic for the company to connect the customers to the province's integrated grid and the economics of electricity provision are better than if the customer produced themselves.

All remote communities in Alberta are served by ATCO Electric, a private utility company regulated by the AUC.[56] The price of electricity sold by utilities servicing the remote communities is based on the Power Pool price[57], as defined in Section 3.2. Recovery of the differential in cost of power generation and the revenues recovered from customers in the community is handled through an adjustment (credit) in the tariff paid by the distribution company to AESO. This means all utility customers in Alberta help subsidize the cost of power generation in remote communities.

3.2.2 Clean power purchase

3.2.2.1 Motivation for change

Although Alberta's deregulated market is underpinned by independent power production, there are currently no policies and programs to date that specifically support clean power purchase in remote communities. Hence, the following paragraph discusses possible future directions for Alberta.

[55] Government of Alberta, *Isolated Generating Units and Customer Choice Regulation,* AR 165/2003, 3. http://www.qp.alberta.ca/documents/Regs/2003_165.pdf

[56] Katie Rowe, Government of Alberta, personal communication, December 3, 2015.

[57] Retail rates in Alberta are based on the Power Pool price with a mark-up that accounts for transaction costs. Regulated rates as of August, 2016 are close to 5 cents per kWh. Source: Alberta Utilities Commission, *Electric rates and terms and conditions of service* (2016). http://www.auc.ab.ca/utility-sector/rates-and-tariffs/Pages/MonthlyRegulatedRateOptionRates.aspx

The current Alberta government (elected in 2015) has followed through on an election promise to broadly consult with stakeholders on a new plan to address climate change and the need for an energy transition. Recommendations from the consultation period have resulted in a Climate Leadership Plan, which includes a 30% renewable energy target and consideration for community and First Nations involvement in clean power projects. The Climate Leadership Implementation Act received royal assent in June 2016, establishing Energy Efficiency Alberta, an agency to, among other mandates, "promote, design and deliver programs… related to … micro-generation and small scale energy systems in Alberta".[58]

3.2.2.2 Policy and program details

Distribution companies in Alberta have yet to purchase power from IPPs in remote communities, and while regulation in Alberta does not prohibits IPPs, there is not sufficient financial support to enable remote communities to produce their own clean power. Alberta has a Micro-generation Regulation[59] that uses a form of net metering to facilitate small clean power projects; however, this policy does not allow IPPs to connect projects greater than 1 MW to the remote community's microgrid. This limitation reflects the current viewpoint that small generators should only be used to offset local energy consumption, instead of producing energy.

In living up to its Climate Leadership Plan, the current Alberta government is interested in supporting remote communities in reducing their reliance on diesel fuel and natural gas consumption; however, it finds that solutions must include federal and provincial funding to leverage opportunities.[60] There is also a specific interest in supporting local First Nations in developing clean power projects.[61] Nevertheless, it is expected that Energy Efficiency Alberta will implement program(s) that support clean power in remote (and First Nation) communities.

[58] Government of Alberta, Climate, *Bill 20 Climate Leadership Implementation Act* (2016), Schedule 2, 2.2(b). http://www.assembly.ab.ca/ISYS/LADDAR_files/docs/bills/bill/legislature_29/session_2/20160308_bill-020.pdf

[59] Government of Alberta, *Micro-generation Regulation* (2008). http://www.qp.alberta.ca/documents/Regs/2008_027.pdf

[60] David James, Assistant Deputy Minister, Electricity & Sustainable Energy, Government of Alberta, personal communication, July 13, 2016.

[61] Shannon Phillips, Minister of Environment and Parks, personal communication with Ben Thibault, 2015.

3.2.3 Opportunities, barriers and next steps

The Isolated Generating Units and Customer Choice (IGUCC) and Micro-generation Regulations provide starting points for new policies and programs to be delivered by Energy Efficiency Alberta. These programs will support communities, and specifically First Nations, in developing clean power projects. The IGUCC regulation could be amended to ensure cost recovery of new investments that are clean, and provide options for communities to own projects as IPPs.

3.3 Saskatchewan

SaskPower is the publicly owned utility responsible for power generation, distribution and transmission, operating under the Power Corporation Act.[62] Electricity rates, unlike in other provinces and territories, are reviewed at request of government by a rate review panel. Rate changes must be approved by cabinet.[63] SaskPower has an effective process for procuring power — it currently purchases close to 20% of its power from IPPs through competitive procurement, standing offer programs and unsolicited proposals.[64] These IPPs are not located in remote communities; Kinosao (Reindeer Lake) First Nation is the only remote Indigenous community in Saskatchewan.

SaskPower operates with an Aboriginal Procurement Policy[65], which encourages the utility to build relationships with First Nations communities as part of developing power projects. Involvement, through procurement of goods and services of First Nation businesses, is seen as a way to build skills in power services and supplies. While not specifically targeting clean power projects, the policy may serve as a starting point for clean power projects and First Nation-owned IPPs.

Further to helping First Nations with clean power projects, the First Nation Power Authority (FNPA) was established in 2011 as a non-profit organization to advise First Nations and First Nation businesses in developing economical clean power projects, and

[62] Government of Saskatchewan, *The Power Corporation Act* (2015). http://www.qp.gov.sk.ca/documents/English/Statutes/Statutes/P19.pdf

[63] Electricity Human Resources Canada, "SaskPower." http://electricityhr.ca/daps/index5a1f.html?page_id=225

[64] Provincial Auditor of Saskatchewan, *Chapter 17 SaskPower – Buying Power from Independent Power Producers* (2015), 205. https://auditor.sk.ca/pub/publications/public_reports/2015/Volume_1/17_SaskPower-Buying%20Power.pdf

[65] SaskPower, Aboriginal Procurement Policy (2015). http://www.saskpower.com/wp-content/uploads/aboriginal_procurement_policy_2015.pdf

works together with SaskPower and the Government of Saskatchewan to streamline development processes.

Most recently FNPA helped Meadow Lake Tribal Council sign its first PPA for a 36 MW biomass power project with SaskPower. MLTC Resource Development, a for-profit arm of the Meadow Lake Tribal Council (MLTC) and representative of the Meadow Lake First Nation, will own and develop the biomass project and sell power under the PPA. All profits from the project will be distributed back to the First Nation via the Tribal Council. Biomass technology is expected to create up to three to four times as many jobs as fossil fuel alternatives.[66]

3.4 Manitoba

Manitoba uses a centralized and regulated approach to manage its power sector. Manitoba Hydro is publicly owned utility and is responsible for all electricity generation, transmission and distribution. It is governed under the Manitoba Hydro Act, which describes how power may be purchased and sold, and regulates the electric system reliability and security of supply.[67]

The Manitoba Public Utilities Board is responsible for regulating electricity rates charged by Manitoba Hydro, under authority of the Public Utilities Board Act that allows Manitoba Hydro to charge rates based on reasonable cost less the value of depreciated generating assets.[68]

3.4.1 Context of power in remote communities

Manitoba has four remote communities that are not connected to the provincial grid: Brochet, Lac Brochet, Tadoule Lake and Shamattawa. These four communities have diesel generators that are significantly supported by INAC — including capital replacement, upgrades, and improvements of infrastructure. An agreement between INAC and Manitoba Hydro, while not formally ratified, distributes the obligation of capital expenditure between INAC and Manitoba Hydro by approximately a 70-30 split.[69]

[66] MLTC Resource Development, "Bioenergy," 2016. http://www.mltcrdi.ca/industrial-synergy/mltc-bioenergy-centre/

[67] Government of Manitoba, *Manitoba Hydro Act* (2014). http://web2.gov.mb.ca/laws/statutes/ccsm/h190e.php

[68] Government of Manitoba, *Public Utilities Board Act* (2014), 61. http://web2.gov.mb.ca/laws/statutes/ccsm/p280e.php

[69] Elke Banting, personal communication, June 27, 2016.

Manitoba Hydro is responsible for the cost of diesel fuel and a majority share of operations and maintenance of the diesel generators. Fuel is shipped by winter roads or by year-round air service. In order to reduce the cost of the diesel system, residential customers are limited to drawing 60 amps per home. Provision of heating is otherwise the responsibility of the community with INAC funding support.

Electricity rates are set by Manitoba Hydro and are fixed for all remote community residents. Rates are as high as $2.50 per kWh for government loads, with commercial customers paying $0.42 per kWh and residential customers paying a grid-connected parity rate of approximately $0.07 per kWh. The higher rates are necessary subsidize the residential rates as the true cost of generation is close to $1.00 per kWh.[70] Manitoba Public Utilities Board governs these retail electricity rates, and has the authority to set new rates in consultation with Manitoba Hydro.[71]

3.4.2 Clean power purchase

3.4.2.1 Motivation for change

Manitoba Hydro's 2013 Corporate Strategic Plan[72] indicates that the utility shall grow and use new energy sources as required while committing to a demand-side management approach ("Power Smart"), and developing "clean, renewable hydro resources". The plan also addresses strengthening relationships with Aboriginal peoples. Reflecting these sentiments, Manitoba Hydro is interested in making use of environmentally friendly, but also reliable power with the goal of reducing the cost of diesel fuel.[73] The strategy is a layer of ambition on top of Manitoba Hydro Act requirements to ensure power is delivered to customers for a price that reflects the full cost of generation.

3.4.2.2 Policy and program details

In following to its 2013 Corporate Strategic Plan, Manitoba Hydro introduced a Non-Utility Generation policy (2014/01)[74], equivalent to a Standing Offer contract that

[70] Rick Halas, personal communication, July 12, 2016.

[71] Electricity Human Resources Canada, "Manitoba Hydro." http://electricityhr.ca/daps/index31a9.html?page_id=222

[72] Manitoba Hydro, *Corporate Strategic Plan* (2013). https://www.hydro.mb.ca/corporate/csp/corporate_strategic_plan.pdf

[73] Elke Banting, personal communication, June 27, 2016.

[74] Manitoba Hydro, *Electric General Rate Application* (2012), 1. http://www.pub.gov.mb.ca/exhibits/mh-gra-2012-14/Exhibit-76.pdf

applies to grid-tied and remote communities. The key limitations of the policy are that systems must be restricted to small sizes (10 kW or less) or else a grid reliability study must be done.[75] The purchase price of clean power depends on the capacity size of the clean energy system. For smaller systems the price paid is set to the Standard Residential Rate (~$0.07), but is not sufficient for remote communities. Larger systems are subject to a rate negotiation.[76]

There are no existing PPAs between Manitoba Hydro and any one of the four remote communities. However, in following to its Corporate Strategic Plan, Manitoba Hydro works together with INAC and the communities to reduce diesel consumption as much as possible through energy conservation and energy efficiency programs. More recently, this collaborative effort includes assessment of renewable energy resources such as bio-energy, wind and solar. The utility is also conducting technology pilots such as operating woody biomass gasification and training high school students to operate the plant.

Remote communities' first preference is always to be connected to the Manitoba grid, citing reliability and affordability of power as primary reasons. However, there is still a benefit to local generation options when power lines are disrupted by natural circumstance, failures and/or planned repairs. Manitoba Hydro is considering grid-connection options given its globally recognized expertise in high-voltage DC transmission over long distances.[77]

3.4.3 Opportunities, barriers and next steps

While Manitoba Hydro is aware of the job creation and socio-economic development opportunities of clean power projects, project economics remain a significant barrier. However, Manitoba Hydro has recently examined the economics of integrating up to 40% clean power into all four of its remote communities, and enlisted the support of private enterprise to asses detailed business cases. While the project technical and economics look favorable, even with conservative discount rates and a US$30 to $40 per barrel oil price, no decision has been made whether projects shall be owned and/or operated by Manitoba Hydro or by the remote communities.[78]

[75] Elke Banting, personal communication, June 27, 2016.

[76] Ibid.

[77] Lower-medium voltage alternatives may be the best option for increased reliability, efficiency and lower cost, but Manitoba Hydro does not yet consider the technology commercially ready. Source: Ibid.

[78] Rick Halas, personal communication, July 12, 2016.

3.5 Ontario

Ontario's Ministry of Energy has the overall responsibility for regulating Ontario's energy market and setting policy direction for both electricity and natural gas. The Ontario Energy Board (OEB), an independent tribunal board, is responsible for regulating Ontario's electricity sector including distribution rates.[79] The governing Act related to electricity is the Ontario Electricity Act, 1998.[80]

One main guiding objective of the OEB is to "promote the use and generation of electricity from renewable energy sources in a manner consistent with the policies of the Government of Ontario, including the timely expansion or reinforcement of transmission systems and distribution systems to accommodate the connection of renewable energy generation facilities."[81]

The Independent Electricity System Operator (IESO)[82] is responsible for the province's long-term electricity planning, day-to-day operation and purchase of electricity from province-owned and independent power producers, and for ensuring reliable operation and supply of electricity. IESO balances demand for electricity against available supply through the wholesale market.

Ontario Power Generation (OPG) is owned by the province and is the largest electricity generator in Ontario, providing approximately 70% of the electricity consumed in Ontario. Bruce Power is a privately owned nuclear generation company providing 20% of electricity in Ontario. The remaining 10% of electricity is produced by IPPs that typically produce electricity from renewable energy sources. Electricity purchase from IPPs has happened over the years through a variety of policies and programs, including the Renewable Energy Standard Offer Program from 2006, the FIT and microFIT program launched in 2009 and most recently, the Large Renewable Procurement program announced in 2015.

HydroOne Inc. is also provincially owned and is the main transmission / distribution utility, and transmits approximately 97% of electricity in Ontario.

[79] Ontario Energy Board, "What We Do." http://www.ontarioenergyboard.ca/OEB/Industry/About+the+OEB/What+We+Do

[80] Government of Ontario, *Electricity Act*. https://www.ontario.ca/laws/statute/98e15

[81] Ibid.

[82] On January 1, 2015, the Ontario Power Authority merged with IESO under the common name of IESO.

3.5.1 Context of power in remote communities

HydroOne Remote Communities Inc. (H1RCI), a subsidiary of Hydro One, generates and distributes electricity to 21 remote communities in northern Ontario, 14 of which are remote First Nation communities. Eight remote communities are their own Independent Power Authority (IPA), generating and distributing their own power within their communities. All the northern remote communities are only accessible by winter roads and air with one community accessible by water. The requirement for H1RCI to provide power to these communities is under Section 26 of the 1998 Electricity Act.

As in most remote communities in Canada, diesel electricity generation is the primary source of electricity. H1RCI also own and operates two run-of-river hydro facilities and some demonstration wind turbine sites.

Ontario's Long Term Energy Plan, first introduced in 2010 and updated in 2013,[83] includes a transmission plan to connect 21 of 25 northern First Nation and Métis communities to the provincial grid.[84] When this happens, remote communities will no longer be reliant on diesel generators and fuel.

3.5.2 Clean power purchase

3.5.2.1 Motivation for change

The Ontario Green Energy Act[85] was legislated in 2009. The primary focus of the Act was to promote and expand renewable energy generation and procurement from renewable sources, create green jobs, encourage conservation and working more closely with First Nation and Métis. The Act also increased ministerial directive powers.

From the Green Energy Act came the introduction of Canada's first two feed-in tariff programs, the FIT and microFIT.[86] These standing offer programs were both introduced in 2009 to encourage the development of renewable energy technology, attract investment in Ontario and create local jobs. The FIT program supported projects between 10 kW and 500 kW in size and was open to private companies, co-operatives,

[83] Government of Ontario, *Ontario's Long-Term Energy Plan* (2010). Available at http://www.powerauthority.on.ca/power-planning/reports/long-term-energy-plan; Government of Ontario, *Achieving Balance: Ontario's Long-Term Energy Plan* (2014). http://www.energy.gov.on.ca/en/ltep/

[84] IESO, "Remote Community Connection Plan." http://www.ieso.ca/Pages/Ontario's-Power-System/Regional-Planning/Northwest-Ontario/Remote-Community-Connection-Plan.aspx

[85] Formally known as the Green Energy and Green Economy Act, 2009

[86] IESO, "FIT Program / MicroFIT Program." http://fit.powerauthority.on.ca/

municipalities and First Nations. The microFIT program is for projects up to 10 kW and was geared more towards homeowners, farmers and institutions (e.g. schools). For larger projects, the FIT program has seen subsequent revisions of rules, the first of which resulted in FIT 2.0 in 2012. The revision included a variety of changes to the program, including revised electricity rates for various renewable projects. The IESO is currently working on and accepting feedback for new FIT 5.0 rules.[87]

The successful FIT and microFIT programs only applied to projects connected to the provincial grid; remote First Nation and Métis communities in H1RCI's service territory are not eligible. With the rollout of the FIT and microFIT program and the uptake these programs saw, there were requests from remote communities for H1RCI to offer a program similar to a FIT that would allow First Nation and Métis communities to develop renewable energy projects and sell the power to H1RCI. This, combined with H1RCI's environmental goals to reduce diesel usage and associated environmental emissions and also increase the use of renewable technologies in the North, encouraged H1RCI to explore ways to introduce a similar program to remote communities.

In late 2013, after receiving approval from the OEB, H1RCI launched an SOP-like program called the Renewable Energy INnovation DiEsel Emission Reduction (REINDEER) program. It supported remote communities to develop renewable energy projects and reduce the dependency on and impact of diesel fuel on the environment. The program allows renewable energy projects to be connected to the community's microgrid and has two streams, as discussed below. Both programs and their rates are reviewed yearly and new guidelines are released with approval of the OEB.

3.5.2.2 Policy and program details

Clean power purchase from the REINDEER program falls under two streams: *net metering* and *stand-alone*.

Net metering program – Net metering projects are connected "behind the meter" in a metered building. When the project generates more power than is needed on-site, it sends that electricity back to the grid and is credited for this. Credits can accumulate for up to 12 months. Systems are typically 10 kW in size.

Stand-alone program – Stand-alone projects are larger systems that generate additional electricity for the community and connect directly to the utility's microgrid.

[87] IESO, "FIT Program." http://fit.powerauthority.on.ca/what-feed-tariff-program

This electricity feeds directly into H1RCI's microgrid and is paid at fixed rate per kWh, based on the contract.

As of May 2016, there were seven communities in northern Ontario with REINDEER contracts. All projects involve small-capacity solar PV systems, mostly under the net-metered stream with only a few stand-alone projects. Of the net-metered projects, most connected their systems to community buildings that are charged high Standard A rates[88] (2014 Standard A rates from H1RCI were $0.92 / kWh). Higher rates have the biggest impact in terms of reduced utility bills. Even with the small uptake, the program has seen a reduction in diesel fuel consumption, decrease in GHG emissions and decreased costs to First Nations customers.

Currently a few larger projects are pending review under the stand-alone stream. [89] The proposed systems are larger than those currently installed, ranging from 20 kW to as large as 3 MW. The larger proposed systems are sized to approximately 50% of a community's annual electricity load and represent quite a deep penetration of renewable energy integrated into H1RCI's grid.

3.5.2.3 Setting the clean power price

Net-metered power projects do not have a defined or set clean power price; instead, the building consumes the electricity produced by the project first. Any excess electricity that the building does not consume is fed back to the grid and credited at the electricity rate for the building.

Rates received for stand-alone power projects are set by H1RCI and are specific to each community. The rates are based on the three-year historical average of landed diesel cost[90] in the community. For 2016, these rates ranged from $0.24 to $0.70 per kWh, averaging around $0.41 per kWh. These rates are essentially the avoided cost of diesel incurred by H1RCI and account only for the direct cost of fuel; the rates do not account for any other aspects of the diesel generation system that would see a benefit from a reduction in diesel fuel being consumed.

[88] Standard A electricity rates are applied to buildings that receive direct or indirect funding from government sources

[89] Kevin Mann, H1RCI, personal communication, May 2016

[90] Landed diesel costs is the cost of purchasing diesel by H1RCI to run in their diesel generators. Rates vary based on commodity price, supplier and transportation method (land, air, barge).

3.5.2.4 Terms and obligations

All REINDEER contracts are 10-year terms (renewable after 5 years) and are entered between H1RCI and the community developing the project.[91] Although the REINDEER rates are publicly available, the details of specific contracts are confidential. All proposal projects are subject to a technical review, and the community must enter a connection agreement with H1RCI. Projects must be sized accordingly to electricity needs and capacity in the community (net-metered project size may not exceed 50% of annual building consumption). REINDEER recipients are responsible for designing, building, owning, operating and maintaining all assets of the system up to the point of connection to H1RCI. Service, reliability and power quality provided by H1RCI cannot be compromised by the connection.

3.5.3 Opportunities, barriers and next steps

The REINDEER has had slow uptake but some projects have been developed, and some larger-scale projects are in the works.

There seem to be two main barriers to uptake in the REINDEER program. Stand-alone (avoided cost of diesel) rates are still quite low compared to Ontario's FIT and micro-FIT rates and it is very difficult to make the economics of the project viable. FIT rates are basically double REINDEER and this has driven the renewable energy industry to focus on these types of projects. To see dramatic uptake of the REINDEER program, the economics of these systems need to be resolved, to acknowledge the difficulties of developing remote off-grid projects.

Secondly, although H1RCI will pay a defined rate, capital to purchase and install these systems is still hard to access. For remote communities, INAC contributes capital for renewable energy systems through the ecoENERGY for Aboriginal and Northern Communities Program.[92]

3.6 Quebec

In Quebec's government-regulated power sector, the publicly owned utility Hydro-Quebec, owns and operates the majority of electricity generators, including many grid-connected hydro-electric plants and all remote community diesel power plants of

[91] There is a clause, however, that will terminate contracts if the community is connected to future Ontario grid expansion.

[92] This program expired March 31, 2016.

Nunavik, the northern third of Quebec. This region is largely self-governed by the Kativik Regional Government, created in 1978 following the James Bay and Northern Québec Agreement to deliver public services to the Inuit people of Nunavik.[93]

Hydro-Quebec's mandate and governance is established by the Hydro-Quebec Act[94], which allows IPP generators where necessary to fulfill the utility's generation requirements. The Régie de l'énergie, as per the Act respecting the Régie de l'énergie[95], is responsible for regulating electricity transmission and distribution rates, as well as facilitating electricity rate setting.

3.6.1 Context of power in remote communities

All of Quebec's 14 remote communities are located within the Nunavik region. Under the James Bay and Northern Quebec Agreement, the Makivik Corporation was established to administer funds received through the settlement. The corporation negotiates with Hydro-Quebec regarding power generation projects, including hydro projects, and operation of the region's remote communities that rely on diesel generators.[96]

3.6.2 Clean power purchase

3.6.2.1 Motivation for change

Policy developments from 2010-2013 within the Nunavik region follow discussions and analysis on interconnection of remote communities to Quebec's integrated grid, as well as consideration for small hydro projects and wind-diesel hybrid systems.[97] The 2012 Plan Nunavik calls for Quebec Hydro to address two goals: to build renewable energy pilot projects in the short term, and to connect all remote communities to the integrated grid in the long term.[98]

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[93] Hydro-Quebec, "The History of Hydro-Quebec." http://www.hydroquebec.com/about/who-are-we/history-hydro-quebec.html

[94] Government of Quebec, *Hydro-Quebec Act* (2006). http://legisquebec.gouv.qc.ca/en/showDoc/cs/H-5?&digest=

[95] Government of Quebec, *Act respecting the Régie de l'énergie* (1996). http://legisquebec.gouv.qc.ca/en/ShowDoc/cs/R-6.01

[96] Natural Resources Canada, *Status of Remote/Off-Grid Communities in Canada* (2011), 26. https://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/canmetenergy/files/pubs/2013-118_en.pdf

[97] Polar Knowledge Canada, *State of Alternative Energy in the Arctic* (2015), 44.

[98] Makivik Corporation, *Plan Nunavik* (2012), 404. http://parnasimautik.com/plan-nunavik-past-present-and-future/

The Makivik Corporation is the dominant and responsible player that contributes to economic development in the Nunavik region. With several objectives, including preservation of Inuit values, culture and traditions, and to "develop and improve Inuit communities"[99], it is positioned to facilitate clean power projects in the future. See Section 2.4 for details of ownership model involving economic development corporations, such as Makivik Corporation.

3.6.2.2 Policy and program details

In April 2016, the Quebec government announced its 2030 Energy Policy, an overarching policy for the power sector to guide actions to 2030.[100] This policy includes addressing economic development for local and Indigenous communities through small hydro projects, while meeting "high environmental and social acceptance" standards.[101] It sets a target for 25% more renewable energy (and specifically, 50% more biomass energy). It also calls for support to "projects of off-grid communities … to convert electricity generation using fossil fuels to renewable energy sources".[102] The strategy does not indicate whether the government will consider an IPP approach; language suggests that Hydro-Quebec will remain responsible for implementing and owning future clean power projects in remote communities. However, there is a precedent for using IPPs in Quebec to develop wind energy resources, whereby Hydro-Quebec has made competitive requests for proposals.[103] This would suggest that the utility is legally able, and perhaps motivated, to sign PPAs with small hydro IPPs in remote Indigenous communities.

3.6.3 Opportunities, barriers and next steps

The 2030 Energy Policy mandates Hydro-Quebec to develop plans for converting diesel generators in remote communities to clean power systems. The utility could work closely with the Makivik Corporation and the Kativik Regional Government in building clean power projects together, or Makivik could take a leading role. The public utility

[99] Makivik Corporation, "Makivik Mandate." http://www.makivik.org/corporate/makivik-mandate/

[100] Government of Quebec, *2030 Energy Policy* (2016). http://mern.gouv.qc.ca/english/energy/strategy/pdf/The-2030-Energy-Policy.pdf

[101] Daniel Benay, Thomas Lavier, Jacob Stone, and Grogory Larroque, *Quebec's New Energy Policy* (2016). http://www.canadianenergylawblog.com/2016/04/08/quebecs-new-energy-policy/

[102] *2030 Energy Policy*, 43.

[103] Hydro-Quebec, "Electric Power Purchase — Quebec Market" http://www.hydroquebec.com/distribution/en/marchequebecois/

may also build on a precedent with wind power procurement and, in the future, work with clean IPPs to develop local, small hydro projects.

3.7 New Brunswick

The Department of Energy and Resource Development is responsible for setting the direction for electricity and renewable energy policy in New Brunswick.[104] The government has set a goal of increasing the amount of electricity from new renewable resources from 28% to 40% by 2020. It lays out this plan in the New Brunswick Energy Blueprint, which translates 2010's Energy Commission 10-year vision of more energy efficiency and a transition to renewables, while ensuring reliable, and affordable power to residents and businesses.[105]

There are no remote communities in New Brunswick. The following information applies to grid-tied First Nation communities.

NB Power, the province's publicly owned and regulated utility company, is keen to encourage locally owned, small-scale clean power projects. Their plan involves co-operatives and First Nation community building around owning wind, solar, small-scale hydro and biomass projects. NB Power would buy power from these communities through PPAs with the locally owned IPP. The program to support community ownership has yet to be announced, but would fall within the scope of NB Power's Community Energy Program which is to source the production of 40 MW of electricity from renewable resources.[106] Specific opportunities also exist for First Nation communities, where NB Power will support the First Nation in develop, implementing and managing their own clean power projects.[107]

[104] Government of New Brunswick, "Community energy policy announced," media release, February 9, 2010. http://www.gnb.ca/cnb/news/ene/2010e0178en.htm

[105] New Brunswick Department of Energy, *The New Brunswick Energy Blueprint* (2011). http://www2.gnb.ca/content/dam/gnb/Departments/en/pdf/Publications/201110NBEnergyBlueprint.pdf

[106] Redmond Shannon, "NB Power looks to small-scale renewable energy," *CBC News,* April 17, 2015. http://www.cbc.ca/news/canada/new-brunswick/nb-power-looks-to-small-scale-renewable-energy-1.3038598

[107] NB Power, "NB Power Invites First Nations to participate in Renewable Energy project," media release, January 29, 2016. https://www.nbpower.com/en/about-us/news-media-centre/news/2016/nb-power-invites-first-nations-to-participate-in-renewable-energy-project/

3.8 Nova Scotia

Since 2010, Nova Scotia has supported communities in developing clean power projects, first through a competitive purchase program and later a FIT program targeted specifically for communities (COMFIT). While the province has no remote communities, apart from the very small island community Picto (where residents are obliged to generate their own power), the COMFIT offers a good example of policies and programs that work exceptionally well to promote locally owned renewable energy projects.

In 2007, the province enacted the Environmental Goals and Sustainable Prosperity Act[108] establishing a foundation for creating one of the world's "cleanest and most sustainable environments in the world by 2020" which included a target of 18% of electricity needs covered by renewable sources by 2013.[109] This vision has been updated with goals for greenhouse gas emissions reduction targets and renewable energy goals (25% renewable electricity by 2015).

To help advance penetration of clean power, the government worked with Nova Scotia Power to procure clean power from community-owned projects starting with small-scale competitive procurement (RFP) for up to 20 MW. The program helped Black River Hydro in Cape Breton with a community wind project; North Cumberland also developed a wind project. While these projects were successful, many others who participated in the competitive bidding process were unsuccessful. Unfortunately, these communities put much time and effort in their bids without receiving a contract. Evidence from this process encouraged the Government of Nova Scotia in 2010 to design a more effective program alternative that would align perfectly with its 2009 Climate Change Plan and Renewable Electricity Strategy.

The new program, a community-targeted Feed-in Tariff, or COMFIT, is intended not only to install a significant amount of clean power generation, but also facilitate larger-scale project development by raising awareness for clean power, creating a social license, and giving communities an opportunity to participate in development. In designing the program, no particular capacity cap was legislated, but a mandate for 100 MW was provided as an aspirational target. The target resulted from an analysis of probable projects to be connected to distribution systems, sized to not exceed minimum electric loads at system nodes (where wires tie in branches of the grid to the

[108] Government of Nova Scotia, *Sustainable Procurement Policy*. http://www.novascotia.ca/treasuryboard/manuals/PDF/300/30301-01.pdf

[109] Government of Nova Scotia, *Nova Scotia's 2020 Vision*. https://www.novascotia.ca/nse/pollutionprevention/docs/2020FactSheet.pdf

transmission system). The target was greatly exceeded: including projects currently being developed, a total of 204 MW were approved. The program was ended following a 2015 review, based on the argument that COMFIT had met its mandate, and that adding further capacity would result in a negative impact on electricity rates.[110]

Nova Scotia's new government, elected in 2013, has yet to clearly define next steps for the province to move towards more aggressive renewable energy targets, and further involve communities in needed clean power investments.

3.9 Newfoundland and Labrador

Newfoundland and Labrador's power sector is regulated by the provincial government, in which the investor-owned utility Newfoundland Power owns and operates all transmission and distribution grids, and sells power to customers. It purchases the majority of power it sells from the publicly owned Newfoundland and Labrador Hydro (NL Hydro). This utility also owns and operates remaining diesel generators and hydro facilities in Labrador on the mainland.[111]

Utilities are regulated by the Newfoundland and Labrador Board of Commissioners of Public Utilities, which regulates rates, investments and overarching policies relevant to the power sector.[112]

3.9.1 Context of power in remote communities

Newfoundland and Labrador has 28 remote communities; 16 of these are Indigenous communities.[113] NL Hydro operates 25 diesel generators, the majority of which are located in remote communities on the Labrador coast.[114]

NL Hydro's parent company, Nalcor Energy, is investigating clean energy alternatives for diesel generators, specifically small hydro and wind energy options. In support of these efforts, the provincial government announced the Coastal Labrador Wind

[110] Government of Nova Scotia, "Minister Announces COMFIT Review Results, End to Program," media release, August 6, 2015. http://novascotia.ca/news/release/?id=20150806001

[111] Newfoundland and Labrador Hydro, "Power Your Knowledge – Diesel." http://www.poweryourknowledge.com/diesel.html

[112] Newfoundland Power, "About Us." http://www.newfoundlandpower.com/aboutus/

[113] Natural Resources Canada, *Status of Remote/Off-Grid Communities in Canada* (2011). https://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/canmetenergy/files/pubs/2013-118_en.pdf

[114] "Power Your Knowledge – Diesel."

Monitoring Program in 2011. This program represents the second phase of the Labrador Alternative Energy study.[115]

3.9.2 Clean power purchase

3.9.2.1 Motivation for change

In 2009 the Newfoundland and Labrador government invested $250,000 in NL Hydro to study the potential for clean energy alternatives, including small hydro, wind, solar and biomass facilities, to reduce reliance on diesel generators in remote, off-grid Labrador communities. The communities of Cartwright, Charlottetown, Hopedale, Makkovik, Mary's Harbour, Nain, and Port Hope Simpson were selected based on their current and growing energy consumption.[116]

A feasibility study for hydro potential on the coast was prepared in 2012 with data collection through to 2015. Similarly, the provincial government continued to support monitoring wind resources until mid-2015.[117]

3.9.2.2 Policy and program details

Feasibility studies and the Ramea Island wind-hydrogen-diesel hybrid project provide clear indication that the Newfoundland and Labrador government is keen to reduce remote community reliance on diesel power plants for power production. However, these actions are not reflected in a power purchase policy or corresponding programs. In 2014 the government contracted Navigant to research industry practices for net metering.[118] The study offered several recommendations for a net metering policy including application of rates, capacity limits relative to system and customer load. It does not specifically mention applicability to remote communities.

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[115] "Power Your Knowledge – Diesel."

[116] Newfoundland and Labrador Hydro, *Preliminary Assessment of Alternative Energy Potential in Coastal Labrador* (2009). http://www.nr.gov.nl.ca/nr/publications/energy/preliminary_assessment_of_alternative_energy_potential_in_coastal_labrador.pdf

[117] Newfoundland and Labrador Hydro, *Transparency and Accountability Act 2015 Annual Performance Repor*t (2016). http://www.nalcorenergy.com/uploads/file/2015%20Annual%20Performance%20Report%20Transparency%20and%20Accountability.pdf

[118] Navigant, *Net metering standard industry practices study* (2014). http://www.nr.gov.nl.ca/nr/energy/electricity/net_metering_study.pdf

3.9.3 Opportunities, barriers and next steps

The Ramea island wind-hydrogen-diesel hybrid project, with Natural Resources Canada involvement and NL Hydro leadership, is a showcase project with much potential to meet 100% of the community's energy needs with clean power. The pilot project could set an example for other Labrador communities to reduce reliance on diesel fuel. However, such scaling of technology solutions will require a directed policy and corresponding program to support the transition.

3.10 Yukon

Yukon Government regulates electricity supply and distribution to customers via the Yukon Development Corporation Act[119] and the Public Utilities Act.[120] The Public Utilities Act establishes the mandate for Yukon Energy Corporation (YEC), a wholly owned subsidiary of the Yukon Development Corporation, to "furnish electricity" given rates agreed upon by the government.

3.10.1 Context of power in remote communities

There are 22 communities in Yukon that are considered remote; the majority of them are Indigenous communities.

Power generation in Yukon is separated into two zones, one based on hydro generation and the other on thermal generation. The hydro zone connects the majority of the communities (which are still considered remote) to the hydro-based grid called the Yukon Integrated System. Four remote communities are not connected to these two zones and are fully reliant on diesel generators to meet electricity demand. These communities are Old Crow, Beaver Creek, Burwash Landing / Destruction Bay, and Watson. ATCO Electric (Yukon Electrical Company Ltd) owns and operates the diesel generation systems and provides electricity for all of these remote communities.[121]

[119] Yukon Government, *Yukon Development Corporation Act (*2002). http://ydc.yk.ca/uploads/documents/yudeco.pdf

[120] Yukon Government, *Public Utilities Act* (2002). http://yukonutilitiesboard.yk.ca/pdf/General/149_pua.pdf

[121] ATCO Electric Yukon, *About Us* (2016). http://www.atcoelectricyukon.com/About-Us/

3.10.2 Clean power purchase

3.10.2.1 Motivation for change

Yukon Government released its Energy Strategy in January 2009 calling for a sustainable power sector that is "environmentally, economically and socially responsible" and underpinning this with a key principle to support energy security through a reliable energy supply with reasonable cost and "reduced dependence on non-renewable energy resources".[122]

The Energy Strategy has resulted in a two-pronged approach: one to understand the potential of under-utilized resources including biomass and geothermal energy, and a second approach to accelerate solar and wind deployment with net metering and IPP policies. While originally envisioned as a single policy, public consultations in 2009–2010 resulted in two separate policy statements, one for net metering[123] and a second policy for IPPs.[124] The net metering, now called Microgeneration, policy was geared to support power generation for own consumption, and the IPP policy was to enable third parties to generate additional power that can help utilities fulfill the Energy Strategy goals of securing clean, reliable and affordable power. Both policies emphasize the need to reduce GHG emission and diversify renewable energy resources. Both policies required amendments to the Public Utilities Act to enforce; these amendments were made in 2013 and 2015.[125]

3.10.2.2 Policy and program details

Yukon Government published its Microgeneration (net metering) policy in 2013. The policy is for *behind-the-meter* projects, restricted to 5 kW when connected to load on a shared transformer and 25 kW for single transformers with utility approval.[126] The utility owns, operates and maintains all metering equipment, but the customer is responsible for interconnection and transformer upgrade costs. In diesel-powered communities, the net-meter rate for surplus energy exported to the microgrid is paid for

[122] Yukon Government, *Energy Strategy for Yukon* (2009). http://www.gov.yk.ca/pdf/enery_strategy_for_yukon.pdf

[123] Yukon Government, *Micro-Generation Policy* (2013), 1. http://www.energy.gov.yk.ca/pdf/20131023_micro_generation_policy.pdf

[124] Yukon Government, *Independent Power Production Policy* (2015). http://www.energy.gov.yk.ca/pdf/independent-power-production-policy-201510.pdf

[125] Ryan Hennessey, personal communication, June 28, 2016.

[126] Projects up to 50 kW are considered on a case-by-case basis.

at $0.30 per kWh. To support microgeneration investment, residents may apply for a 20% rebate up to $5,000 through the Residential Energy Incentives Program.[127]

The IPP policy was introduced in October 2015 following a government's desire to support IPPs in developing their own power projects and supports power producers who want to produce and sell power to Yukon's public utility, Yukon Energy Corporation, or to ATCO Electric (both utilities operating independently in Yukon), excluding producers covered by the net metering policy. The primary objectives of the policy are to "strengthen energy security and affordability,"[128] and to facilitate collaboration between the public utilities and IPPs wishing to develop new clean power projects. It also directly establishes targets for 10% of electricity demand to be met by IPPs, and that at least half of all IPP projects incorporate some share of First Nation ownership — regardless of the ownership share's size. To meet these targets, three approaches are defined by the policy: a standing offer program (SOP), a call for power, and a third, unsolicited approach.

Approaches for facilitating IPP projects depend on the project location. Remote communities (Old Crow, Beaver Creek and Destruction Bay and Burwash Landing) are not eligible for both the SOP and call for power mechanisms because of concerns for the "safety and security of the electrical grid". However, the policy re-iterates a government commitment to work with these communities to develop locally owned IPP projects for purpose of local economic development, while securing energy self-reliance — reducing diesel fuel consumption and corresponding greenhouse gas emissions.[129] One remote community that is eligible for the SOP is Watson Lake, given that its grid is sufficient in size to accommodate a clean power project within given size restrictions.

Kluane First Nation in Burwash Landing is trying to develop a 300 kW wind-battery system, building on successes from the Alaskan Indigenous-run Chaninik Wind Group. The wind project would consist of three Windmatic wind turbines and would be the first wind energy project owned by a First Nation community in northern Canada. The community is still in negotiations with Atco Electric Yukon to develop the project under a PPA agreement but have unable to arrive at a contract rate that would make the project economically viable.

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[127] Yukon Government, *Micro-generation program* (2016). http://www.energy.gov.yk.ca/microgeneration.html

[128] *Independent Power Production Policy*

[129] Ibid.

3.10.2.3 Setting the clean power price

Although there is no detail in the IPP policy, PPA contract rates are expected to be based on the avoided cost of diesel, a rate that will be governed by the Yukon Utilities Board.[130] Given that diesel fuel prices are relatively low, the avoided cost of diesel fuel in Yukon is likely not sufficient to finance a complete clean power project without further government up-front capital assistance.[131]

3.10.3 Opportunities, barriers and next steps

The IPP policy formalizes a commitment to work with remote communities to reduce their reliance on diesel power generation. But it does not provide programmatic guidance on how these projects should be developed, a price that should be paid, or framing of the contracts to be developed.

Impetus for IPP project development from the Yukon Government perspective is clearly not only a cost savings exercise, but increasingly a means to support local economic development through job creation and supporting business development. Yukon has seen its economy shrink three years in a row, and unemployment rose from 4.3 to 7.5% in the course of last year.[132] A window of opportunity for such development also aligns with the state of many diesel generators that were installed in the 1970s and 80s. Most recently, diesel generators were replaced in Whitehorse with natural gas systems (using LNG technology). But many older diesel generators could be replaced with renewable energy alternatives.

3.11 Northwest Territories

The Northwest Territories' power sector is government regulated, with more than 350 electricity generating assets owned and operated by a single publicly owned utility, the

[130] Ryan Hennessey, personal communication, June 28, 2016.

[131] JP Pinard, personal communication, June 18, 2016.

[132] CBC News, Yukon government issues gloomy economic forecast (2015). http://www.cbc.ca/news/canada/north/yukon-gloomy-economic-forecast-fall-2015-1.3294722; CBC News, *Yukon unemployment rate more than double what it was a year ago* (2015). http://www.cbc.ca/news/canada/north/yukon-unemployment-rate-more-than-double-what-it-was-a-year-ago-1.3183367

Northwest Territories Power Corporation (NTPC).[133] The utility is regulated by the Northwest Territories Power Corporation Act, which mandates NTPC to "generate, transform, transmit, distribute, deliver, sell and supply energy on a safe, economic, efficient and reliable basis". [134] It also must undertake programs to conserve energy and ensure a continuous supply of energy that is adequate to current and future development of the Territories.

Rates and structure are set by NTPC subject to the Public Utilities Act. The Government of Northwest Territories (GNWT) may make a financial contribution, invest in, and loan funds to the utility company. The Public Utilities Board determines rates, through consultation with NTPC, by consideration of distribution and generation asset ("property") costs at the time of acquisition and use in public service, less depreciation, amortization or depletion. Rates must be set under "just and reasonable" conditions, accounting for all revenues and expenses.[135]

NTPC, or in certain cases, Northland Utilities[136], are under contractual obligations to generate, distribute, and supply electricity to communities through franchise agreements. These agreements ensure the right of the utility to operate under certain conditions, such as guarantees of access to public lands, exclusive supply to municipal assets, and restrictions on distributed generation resources.[137] The franchise may also involve "fees" charged by the municipality in return for the agreement rights to the utility company.[138]

Government may further lend direction to the utility company, specifically NTPC, by using the Public Utilities Board to set policy and regulatory direction. Most importantly, policies include strategic plans for solar and biomass energy. Smaller decisions include limitations on the types of projects that may be developed by the utility company

[133] Government of Northwest Territories, *Energy for the Future: An Energy Plan for the Northwest Territories* (2007). http://www.pws.gov.nt.ca/pdf/Energy/NWT%20Energy%20Plan%20-%20Energy%20for%20the%20Future.pdf

[134] Government of Northwest Territories, *Northwest Territories Power Corporation Act* (1988, amended 2016). https://www.justice.gov.nt.ca/en/files/legislation/nwt-power-corporation/nwt-power-corporation.a.pdf

[135] Government of Northwest Territories, *Public Utilities Act* (1988, amended 2013), 19. https://www.justice.gov.nt.ca/en/files/legislation/public-utilities/public-utilities.a.pdf

[136] Non-government utilities are allowed to purchase wholesale power from NTPC and sell this to customers in its franchise area based on contractual agreements. The Northwest Territories Power Corporation Act governs this relationship.

[137] Town of Iqaluit, NT, *By-Law No. 363* (1995). http://www.city.iqaluit.nu.ca/sites/default/files/by-law_363.pdf

[138] *Public Utilities Act*, 15.

without permission from the Public Utilities Board. Projects greater than $5 million (or 10% of rate base) must first be permitted.[139]

3.11.1 Context of power in remote communities

Similar to Yukon, NWT's electricity grid, and its customer base, is divided into two zones — thermal and hydro. The hydro zone of customers receives electricity primarily from hydro power plants around the Great Slave Lake, while the thermal zone is comprised of 23 remote communities that rely on diesel generators for electricity. Residents in these communities who would otherwise be subject to at-cost rates charged to government and commercial customers make use of the Territorial Power Subsidy Program, which subsidizes residential rates up to 1,000 kWh per month to the equivalent hydro zone rate for Yellowknife customers.[140] Equivalent rates fall within the $0.17 to $0.26 per kWh range; however, low water flows in 2014/2015 in the hydro zone has put pressure on rates to cover cost of filling in demand with diesel power generation.[141]

Communities such as Lutsel K'e, Colvile Lake and Fort Simpson have taken different approaches to clean power production. Lutsel K'e has elected to invest in their own project, thereby establishing an independent power producer with a PPA with NTPC. The Colville Lake community is home to a high-penetration renewable energy project that is fully owned and operated by NTPC, while Fort Simpson's renewable energy project is somewhat smaller (relative to the size of the community). The GNWT's Community Renewable Energy Program provided funds for all three community projects, with additional federal government grants and contributions from Bullfrog Power. In case of Lutsel K'e, a total of $300,000 was granted towards the project.

More communities may see IPPs, like Trout Lake, serviced by Northland Utilities. This PPA is in addition to a legacy PPA in Normal Wells, for whom electricity is served by way of natural gas from a nearby oil field processing facility owned by Imperial Oil. GNWT is motivated to allow more IPP-type projects, but because of NWT's small rate base — not many customers, spread over a large geographic area — the funds to support such projects with upfront government capital is not sustainable. The capital funding model would ultimately lead to an increase in rates, which is counter to the Energy Plan

[139] Ibid, 20.

[140] Government of Northwest Territories, *Northwest Territories Energy Action Plan* (2013), 16, 23. http://www.mrif.gouv.qc.ca/PDF/actualites/nwt_energy_action_plan_december2013.pdf

[141] Polar Knowledge Canada, *State of Alternative Energy in the Arctic* (2015), 23.

objective and GNWT mandate to guarantee an affordable supply of electricity to all NWT communities.

3.11.2 Clean power purchase

3.11.2.1 Motivation for change

GNWT's 2007 energy plan clearly lays out a mandate for subsequent policy and planning to reduce energy costs, GHG emissions and reliance on imported fuel for power generation. [142] In addition to these goals, the plan introduces several principles, of which are the use of northern renewable energy for industrial developments, maintaining the integrity of the natural environment and recognizing their importance to NWT residents' long-term economic, social and cultural well-being. Underlying this, the plan's leading principle is making energy available in all NWT communities that is both reliable and affordable. While doing so, NTPC shall remain in public control, and the GNWT shall demonstrate leadership in providing "affordable power" and promoting a "lasting legacy of renewable energy."[143] Building on the 2007 plan, 2013's Energy Action Plan continues to address the same principles and goals with a renewed impetus for action to support renewable energy, especially in thermal-zone, remote communities.[144]

3.11.2.2 Policy and program details

Whereas the energy plans establish overall strategy, the GNWT has published two separate strategy documents for developing biomass and solar resources. These strategies were both released in 2012, respectively leading to supporting actions through to 2015 and 2017.[145] The solar strategy's Action 5 specifically directs the Public Utilities Board and NTPC to work together to enable grid-connected PV systems through net metering arrangements, streamline connection processes, and allow IPPs to develop their own projects. Actions 6 and 7 provide directions for renewable energy penetration level for allowable systems (up to 20% average of summer load) and facilitating innovations to maximize penetration up to 75%. Meanwhile, Action 1 provides governmental backing for the Arctic Energy Alliance to continue support for

[142] *Energy for the Future*, 2.

[143] Ibid, 16-17.

[144] *Northwest Territories Energy Action Plan*, 16.

[145] Government of Northwest Territories, *Strategies Aim to Increase Use of Biomass and Solar Energy in the NWT* (2012). http://news.exec.gov.nt.ca/strategies-aim-to-increase-use-of-biomass-and-solar-energy-in-the-nwt/

community energy efficiency and renewable energy projects. [146] While these actions enable, and in some instances, support government decisions to grant funds to IPP projects such as in Lutsel K'e, the actions have yet to materialize in a clear policy statement in support of clean power procurement using an IPP approach.

In the short- to medium-term, NTPC's Net metering program offers an alternative to IPPs. [147] The program compensates micro-generators at the full retail rate for any excess energy that is exported to the grid. The full retail rate is subsidized for residential customers, but the program could be of interest to owners of commercial and government buildings that pay much higher energy rates. Compensation is made by an energy credit system. Credits that are not consumed by the end of the year are reset to zero.[148]

3.11.2.3 Setting a price for clean power

In absence of a formal policy statement to set the price for clean power purchased from IPPs, the Lutsel K'e Dene First Nation owned IPP project may set a precedent. At the time of writing this is the only IPP project that has signed a clean power PPA with NTPC. While the PPA's details are confidential, it is understood that the contract price is set using avoided cost of diesel fuel. A concession (5% top-up) is incorporated into the agreement for reduced operation and maintenance of existing diesel generation assets, based on running diesel generators less often in the summer months.

3.11.3 Opportunities, barriers and next steps

In discussing GNWT's renewable energy efforts, it is believed that scaling up solar energy beyond current levels of support (most noticeably Lutsel K'e and Colville Lake examples) would contribute to a substantial rise in fixed costs for NTPC. While renewable energy technologies like solar PV reduce the diesel load required for each community's microgrid, they are also perceived to cut into NTPC's primary source of revenue — selling power from its diesel generator assets. But since these projects fulfill a mandate to support clean power, as well as offering sustainability and reducing environmental impact, funding for such renewable energy projects is justified.

[146] Arctic Energy Alliance (AEA) is an independent, non-profit organization that delivers key energy efficiency and renewable energy programs for NWT communities. GNWT is a primary funder of AEA programs.

[147] Northwest Territories Power Corporation, *Customer Information Net Metering: Things you should know* (2014). http://www.ntpc.com/docs/default-source/default-document-library/ntpc-net-metering-13-08-14.pdf?sfvrsn=2

[148] Ibid, 1-2.

Transitioning from one-off capital funding of projects to guaranteeing higher PPA rates, above and beyond avoided cost of diesel fuel, is necessary to support high-penetration renewable energy projects at scale. But from GNWT's perspective, higher rates will require federal intervention via instruments such as tariffs, subsidies, and tax or production incentives.

3.12 Nunavut

Nunavut's power sector is regulated and owned by the territorial government. While a majority of Nunavut is self-governing, power generation and delivery is the responsibility of the Nunavut territorial government. The Qulliq Energy Corporation Act regulates the responsibilities and authority of Nunavut's publicly owned utility, Qulliq Energy Corporation (QEC). It includes a clear objective "to plan and provide for Nunavut's long term needs for affordable energy … [with] desire to enhance energy self-reliance and to conserve energy and energy resources".[149] The Utility Rates Review Council Act delegates authority to a Review Council with membership of Nunavut Government ministers for regulating electricity rates and tariffs charged by QEC.[150]

QEC owns and operates all diesel generator assets and transmission and distribution lines. Diesel fuel is either purchased from the Government of Nunavut's Petroleum Products Division or directly from suppliers who deliver fuels by barge. With the vast distances fuel must travel to communities throughout Nunavut, fuel cost is by far the highest of all remote communities in Canada. Electricity costs range from $0.60 to as high as $1.14 per kWh.[151]

3.12.1 Context of power in remote communities

All of Nunavut's 25 communities are remote, and rely on diesel fuel for power generation. To keep electricity rates affordable for Nunavut community residents, the government operates the Nunavut Electricity Subsidy Program, which provides a subsidy at 50% of the Iqaluit rate which turns out to be around $0.60 per kWh. In addition, all residents who live in public housing (52% of the Nunavut population), have

[149] Government of Nunavut, *Qulliq Energy Corporation Act* (2010). http://www.gov.nu.ca/sites/default/files/gnjustice2/justicedocuments/Consolidated%20Law/Current/634231687118284402-1979138454-consRSNWT1988cN-2.pdf

[150] Government of Nunavut, *Utility Rates Review Council Act* (2010). http://www.gov.nu.ca/utility-rates-review-council-act-consolidation

[151] *State of Alternative Energy in the Arctic*, 37.

rates capped at $0.06 per kWh.[152] As such, electricity is dramatically subsidized by government, thereby perpetuating diesel fuel consumption and reducing the imperative to support clean power projects.

3.12.2 Clean power purchase

3.12.2.1 Motivation for change

The Government of Nunavut developed its energy strategy (*Ikummatiit*) in 2007. It contains several strategic objectives to improve energy system security, reduce reliance on fossil fuels, manage costs, reduce environmental impact and provide new business and job opportunities through energy efficiency and renewable energy development.[153] This policy statement was the guiding framework for recent decisions to develop net metering and IPP policies for clean power in the territory. Currently, the Qulliq Energy Corporation Act[154], which governs the utility and its central role in power generation and delivery in the territory, does not allow non-QEC entities to generate power.

Several other pillars of support for clean power projects are developing in Nunavut, including Nunavut's 2014-2018 strategic development which captures the principle of economic growth through use of both renewable and non-renewable (local) resources. Guiding principles includes "respect and care for the land, animals and the environment".[155]

3.12.2.2 Policy and program details

In 2013, QEC started looking into net metering policy options for offsetting load with renewable energy like solar PV, and more recently, at IPP policies for larger clean projects. The net metering policy discussion covers technical, legal and financial dimensions. An interconnection guide specifying the technical aspects of the policy was submitted to QEC's Board of Directors and approved in 2016. The net metering program would support the installation of alternative energy up to 10 kW with additional limits based on individual communities. Legal and rate discussions are on-going. Legislative changes will be required to open up power generation to third parties, both for net

[152] Ibid, 38.

[153] Government of Nunavut, *Ikummatiit: The Government of Nunavut Energy Strategy* (2007), 5. http://www.gov.nu.ca/sites/default/files/ikummatiit_energy_strategy_english.pdf

[154] *Qulliq Energy Corporation Act.*

[155] Nunavut Energy, *Guiding Principles* (2016). http://www.nunavutenergy.ca/sites/default/files/files/About%20Us%20Section/Guiding%20Principles%20Poster.pdf

metering and IPP polices. Rates, in terms of net metering compensation, are also to be determined.[156]

The Government of Nunavut has yet no net metering contracts or power purchase policies in place for its 25 remote communities.

3.13 Federal government and national efforts

In Canada, the federal government has in the past encouraged grid-tied renewable energy development through production incentive programs, such as the Wind Power Production Incentive (WPPI) Program[157] and the ecoENERGY for Renewable Power[158] (the follow-on program to WPPI), both offered by NRCan and have now lapsed. The programs offered a production incentive of approximately $0.01 per kWh of wind power produced for WPPI and all renewable energy sources for the ecoENERGY program for grid-tied applications. The WPPI program was helpful in encouraging the wind industry, especially in Alberta. The ecoENERGY program received significant attention and was over-subscribed when it was not renewed.

Specifically supporting Indigenous communities in clean power projects, the federal government has provided funding through several departments, including NRCan's ecoENERGY for Aboriginal and Northern Communities program and INAC's Community Opportunity Readiness Program. The federal government also provides loan support, such as through various business programs targeting Indigenous entrepreneurs, and research and development support through programs including Sustainable Development Technology Canada.

In August 2016 NRCan announced the Energy Innovation Program.[159] The program's objective is to support energy technology innovation, while its second stated goal is reducing diesel use by industrial operators in northern and remote communities.

Commencing in 2015, the Premiers' Canadian Energy Strategy[160] includes an explicit component on tackling diesel fuel reliance in remote, off-grid communities with the

[156] Taufik Haroon, personal communication, June 27, 2016.

[157] Natural Resources Canada, "Wind Power Production Incentive Contribution Program." http://www.nrcan.gc.ca/plans-performance-reports/rpp/2015-16/17057

[158] Natural Resources Canada, "ecoENERGY for Renewable Power." http://www.nrcan.gc.ca/ecoaction/14145

[159] Natural Resources Canada, "The Energy Innovation Program: Clean Energy Innovation." https://www.nrcan.gc.ca/energy/science/programs-funding/18876

intent of providing clean, affordable and reliable access to energy to all Canadians, not just those that are connected to the grid. In July 2015, a Pan-Canadian Task Force consisting of all provinces and territories was created to tackle diesel fuel dependence in remote communities.[161]

In 2016, the federal government announced a $10.7 million budget over two years for INAC to implement renewable energy projects in off-grid Indigenous and northern communities, intended to reduce their reliance on diesel and other fossil fuels for energy production. [162] Another $129 million over five years was dedicated to NRCan to support clean power policies and programs.[163] In March 2016, U.S. and Canadian leaders shared their common vision and support to advancing clean energy — wanting clean energy alternatives to powering Arctic communities with diesel power plants.[164]

[160] Canada's Premiers, *Canadian Energy Strategy* (2015) http://www.canadaspremiers.ca/phocadownload/publications/canadian_energy_strategy_eng_fnl.pdf

[161] Government of Ontario, "Provincial & Territorial Ministers Working Together to Reduce Use of Diesel for Electricity in Remote Communities," media release, July 21, 2015. https://news.ontario.ca/mei/en/2015/07/provincial-territorial-ministers-working-together-to-reduce-use-of-diesel-for-electricity-in-remote.html

[162] Indigenous and Northern Affairs Canada, *Budget 2016 Highlights — Indigenous and Northern Investments* (2016). https://www.aadnc-aandc.gc.ca/eng/1458682313288/1458682419457

[163] Ibid

[164] World Wildlife Fund, "Two powerful new allies join WWF for a thriving Arctic," March 16, 2016. http://blog.wwf.ca/blog/2016/03/16/trudeau-obama-join-wwf-for-a-thriving-arctic/

4. Power purchase policy examples – International

There are a few notable countries outside Canada where government and utilities are moving forward with clean power purchase for remote communities. This section summarizes a few jurisdictions and the policies and programs they have implemented.

4.1 U.S.: Alaska

Alaska's power sector is regulated by the Regulatory Commission of Alaska under mandate of the Alaska Public Utilities Regulatory Act[165], which establishes a legal framework for public utility regulation.[166] This Act regulates who may operate as an electric utility and the rates they may charge to customers. It also gives electric utilities the authority to purchase power from IPPs at mutually agreed-upon prices, in considering several guiding objectives. These are defined by the Regulatory Act, and include conservation, energy efficiency considerations and equity of rates among different types of customers.[167]

While Alaska still owns several hydroelectric projects and a significant electric transmission line (Alaska Intertie)[168], all other power generation, transmission and distribution is owned by a mix of investor-owned, co-operative and public utilities (owned by municipalities).[169] The Alaska Power Association is the industry organization that represents Alaska's electric utilities. Member utilities include Southeast Alaska

[165] Government of Alaska, *Alaska Public Utilities Regulatory Act* (2015), http://www.akleg.gov/basis/statutes.asp#42.05.141

[166] Robert Pickett, *Electric Utility Regulation in Alaska* (2008). www.lawseminars.com/materials/08ENAK/enak%20m%206%20Pickett%2011-14.doc; Regulatory Commission of Alaska, "Electric – overview." https://rca.alaska.gov/RCAWeb/ForConsumers/Electric.aspx

[167] *Electric Utility Regulation in Alaska*, 2.

[168] Alaska Energy Authority, "Owned Assets." http://www.akenergyauthority.org/EnergyInfrastructure

[169] Jill Erin Maynard, *Factors Influencing the Development of Wind Power in Rural Alaskan Communities,* Master of Science Thesis, University of Alaska Fairbanks (2010). http://www.uaf.edu/files/rap/Maynard-thesis.pdf

Power Agency, several municipal utilities, and co-operatives such as the Cordova Electric Co-operative.[170]

The Alaska Energy Authority (AEA), an independent corporation, is Alaska's acting energy office and leading agency for energy policy, program development and delivery. It was established by the state legislature in 1976 with a mandate to develop energy resources and diversify the local economy. In the 1990s, Alaska furthered this mandate to increase the state's share of renewable energy generation for heat and power. This was partially accomplished by establishing the AEA's role as owner and operator of several key state-owned electricity generation assets, and as manager for key remote community electricity and heat programs.[171] The AEA also developed several programs focusing on energy efficiency, renewable energy and emerging technologies, including the Renewable Energy Fund, the Emerging Energy Technology Fund, and the Power Cost Equalization Program.

4.1.1 Context of clean power in remote communities

There are approximately 170 communities in rural Alaska[172] with a population of just over 60,000 people; 78% of which are Alaska Native (Indigenous).[173] These communities are served by local electric utilities, and are not connected to Alaska's Intertie transmission system.[174] Instead, diesel fuel is used to generate electricity in most remote communities. The cost of energy is a significant contributor to total cost of living in these remote regions, where fuel costs for heating and electricity generation can be up to 92% higher than in Anchorage.[175]

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[170] Alaska Power Association, "Members of Alaska Power Association" (2015). http://alaskapower.org/members

[171] "Owned Assets."

[172] Sydney Kaufman, "Microgrids and the Arctic," presentation to National Association of State Energy Officials, February 11, 2016, 6. http://energyoutlook.naseo.org/Data/Sites/8/media/presentations/Kaufman.pdf

[173] Scott Goldsmith, *Understanding Alaska's Remote Rural Economy* (University of Alaska Anchorage, 2008), 1. http://www.iser.uaa.alaska.edu/Publications/researchsumm/UA_RS10.pdf

[174] Nearly 75% of the state's population is served by electric utilities connected to the Alaska Intertie. Alejandra Villalobos Melendez and Ginny Fay, *Energizing Alaska: Electricity Around the State*, Research Summary No. 73 (University of Alaska Anchorage, 2012). http://www.iser.uaa.alaska.edu/Publications/2012_07-RS-EnergizingAlaska.pdf

[175] *Understanding Alaska's Remote Rural Economy.*

The cost of electricity for these remote communities range from $0.30 to more than $1 per kWh (US$).[176] The Power Cost Equalization program subsidizes otherwise very high electricity and heat costs in remote communities with an equalization payment to the responsible utility companies; the Regulatory Commission of Alaska determines which utilities (in remote communities) are eligible for the equalization payment. In 2011, 191 communities participated in the program. [177]

The goal is to "equalize" high costs of electricity in rural communities to approximate lower costs in more urban areas.[178] Community buildings are eligible, whereas government and commercial buildings are not. The equalization payment amount is unique to each community and is based on the cost of fuel (including transportation) and overhead expenses (such as salaries for local utility workers). Payment is also conditional upon various prerequisite community activities, including energy conservation, and requires utilities to generate electricity from non-diesel fuel sources.[179]

4.1.2 Clean power purchase

4.1.2.1 Motivation for change

Alaska has a history of developing and powering remote communities with local fossil fuel, but within the last five years the state has started to significantly introduce renewable energy sources. As a large share of the state economy is linked to volatile oil prices, electricity costs for remote communities are high. Before the 1970s most remote communities were without power. The AEA, with funding from oil revenues, helped create electrification grants, and fund construction of electric power generators and distribution infrastructure. These projects focused on connecting customers and keeping cost of energy affordable, not incenting energy efficiency or clean power.

[176] Ginny Fay, Alejandra Villalobos Melendez, Corinna West, *Alaska Energy Statistics 1960-2011 Final Report* (University of Alaska Anchorage, 2013), 8. http://iser.uaa.alaska.edu/Publications/2013_12-AlaskaEnergyStatistics2011Report_Final_2014-04-30.pdf

[177] 170 communities are identified as "remote", which suggests the Power Cost Equalization program is not limited to these communities.

[178] Alaska Energy Authority, *Power Cost Equalization Program Guide* (2014), 5. http://www.akenergyauthority.org/Content/Programs/PCE/Documents/PCEProgramGuideJuly292014EDITS.pdf

[179] Ibid, 14.

In 1979, Alaska's first energy policy included principles of supporting local energy technologies, improving efficiency, making funds available and equitably distributing Alaska's oil-derived wealth. Oil price increases influenced this policy shift, which included consideration for clean and cheap power such as hydroelectric developments. These projects were thought to also fuel economic growth. By the 1980s plans included mention of biomass, solar, wind, geothermal, tidal and waste heat recovery.[180] From 1975 to 1985, the state had spent close to $1.7B on energy programs including hydroelectric infrastructure, and renewable energy pilot projects. Subsequent economic recession (due to declining oil prices) put pause to major investments, but lasting effects included the Power Cost Equalization program for subsidizing electricity cost, and hydroelectric and several renewable energy demonstration projects.

In 2003, the Alaska Energy Policy Task Force published the Statewide Energy Issues Overview, including recommendations for more energy efficiency, conservation and some alternative energy.[181] Concurrently, the 2004 Rural Energy Plan recommended that utilities follow best practices for cost-effective production and use of efficient technology, with guidance to the AEA on alternative energy, efficiency and training. Ultimately, Alaska's legislature established the Renewable Energy Fund (RE Fund) program, to be administered by the AEA, to fund renewable energy projects over five years at $50 million per year. House Bill 152, establishing the fund, still requires legislative approval to release funds to RE Fund selected projects.[182]

In confirmation of support for clean power, the state legislature subsequently passed the 2010 Declaration of State Energy Policy after significant input from public stakeholders. It had two significant goals: a 15% improvement in energy efficiency by 2020, and 50% of electricity generation from renewable energy sources by 2025.[183] And most recently in 2014, the legislature commissioned a study on how to deliver affordable energy to remote areas via mandate of the Alaska LNG project legislation.[184]

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[180] Energy policy developments are captured through sequential references to State Long Term Energy Plans.

[181] Alaska Energy Policy Task Force, *Statewide Energy Issues — An Overview* (2003). http://citeseerx.ist.psu.edu/viewdoc/download;jsessionid=8E0006803AFA961C77892C71288CA2AB?doi=10.1.1.174.2013&rep=rep1&type=pdf

[182] Alaska Energy Authority, *A Guide for Alaskan Communities to Utilize Local Energy Resources* (2009), 33-37. http://www.hud.gov/offices/cpd/about/conplan/energyplans/ak.pdf

[183] Gene Therriault, *Alaska Energy Authority Policy Overview,* presentation to the Rural Energy Conference (2013). http://www.uaf.edu/files/acep/2013_REC_Energy%20Policy%20Development_Gen%20Therriault.pdf

[184] The Alaska Affordable Energy Strategy specifically targets areas that do not have direct access to a North Slope natural gas pipeline. Neil McMahon, *Alaska Affordable Energy Strategy Update to Alaska Energy*

Preliminary results from the study, addressed as the Alaska Affordable Energy Strategy, identify significant opportunity for renewable energy (biomass, wind, hydro) and efficiency upgrades to diesel infrastructure (delivery and power generation).

4.1.2.2 Policy and program details

Alaska's legislature created the Renewable Energy Fund in 2008 with a five-year budgetary commitment, subject to legislative approval.[185] The AEA was given state authority to manage this fund, and was re-confirmed in 2012.[186] This is a granting program, and while it establishes a clear precedent for clean power development, it is not a power purchase policy. Grants awarded by the RE Fund do not necessarily favour or mandate IPP projects. Since 2008, the fund has granted more than US$250 million to renewable energy projects.[187]

The RE Fund is Alaska's main tool for supporting the development of clean power projects. It is a capital funding model and does not purchase electricity or enter in PPAs. The fund has operated for eight years and has been the main tool with which AEA achieves its mandate for increasing Alaska's share of renewable energy in heat and electricity production. The RE Fund has gathered long-term support from the state legislature because its thorough approach reduces technical and economic risks for a portfolio of clean power projects, and it avoids having to allocate funds to communities on a one-by-one basis. Instead, the AEA's approach systematically selects good projects every year, which are then funded as part of a portfolio. Funds were confirmed for two five-year periods, but the legislature is required to approve budgets annually.

The RE Fund uses a four-stage approach to selecting projects:

1. **Eligibility** — only utility projects, IPPs, municipal and tribal government, and non-profit projects are funded (effectively, excluding private proponents).
2. **Technical and economic analysis** — the AEA uses in-house energy modelling expertise to assess project economics and verify technical analyses (e.g., wind measurements and turbine icing data for wind energy projects).

Efficiency Partnership (Alaska Energy Authority, 2016). http://www.akenergyauthority.org/Portals/0/Policy/AKaES/Documents/AkAESEEPartnership063016.pdf?ver=2016-06-30-094238-983

[185] *A Guide for Alaskan Communities to Utilize Local Energy Resources*, 33-37.

[186] *Alaska Energy Authority Policy Overview*.

[187] Alaska Energy Authority, *Renewable Energy Fund Detailed Round Information* (2016). http://www.akenergyauthority.org/Programs/Renewable-Energy-Fund/Rounds#Round%201

3. **Ranking** — based on verified economic and technical analysis, the project is ranked on nine criteria including cost of energy by location, economic development and community capacity, and the top projects move to the final stage.
4. **State-wide distribution** —under-represented regions are prioritized based on past successful funding applications.

Projects that are supported by the RE Fund receive grants over the course of multiple years (rounds) as work progresses from project scoping to feasibility studies, conceptual design, finalization and construction. Funded projects are mostly in communities with highest cost of energy, as this is a top-weighted criteria in the ranking stage. Grants for clean power projects tend to support utility-sponsored projects, where the local utility (co-operative, public and private) is the proponent and works with the community and/or private developers. IPPs, such as the Delta Junction wind farm[188], are able to access grant money and establish a PPA with the local utility company.[189]

4.1.2.3 Setting a price for clean power

While the AEA does not operate a call for power or a standing offer program, the projects that are funded through the RE Fund are assessed for how they reduce the high cost of electricity. The economic models do so by weighing all costs against benefits, comparing business-as-usual (often diesel generation) and a clean power option. Clean power plant capital cost and replacement of electricity generators, significant repairs, and operations and maintenance overhead are weighed against savings from clean power displacement of diesel fuel purchase, reduced operation and maintenance, etc. The analysis includes a future price forecast for diesel fuel costs as landed in the community, and it incorporates a shadow carbon price, recognizing the environmental cost of fossil fuel power generation.[190]

The Delta Junction wind farm currently sells up to 2 MW of wind to Golden Valley Electric. However, it does so at US$0.10 to US$0.13 per kWh. The IPP argues this

[188] Delta Junction established itself as a local IPP along the main power transmission corridor between Fairbanks and Anchorage to sell electricity to the Golden Valley electric utility. While this project is grid connected, the IPP struggles with many of the same problems as remote community projects, including how to value electricity.

[189] Weston Morrow, "GVEA rejects Delta Junction wind farm offer," *Newsminer*, July 31, 2014. http://www.newsminer.com/news/local_news/gvea-rejects-delta-junction-wind-farm-offer/article_b4601d48-1882-11e4-8d14-0017a43b2370.html

[190] Sean Skaling, Alaska Energy Authority, personal communication, July 14, 2016.

amount does not reflect the cost of electricity that it replaces — diesel generators operating at up to US$0.35 / kWh. But in an article for 2015, the utility company disagrees, stating diesel generators are necessary for reliable power output, something that "wind simply can't provide".[191]

4.1.3 Opportunities, barriers and next steps

Until recently, the state government has been able to fund a majority of the projects selected by the AEA through the RE Fund program. Projects that meet selection criterion are typically funded, but a recent decline in oil revenue and corresponding economic downturn means that future projects will be funded through loans, not grants. This is, in most cases, not conducive to remote clean power business cases. For example, in Hoonah, Alaska, the Inside Passage Electric Co-operative received funding in 2013 to support a 450 kW run-of-river hydro project, Gartina Falls.[192] This project was granted funds for construction, slightly lowering the price of electricity in the community, but a phase two hydro project needs to borrow money. The loan will increase local utility rates, and most likely will not be supported by the community.[193]

The transition of the RE Fund from grants to loans in 2016 means that good projects will have to account for debt financing. This is challenging for communities that do not have the capacity or experience necessary to attract private investment or access many of the lending programs available at state and federal levels. Without a PPA policy where projects receive a price guarantee for electricity produced over a fixed term, project economics will continue to be challenged.

4.2 Russia

Russia's electricity sector has undergone a slow, but steady, process of de-regulation since 2003. The power sector is currently mostly de-regulated with close to 80% of power traded at market prices as of 2014. However, utility customers still purchase most power at rates regulated by each Russian state. While de-regulation progresses, remote

[191] "GVEA rejects Delta Junction wind farm offer."

[192] Inside Passage Electric Co-operative, *Gartina Falls Hydro Project* (2013). http://www.seconference.org/sites/default/files/Energy%20-%20Gartina%20Hydro%20Project%209-17-13.pdf

[193] Sean Skaling, Alaska Energy Authority, personal communication, July 14, 2016.

communities will remain an exception — meaning power generation and delivery in these communities remain regulated.

Russian power is regulated by the Ministry of Energy, implementing state policy, including transmission and distribution tariffs set by the Federal Tariff Service. This authority is defined by many individual pieces of legislation, forming the regulatory framework divided by the wholesale (de-regulated) and retail (regulated) markets.

4.2.1 Context of clean power in remote communities

Russia, with approximately 5,000 remote communities[194] mostly in the Russian Far East, Kaliningrad and Arkhangelsk regions, is not necessarily known for sustainable energy. More than 10 million people live in these isolated regions with a currently installed capacity close to 9.4 GW. [195] Although relatively small, more than 800 MW of existing and developing renewable energy capacity offsets diesel generation in remote communities. Its public utility company, RAO ES East, is responsible for remote power in hundreds of communities, served by close to 500 diesel generators with a total capacity of 670 MW. The cost of electricity may be up to US$1.50 per kWh. Given the significant cost of diesel delivery, the public utility has moved to invest in more cost-effective renewable energy sources, widely available across the remote parts of the country. This strategic decision coincides with directed action to reduce subsidies for diesel fuel use for power generation.

4.2.2 Clean power purchase

Russian federal law in 2003 required the government to adopt a national target for renewable energy, which it complied with in 2009 through a resolution to mandate 4.5 per cent of all electricity to be produced from renewable sources by 2020 — excluding large-scale hydro projects. The Russian Energy Forecasting Agency estimates more than 14 GW of new renewable energy capacity must be installed to meet this target.[196] Unfortunately, while there is political motivation to comply, there are no directed government programs or policies in place to ensure compliance. There is a contrasting

[194] Sydney Kaufman, *Microgrids and the Arctic* (U.S. Department of Energy, Bureau of Energy Resources, National Association of State Energy Officials, 2016). http://energyoutlook.naseo.org/Data/Sites/8/media/presentations/Kaufman.pdf

[195] International Finance Corporation, *Renewable Energy Policy in Russia: Waking the Green Giant* (2011). http://www.ifc.org/wps/wcm/connect/bf9fff0049718eba8bcaaf849537832d/PublicationRussiaRREP-CreenGiant-2011-11.pdf?MOD=AJPERES

[196] Ibid, 7.

story for isolated regions, where a series of government programs were implemented to integrated renewable energy from 1997 onwards.

The state owned utility RAO ES East is responsible for much of the power generation in the Far East remote regions. The recent rise in diesel fuel costs, combined with the federal mandate for renewable electricity, has triggered the utility to invest in clean power projects. The utility aims to construct 178 projects within five to seven years.[197] In doing so, it has calculated net-cost savings through reduced subsidies to fuel transport to remote communities, in addition to avoided fuel cost. Several projects have already been delivered including solar and wind power plants. Reduction in tariffs (subsidies) for diesel fuels was the only legislative barrier; it was resolved through agreement with the Regional Energy Committee responsible for such decisions.[198]

4.2.3 Opportunities, barriers and next steps

RAO East, the dominant publicly-owned utility responsible for power provision in communities for isolated regions, is acting on a national mandate for renewable energy and compelling business cases for clean power substitutes to diesel power plants. Its strategy includes winding down diesel fuel subsidies for delivery of fuel, while ensuring clean power is delivered in accordance with regulated rates per region. Since each region regulates rates (tariffs) separately, the viability of new clean power projects must be addressed by region.

Construction of 178 clean power projects will build support for new clean technologies, allowing RAO East to attract more investment and further reduce cost of power delivery in the long term. A leading project is the 1 MW solar PV power plant built near the Batagai communities in Verkhoyansk of the Sakha Republic, the largest single clean power project above the Arctic Circle. It is planned to scale the system to 4 MW.[199]

[197] Vladislav Vorotnikov, "Russia Turns to Sun, Wind to Improve Electricity Supply for Country's Far East," Renewable Energy World, October 9, 2015. http://www.renewableenergyworld.com/articles/2015/10/russia-turns-to-sun-wind-to-improve-electricity-supply-for-country-s-far-east.html

[198] Olga Dobrolyubova, "Renewable Energy in the Far East – A part of our everyday life," *Far East Capital* March 2014. Available at http://www.eastrenewable.ru/en/media/news/83/

[199] "Russia Turns to Sun, Wind to Improve Electricity Supply for Country's Far East."

4.3 Additional resources

4.3.1 Greenland and Nordic Countries

All of Greenland's 80 communities are remote, and a majority are accessible only by water and air in the summer, and dogsled in the winter. These communities generate their own power using diesel generators.[200] However, recent renewable energy projects are starting to displace some of the country's reliance on diesel fuel imports.

Nordic countries have a long-term approach for implementation of clean power projects driven through renewable energy and energy efficiency mandates, and available funding, at the European, national and regional level. The Nordic Council of Ministers sponsors project analysis and encourages joint approaches to implementation and research; for example, the Action Programme for Nordic Cooperation on Energy Policy (2010 to 2013). The Nordic Investment Bank also has a mandate to address clean power production and support climate mitigation work. Projects include offshore wind and hydro to reduce reliance on diesel generation.[201]

For example, a 22.5 MW hydro plant built near Illulissat, Greenland's third-largest community, completely replaces a heritage diesel power plant. Many other hydro projects have also been built or are in the pipeline. These projects utilize meltwater from permafrost layers and glaciers, where turbines are located as deep as 200 m below the surface.[202] Greenland is also supporting district heating infrastructure, as in the Qaanaaq settlement close to the North Pole.[203] The project utilizes waste heat from diesel generators to feed a small district heat loop augmented by fuel oil boilers; most of the heat would otherwise have been wasted.

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[200] Sydney Kaufman, *Microgrids and the Arctic* (U.S. Department of Energy, Bureau of Energy Resources, National Association of State Energy Officials, 2016). http://energyoutlook.naseo.org/Data/Sites/8/media/presentations/Kaufman.pdf

[201] Magdalena Muir, An integrated approach to Sustainable Energy Development (2012). http://arctic.ucalgary.ca/sites/arctic.ucalgary.ca/files/GL-Muir-Oct%202012-FinalEnglishVersion.pdf

[202] ABB, *Clean sustainable energy for Greenland* (2012). http://www.abb.com/cawp/seitp202/b08ea3b92dc74ac8c1257aaf0047543c.aspx

[203] State of Green, *Low Carbon Arctic Community, Qaanaaq in Greenland* (2009). https://stateofgreen.com/files/download/287

4.3.2 Australia

From 2002-2013, more than 130 clean power systems were installed through the BUSHLIGHT program in the Northern Territory, Western Australia and Queensland, Australia. This program built on the philosophy of enabling community livelihood opportunities through reliable and low-cost power projects. This program, offered by the Centre of Appropriate Technology, uses funds from the Australian government departments of Families, Community Services and Indigenous Affairs, and Environment and Water Resources. Unique to the program is a holistic approach to project development through to operation and maintenance. It ensures the projects are properly maintained throughout their life and that the community is properly trained and consulted.[204]

[204] Centre for Appropriate Technology, *The Bushlight Renewable Energy System Installation and Maintenance Program – Quality, Cost and Outcomes* (2007). http://solar.org.au/papers/07papers/Paper49.pdf; Australian Indigenous HealthInfoNet, *Bushlight* (2015). http://www.healthinfonet.ecu.edu.au/key-resources/programs-projects?pid=3014; Centre for Appropriate Technology, Bushlight Energy Archive (2014). http://www.cat.org.au/bushlight-archive/

5. Observations, challenges, opportunities and next steps

This section of the report summarizes key information, and identifies and articulates observations and key trends related to power purchase policies for remote communities.

5.1 Key observations and trends

Of the almost 260 remote communities throughout Canada that have microgrids predominately served by utilities, only a very small number have developed clean power projects and are selling the power to utilities through some form of PPA contract. According to the information available for this research, only 12 remote Indigenous communities with microgrids (less than 5% of the total) have active PPAs. This number increases to only 18 communities when projects that are under development are included. Table 4 summarizes the jurisdictions that have remote communities with PPAs.

Table 4: Jurisdictions that have remote Indigenous communities with power purchase connections

Jurisdiction	# of remote Indigenous communities	# with PPAs (including net metering connections)	Project types
B.C.	25	4 current 3 developing	Micro-hydro Solar Biomass
Alberta	7	0 current	N/A
Saskatchewan	1	0 current	N/A
Manitoba	4	0 current	N/A
Ontario	25	7+ current 2+ developing	Assumed solar
Quebec	19	0 current	N/A
Newfoundland and Labrador	16	0 current	N/A

Jurisdiction	# of remote Indigenous communities	# with PPAs (including net metering connections)	Project types
Yukon	21	0 current 1 developing	Wind
NWT	26	1 current	Solar
Nunavut	25	0 current	N/A

Other clean power projects in remote communities— both operational and pilot projects that utilities have developed themselves — are worth mentioning. These include Colville Lake's solar project (owned and operated by NTPC), Nalcor's wind-diesel system (Ramea Island, Labrador) and some pilot projects being undertaken by Manitoba Hydro.

5.1.1 Successful policy types

The findings from this research indicate only a small number of the various forms of power purchase policy mechanisms are available for remote Indigenous communities. These are standing offer program (SPO)-like policies and net metering programs. These have either been formally introduced via legislation, or informally released through policy documents. While a few jurisdictions including Ontario, B.C., Yukon, NWT and Nunavut have implemented clean power purchase policies in recent years, specific details around PPA contracts, including terms and rates, are not available. Further, research indicates that no RFP, contract for difference, production incentive or RPS policies specific to remote communities are offered in any Canadian jurisdiction.

In addition to the select few policies used as price-based mechanisms to support clean power projects, there are a few notable government grant funding and financial support programs that have helped advance the transition of clean energy systems for remote communities. These funding programs fill a gap that IPP policies cannot fill. These are all discussed in Section 5.1.1.2.

Successful power purchase policies have followed three approaches, which are not necessarily mutually exclusive:

- **Creating an enabling regulatory environment** – Governments create an enabling but not obligatory environment through clean power purchase through legislated regulations.

- **Government-driven policy (and/or program implementation)** – Governments guide the development of clean power projects through policy documents, announcements or programs but not legislation.
- **Utility-driven policy (and/or program implementation)** – Utilities guide the development of clean power projects through policy documents, announcements or programs but not legislation.

5.1.1.1 Creating an enabling regulatory environment

Government legislation and regulation that delegate authority to utilities and regulating bodies can create an enabling, but not compulsory, environment for clean power purchase. These acts and regulations may include objectives and mandates for clean power projects, for utilities to purchase clean power, or for governments to account for full cost-benefits when making asset investment and/or upgrade decisions (e.g.. the Alaska RE Fund). For example in B.C., the BC Hydro and Clean Energy Act encourage the public utility to work with remote communities to develop clean power projects. Subsequently, BC Hydro's Remote Community Electrification Program (RCEP), which resulted in BC Hydro acquiring many of the remote grid assets, allows the utility to strike PPA deals with local IPPs for clean power.

Acts and regulations for clean power purchase, however, do not always specifically target remote communities, and in some cases even exclude them because of eligibility requirements. When open to remote communities, they may offer terms that are not favourable to developing clean power projects. In Alberta and Manitoba for example, provincial regulations allow IPPs to sell power to utilities, but the terms are not economically favourable and no projects have been developed.

5.1.1.2 Government-driven policy and programs

Government may guide the development of clean power projects in addition to creating an enabling environment, but may do this without using legislation. Guiding may include consultations with utility, community and developers (among other key stakeholders) and formalizing findings, with key recommendations and planned actions, in strategy documents. Governments have also been successful in creating arm's-length agencies with mandates to advance clean energy agendas; an example of this is the NWT Arctic Energy Alliance.

NWT and Yukon both have strategy documents that include biomass, solar and wind energy actions. Yukon has gone one step further by publishing a policy to specifically support IPP projects, including three categories of application (small and large grid-

connected projects, and unsolicited microgrid projects). Unfortunately, the IPP policy makes it difficult for remote communities to participate because of concerns this would negatively impact microgrid reliability.

In NWT, NTPC has already signed a PPA with one remote community, Lutsel K'e, based on open discourse and negotiation but without a formalized IPP policy. These are negotiated as part of the PPA settlement process. Nunavut has recently developed a net metering policy and is in the early stages of considering an IPP policy.

Net metering policies[205]

Even though these policies are geared towards small-scale systems, a few governments and utilities have created (or are in the process of creating) net metering policies for remote Indigenous communities. Most notably, these include Ontario's REINDEER program, and programs in Yukon, NWT and Nunavut (in the final stages). Most net metering programs typically limit the size of the clean power projects to less than 10 kW (25 kW in the case of Yukon net metering program for single transformers). Based on much larger diesel generator capacity in most remote communities, it would take many net metering projects to make any significant change in the percentage of clean power on the microgrid. Some programs also roll over excess production as a credit to next month's bill. While some offer payouts at the end of the year, most expire credits — meaning any excess generation cannot be rolled over to the next year. Other variations include who is responsible (either utility or PPA proponent) for connecting the net metering components to the grid and possible upgrades to infrastructure.[206]

Catalyst / funding programs

Although not power purchase policies, both the Alaska RE Fund and the B.C. RCEP program are excellent examples of programs that have the ability to catalyze clean power projects in remote Indigenous communities. Of note as well is GNWT's Community Renewable Energy Program, which was instrumental in developing three projects in the territory.

Alaska's RE fund is an "electrification granting program" and was critical in developing a large number of projects throughout Alaska. The program has invested US$250 million since its start in 2008, providing not just capital money for systems, but also funding for

[205] Note that there are examples of net metering programs also being developed by utilities

[206] Navigant, *Net Metering Standard Industry Practices Study* (2014). http://www.nr.gov.nl.ca/nr/energy/electricity/net_metering_study.pdf

the various development stages — something that is critical for overall project life cycle success. However, because of the downturn in government oil revenues (which funded the program), the RE Fund has switched from providing grants to providing loans. This has made the RE business case much more challenging since projects now need to account for debt financing, and not as many projects are being developed.

The B.C. RCEP program launched in 2008 supported the transition of electricity generation and ownership from 14 community diesel systems to BC Hydro and opened the door for the possibility of clean energy generation and IPPs through the BC Hydro Act. Before the RCEP program, there was no specific policy to support IPPs in remote communities. Although B.C. has a micro-SOP policy applicable to First Nations and smaller communities, this program is incompatible with remote communities (because of low rates offered and guarantee of purchasing power) and hence connections rules had to default to BC Hydro Act.

Of note as well is the investment by the Newfoundland and Labrador government of $250,000 in NL Hydro for studying the potential for clean energy alternatives including small hydro, wind, solar and biomass facilities to reduce reliance on diesel generators in remote, off-grid Labrador communities.

5.1.1.3 Utility-driven policy and programs

In Canada, Ontario's H1RCI is the only utility to offer a formalized IPP program specifically targeting clean power generation in remote communities. The REINDEER program is based on Ontario's SOP program and offers very specific terms and contract rates for PPA contracts. It was developed to replace Ontario's FIT and microFIT programs as these were not available to remote communities.

Other utilities, including those in NWT, Manitoba, Saskatchewan and B.C., continue to work towards clean power projects in remote communities via internal (utility-owned) efforts, but do not openly solicit and offer formalized programs or policies to purchase clean power from IPPs.

Table 5 summarizes the different jurisdictions researched and the policies that support clean power projects for remote Indigenous communities.

Table 5: Provincial / territorial governments with power purchase policies developed for remote Indigenous communities

Jurisdiction	Description	IPP Type	Enabling Acts and Regulations	Supporting policies/program	PPA contract rates	Highlights
B.C.	Rural Community Electrification Program	Funding Transition Program	N/A	2007 Energy Plan, Policy Action 27	N/A	• Program established to help reduce costs and increase reliability of remote microgrids • Program resulted in 14 remote communities to come under the BC Hydro banner and the subsequent development of four active PPAs with remote First Nations and three in current negotiations
	IPP connection	SOP-like (based on B.C.'s micro-SOP)	Hydro and Power Authority Act; Clean Energy Act	2007 Energy Plan	Avoided cost of diesel (10-year historical cost) + capacity payment (where applicable), ~ $0.30 / kWh	• Although micro-SOP does not exclude First nations, the program is incompatible with them because of clause to unconditionally buy power • IPP projects with First Nations are approached on an ad-hoc basis
Alberta	Alberta's deregulated market supports general IPP's	IPP policy through Alberta's Deregulated market	2003 Electric Utility Act	None	Based on wholesale market prices	• Although the deregulated market supports IPPs, there are no specific policies to support remote communities • However, with new provincial government and their Climate Leadership Plan, there is renewed interest in developing policies to support and include First Nation communities in clean power projects
	Micro-generation connection	Net metering	2008 Micro-generation Regulation	None	Based on retail rate	• Not applicable to remote First Nation communities

Jurisdiction	Description	IPP Type	Enabling Acts and Regulations	Supporting policies/program	PPA contract rates	Highlights
Saskatchewan	IPP connection	Call for Power; SOP	Power Corporation Act	None	N/A	• Developed FNPA to help First Nations develop clean power projects
Manitoba	Non-Utility Generation (IPP connection)	SOP	Manitoba Hydro Act	2013 Corporate Strategic Plan	Based on standardized residential rate, ~ 0.07 / kWh	• Restricted to very small project sizes – 10kW or less • Purchase rates are very low at $0.07 / kWh (set to Standard Residential Rate) and are very challenging to make economics work
Ontario	REINDEER program – net metering stream	Net metering	2009 Green Energy Act	None	Based on building rate tier	• Designed to fill the gap of the FIT and microFIT program that was not available to remote communities • Small uptake (~ seven) in net metering projects in Ontario • Preferred over stand-alone program because projects are connected to buildings which are charged high Standard-A rates (~ $1.00 / kWh)
	REINDEER program – stand-alone	SOP	2009 Green Energy Act	None	Avoided cost of diesel (3-year historical cost) ~ $0.24 - $0.70 depending on community	• Designed to fill the gap of the FIT and microFIT program that was not available to remote communities • Two stand-alone project with some larger projects currently in review
Quebec	IPP connection	Call for Power	Hydro-Quebec Act	2030 Energy Policy	N/A	• Precedent for procurement of wind energy from IPPs through competitive process • Strong interest in Nunavik region for small hydro projects

Jurisdiction	Description	IPP Type	Enabling Acts and Regulations	Supporting policies/program	PPA contract rates	Highlights
NFLD and Labrador	N/A	N/A	N/A	None	N/A	• Renewable resource potential studies • Wind-hydrogen-diesel technology pilot project (Ramea Island)
Yukon	Net metering policy	Net metering	Yukon Public Utilities Act (amendments)	2009 Energy Strategy	Full retail rate $0.30 / kWh (for excess electricity)	• Restricted to very small project sizes – 5 kW or less • Can go up to 25 kW with utility approval (for single transformers) • Residents can apply for a 20% rebate (up to $5,000) to install a net metering system
	IPP policy	SOP; Call for Power; Unsolicited proposal			Avoided cost of diesel	• Goal of establishing 10% of electricity demand provided by IPPs • At least half of IPP projects incorporate some share of First Nation ownership
NWT	Net metering policy	Net metering	N/A	2007 Energy Plan 2013 Energy Action Plan	Full retail electricity rate	•
	IPP policy (very informal)	Unsolicited proposal	N/A	2007 Energy Plan 2013 Energy Action Plan	Avoided cost of diesel plus 5%	• Although there is one remote community with an IPP, there is no formal IPP policy released by the NWT government • Grants are effective for small community clean power projects
	Community Renewable Energy Program	Capital grant funding program	N/A		N/A	
Nunavut	Net metering	Net metering	Not complete	2007 Ikummatiit Energy Strategy	In discussion	• Restricted to small project sizes – 10kW or less; 8% of minimum summer load total program cap per community

Jurisdiction	Description	IPP Type	Enabling Acts and Regulations	Supporting policies/program	PPA contract rates	Highlights
	IPP policy (in preliminary stages)	Unknown	Not complete	2007 Ikummatiit Energy Strategy	N/A	• No information available at this time
Alaska	Nothing specific to remote communities, but general IPP policy for all utilities in Alaska	General IPP connection policy	Alaska Public Utilities Regulatory Act	2010 Declaration of State Energy Policy	Competitive electricity price paid by utility	• IPP model is successful when proponents have needed local capacity to develop clean power projects
	Renewable Energy Fund * Not a power purchase policy, but worthy to include	Capital grant funding program	House Bill 152, State Legislature of Alaska (2008)	2003 Energy Policy Task Force – Statewide Energy Issues overview	N/A	• $50M investment / year over five years. Second five year term of program • Help catalyze deployment of many renewable energy projects • Program is shifting from grants to loans because of lower revenues from oil and gas sector

Figure 5 shows the different power purchase policies and program implemented by provinces and territories. While some power purchase policies are favourable for remote communities, some are unfavourable and restrictive. Highlights include:

- Yukon IPP – while they have a policy, the IPP policy for remote communities is 'unsolicited' approach. Yukon government doesn't want to formalize a policy that would jeopardize the reliability of microgrid with policies that support power generation without capacity constraints, turn-down requirements, etc.
- Alberta IPP – deregulated market; anyone can produce power. However, power pool price is too low to make project economics work. Also, significant hurdles (and learning) remain to get through to get a project off the ground, requiring knowledge of future power prices, contracting, going through the application process of becoming a generator, etc.
- Alberta net metering – retail price is tied to Power Pool price and too low, only the on-site consumed portion of micro-generator energy is credited at the full retail rate. A smaller (energy-only) credit for excess generation applies.
- Manitoba IPP – have a non-utility generator policy (support IPP), but rate is too low ($0.07 / kWh)
- Quebec IPP – have struck PPAs with wind developers (grid-tied), but utility does not see business case (but have done studies for small-scale hydro).

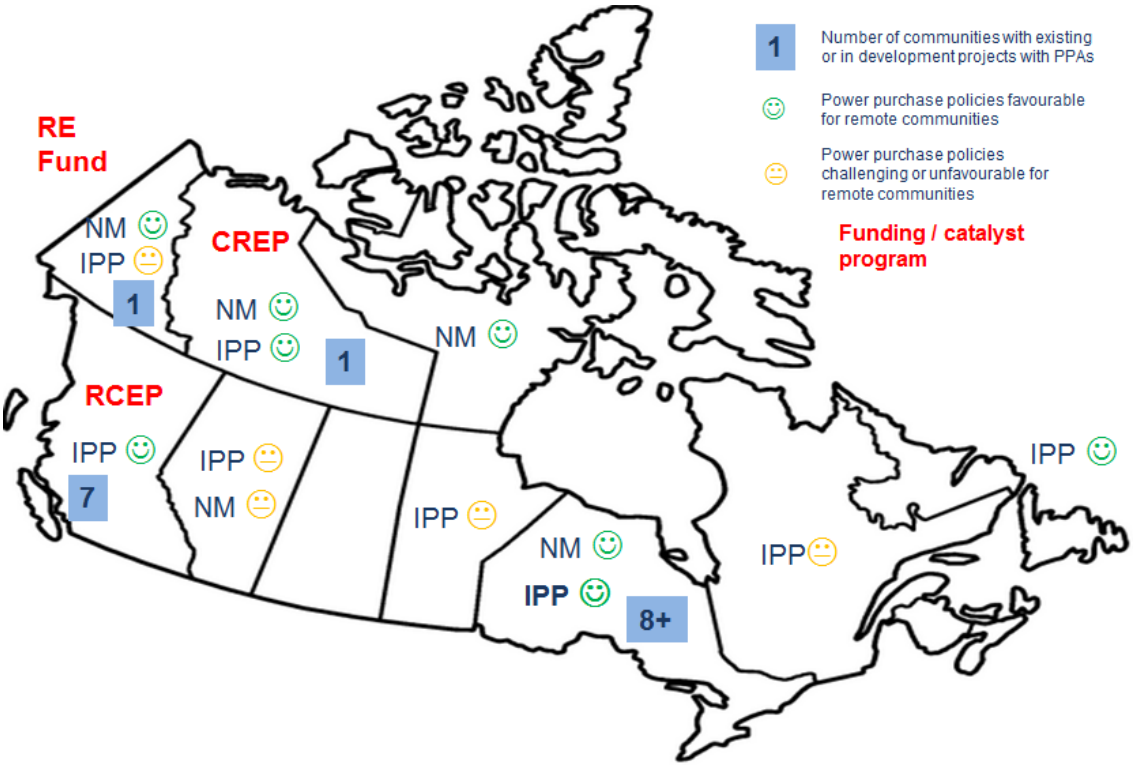

Figure 5: Summary of provincial / territorial power purchase policies

5.1.2 PPA contract rate design

PPA rates ($ / kWh) at which utilities are willing to enter into contract with IPPs are, for the most part, based only on the avoided cost of diesel to the utility. Generally, utilities average the cost over past years to account for fluctuations in the commodity prices.

Ontario's formalized REINDEER program has some of the highest rates available — the highest being $0.70 / kWh with average rates around $0.41 / kWh. Other rates that utilities are willing to enter into contract are generally around $0.30 / kWh, with Manitoba being the lowest at $0.07 / kWh (the standardized residential rate).

Three jurisdictions offer a utility rate that is slight above and beyond the avoided cost of diesel approach:

1. **B.C. PPA rate** – B.C. has a capacity payment that is added onto the standard PPA rate, which accounts for not having to turn on the local diesel generator(s) when clean power is sufficient to meet load requirements. This capacity payment is determined by analyzing historical diesel power plant operations and maintenance data.
2. **NWT IPP policy** – Their one PPA contract is based on avoided cost of diesel but adds a 5% "top-up" as an acknowledgment that there are lower operation and maintenance costs on the diesel system when less fuel is burned.
3. **Alaska RE Fund** – The economic model to evaluate the various clean tech project applications takes into account capital cost and replacement of diesel electricity generators. This includes the full net-cost of investment, operation and decommissioning or salvaging of the diesel power plant-related capital assets. Unfortunately, such is not a common practice, and specifically not included in PPAs as signed by BC Hydro and NTPC. Very few IPP policies include the future capital replacement and upgrade costs of diesel assets, because utilities (often reinforced by community perspectives) are unwilling to compromise the reliability of electricity supply — as perceived to be offered by complete diesel power plants. This establishes a difficult precedent to overcome in remote Indigenous communities.

Generally, PPA contract rates based on avoided cost of diesel are still too low to make clean power project economics work. Even though PPA rates are guaranteed and backed by the government, the revenue from selling electricity is too low for project proponents to find appropriate debt financing or secure investment financing. This is especially true for projects in northern climates where project economics are even harder due to weather and scarcity of labour and construction resources.

5.2 Main drivers for IPP policy success

Six common factors stand out as having successfully influenced provincial and territorial governments in the development of power purchase policies.

Energy strategies and energy acts

Clear leadership and direction from governments can be seen in overarching energy strategies focusing on climate change mitigation, reduction of environmental emissions and the adoption of cleaner energy systems for remote communities. Messaging around adopting more environmentally friendly technologies, increased use of renewable technologies, increased energy diversification and energy targets is apparent in many recent government energy strategies. Noteworthy energy strategies include the B.C. Energy Plan, Alberta's Climate Leadership Plan, Manitoba Hydro's 2013 Corporate Strategic Plan, Ontario's Long-term Energy Plan, Yukon's 2007 Energy Strategy, NWT's 2007 Energy Plan and subsequent Biomass and Solar Energy Strategies, Quebec's 2030 Energy Policy and Nunavut's 2007 Energy Strategy.

Many energy strategies also have mandates or goals for the amount of renewables to include in the energy generation mix; and although these may not specifically target remote communities, these are part of a robust energy strategy. Alaska's 2010 Declaration of State Energy Policy has a goal of 50% of electricity generation to come from renewables by 2025, which has been instrumental in the continued funding of Alaska's RE Fund. The B.C. Clean Energy Act (which implemented the Energy Plan), also calls for energy self-sufficiency and at minimum 93% of all electricity to be generated from RE sources, Alberta's Climate Leadership Plan calls for 30% renewable energy generation by 2030, and Quebec's 2030 Energy Policy includes a target of 25% more renewable energy projects. Ontario's Long-term Energy Plan includes connecting 21 of their 25 remote communities to the provincial grid which would be an enormous achievement in reducing diesel fuel usage in that province.

Most energy strategies result in legislation linked to the government's original policy decisions; including Ontario's 2009 Green Energy Act, B.C. 2007 Clean Energy Act, and Alberta's 2016 Climate Leadership Implementation Act (2016). These Acts provide the legal means for governments to mandate minimum outcome and behaviour, and guide decision-making processes among bureaucracy and private sector, including publicly and privately owned utilities.

Energy legislation also allows governments to implement and support pilot projects, feasibility studies and smaller granting programs within a larger, cohesive strategy.

NWT's Solar Strategy includes specific actions that call for pilot projects as well as supporting projects with specific criteria, such as a piloting solar integration into a microgrid at up 75% of a community's electricity demand. Newfoundland and Labrador's Energy Plan calls for several phases of feasibility studies to assess wind resources along the Labrador coast.

Relationships with Indigenous communities

Several jurisdictions have also directly indicated the need to foster and develop relationships with Indigenous communities related to clean energy. A key mandate of the B.C. Clean Energy Act is to "foster the development of First Nation and rural communities through the use and development of clean or renewable resources." SaskPower's Aboriginal Procurement Policy also encourages the utility to build relationships and acquire goods and services through First Nation communities. Although not clean energy focused, this policy can be seen as a good starting point for First Nation's to develop IPP projects. Ontario REINDEER program was a response to requests for a program similar to the FIT but targeting remote First Nation communities. Manitoba Hydro Corporate Strategic Plan includes strengthening relationship with Aboriginal people. Alberta's government has expressed interest in supporting First Nations in developing clean power projects through its Climate Leadership Plan.

Focus on decreasing environmental impacts associated with diesel fuel combustion

Many governments and utilities acknowledge the environmental risk associated with continued fossil fuel combustion, and corresponding GHG emissions and reduced air quality. These factors, along with the cost, risk and liability of transporting diesel fuel to remote communities, make a strong environmental justification to decrease fossil fuel usage. Implementing IPP policies that help with the implementation of clean power projects will directly reduce these environmental impacts. These goals are highlighted in provincial and territorial government approaches to clean power purchase policies including BC Hydro, H1RCI (Ontario), Newfoundland and Labrador, Yukon, NWT and Nunavut.

The risks and reality of climate change also has direct implications for the cost and reliability of electricity generation in northern and remote communities. Shortening winter road seasons make it logistically more challenging and costly to transport diesel to the north. There is also inherent risk in diesel spills occurring with unstable and shortened time of ice roads.

Utility mandate for safe and reliable electricity

Most government energy plans and legislation include mandates to provide remote communities with safe, reliable and affordable power. All jurisdictions studied in this research include this explicit mandate, including utilities in Alaska, and Canadian provincial and territorial governments.

Solar and small-hydro plants, and even small wind turbines, are robust and safe systems that require only minimal training to operate. When combined with smaller and efficient diesel generators, microgrid controls and energy storage, it is possible to reliably power a remote community without load restrictions or blackouts. For example, the diesel-solar hybrid microgrid in Colville Lake, Northwest Territory, was able to reliably power up to 75% of its community with solar during summer months.

Innovation and advancement of clean energy systems

The cost of solar and wind technologies has rapidly declined over the past two decades, and continues to do so as more systems using these technologies are installed.[207] Lessons learned from two remote clean power projects in NWT show that these technologies are capable of reducing reliance on diesel fuel. Several jurisdictions promote the innovation and advancement of clean energy systems including B.C.'s 2010 Clean Energy Act, Hydro-Quebec's 2030 Energy Plan and Yukon's IPP and net metering policies.

However, northern climates and remote access to communities mean that declining prices of clean energy system components can do only so much to reduce total system costs. Weatherization, transportation and unique engineering requirements means costs and technical requirements are higher in remote communities. These are surmountable barriers that can be overcome with project experience.

The Colville Lake (Northwest Territories) project uses latest energy storage and control technologies, while Labrador's Ramea island project integrates wind power with existing diesel generation, and project proponents plan for hydrogen energy storage to further reduce reliance on diesel fuel.

NRCan's announcement of the Energy Innovation Program shows the level of support the current federal government is ramping up on clean energy innovation and will help support larger remote clean energy projects.

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[207] Pembina Institute, *True price of wind and solar electricity generation* (2016). http://www.pembina.org/pub/true-price-of-wind-and-solar

Local economic development, job creation, and economic diversification

Governments that also use local economic development and job creation as a driver to advance clean energy policies include Alaska, Ontario, Quebec, Yukon and Nunavut. Clean energy projects that involve community members, and which may also be community-owned, may generate substantially more jobs and economic impact than connection to an integrated grid. One study shows these projects may create up to 2.8 times more jobs and 3.4 times economic impact compared to grid integration and utility scale projects.[208]

Yukon and Alaska governments are specifically interested in economic diversification. Whereas Yukon has historically relied on the mining sector to create jobs and provide government revenues[209], Alaska's economy is linked to the boom-and-bust cycle of oil and gas development[210]. With reduced government budgets and fewer available jobs, both economies have indicated a desire to develop local and renewable energy resources in order to reduce overall energy costs and create local jobs.

5.3 Challenges and barriers

The following is a summary of the main challenges and barriers identified in this research that require further efforts to advance power purchase policies and the effectiveness of these policies.

Legislative and regulatory barriers

Existing legislation (including regulations) may prohibit publicly owned utilities from purchasing power from IPPs simply because the legislation was designed to regulate an existing utility monopoly. For example, Nunavut's Qulliq Energy Corporation Act does not allow non-QEC proponents to generate power. Legislative changes are required to

[208] John Farrell, *Advantage Local: Why Energy Ownership Matters* (ILSR, 2014). https://ilsr.org/report-advantage-local-clean-energy-ownership-matters/

[209] Lisa Wright, "Miners descend on Toronto amid brutal market downturn," *Toronto Star*, March 1, 2015. https://www.thestar.com/business/2015/03/01/miners-descend-on-toronto-amid-brutal-market-downturn.html; Conference Board of Canada, "Mining Sector Woes Continue to Limit Economic Growth in the Territories in 2016," media release, February 24, 2016. http://www.conferenceboard.ca/press/newsrelease/16-02-24/mining_sector_woes_continue_to_limit_economic_growth_in_the_territories_in_2016.aspx

[210] Heesun Wee, "Amid oil price plunge, Alaska's economy braces for losers and survivors," MSNBC, April 21, 2016. http://www.cnbc.com/2016/04/21/amid-oil-price-plunge-alaskas-economy-braces-for-losers-and-survivors.html

open up power generation to third parties, both for net metering and IPP polices. In other instances, such as in B.C., clean power programs that are designed for BC Hydro customers are only applicable where this utility owns distribution and generation assets.

PPA contract price based on avoided cost of diesel

Almost all of the PPA contracts in remote communities are based on the utility's calculation of avoided cost of diesel. Consensus among utilities — the power purchasers — is that the purchase price of diesel, as delivered and converted to electricity by the community's diesel power plant, is representative of clean power's value. In only a few cases, noted in Section 5.1.2, have utilities conceded some additional value to clean power in terms of reduced reliance on diesel systems.

The current approach of using only the avoided cost of diesel does not offer adequate financial support for clean power projects, especially in competition with business-as-usual diesel systems. This lack of competitiveness is exacerbated by inherent downstream subsidies for diesel fuel systems. Subsidies include shipping, operations and maintenance, and equipment replacement costs for the diesel power plant, which includes more than just the diesel generators.[211]

The total cost of diesel power plant ownership (including initial construction, upgrades and replacement of individual equipment, and operations and maintenance, but excluding fuel purchase) must be accounted for when considering the cost and benefits of an equivalent clean power project. Benefits include reduced operation and maintenance costs, reduced (future) replacement costs for smaller equipment, and reduced costs associated with diesel fuel spills. These benefits are additive to reduced subsidies needed for diesel fuel directly tied to lower fuel consumption. These are all examples of factors that are externalized and not currently considered when setting a PPA price.

Utilities will need to work closely with both territorial/provincial and federal governments to co-ordinate financial innovations for clean power projects such that both, and communities, realize a net benefit to their investments (as opposed to business-as-usual). Utilities should also be more transparent about operation and maintenance costs incurred, and especially the costs associated with upgrades and

[211] Diesel generators are only one of many pieces of equipment that make up a diesel power plant. Other equipment includes ventilation, heating and cooling, control and power systems, transformers, etc.

replacements to diesel generating equipment as components of complete diesel power plants.

Lack of support for carbon pricing

With the exception of projects funded by Alaska's RE Fund, carbon is not priced in the clean power project economic assessments included in this research. The price of carbon should be considered in business-as-usual operation of diesel power plants in all remote Indigenous communities. The oil and gas sector for years has included a shadow price on carbon[212] to incentivize their own decision-making in business planning and preparing for future climate and carbon policies. With the current federal government working on a establishing a national carbon price[213], it will be worthwhile to include a carbon price in the avoided cost of diesel calculation as it will be a realistic cost in the future.

Policies lag behind advancement of clean technology innovation

Policies, such as those resulting in valuing PPA contracts at the avoided cost of diesel, are partly a consequence of a lagging policy perspective that clean power systems are not robust, have low reliability, etc. While diesel systems offer tried-and-true power generation, they come with many negative environmental, economic and social impacts. Demonstrating economic benefits of clean power projects should not be bound by simple environmental and local economic impact considerations. Investment decisions should look beyond the new capital costs of adding clean energy to the microgrid generation mix and include the likely future value of current assets, and lifetime operation and maintenance costs looked from the lens of levelized cost of energy (LCOE).[214] There are not many studies or research that evaluates the LCOE of diesel systems compared to renewables and this is a needed area of research.

Entangled in the above challenge is the avoided cost of diesel contract prices included in PPAs (as above). Part of the solution to make projects competitive against diesel

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[212] Sustainable Prosperity, *Shadow Carbon Pricing in the Canadian Energy Sector* (2013). http://www.sustainableprosperity.ca/sites/default/files/publications/files/Shadow%20Carbon%20Pricing%20in%20the%20Canadian%20Energy%20Sector.pdf

[213] Josh Wingrove, "Trudeau Commits to Carbon Price Amid Provincial Opposition," *Bloomberg*, July 20, 2016 http://www.bloomberg.com/news/articles/2016-07-20/trudeau-commits-to-carbon-price-as-canada-moves-to-cut-emissions

[214] Wikipedia, "Cost of electricity by source." https://en.wikipedia.org/wiki/Cost_of_electricity_by_source#Levelized_cost_of_electricity

systems requires changing the perspectives of stakeholders, including utilities and governments.

Net metering programs are a mechanism to support small-scale clean power behind the meter. While net metering will help reduce load at points of consumption, these types of projects still require microgrid connectivity with a centralized power plant (clean and/or diesel systems).

Although IPP policies have the potential to incentivize clean energy systems for remote communities, history so far in Canada has not seen this, and only SOP policies have been developed. Governments and utilities need to consider the different types of IPP policies that would work for remote communities or consider replicating existing policies for other sectors, ensuring the policy is compatible and does not exclude remote communities. Governments and utilities should also consider other policy mechanisms that could work in parallel or complementary to PPA agreements such as grant programs, production incentives or finding ways to introduce the REC market into policy development. The federal government could also play a role in developing policies that could complement provincial / territorial programs. These points are discussed further below.

Utilities' mandate to maintain an affordable rate base

Most government and utilities believe that implementing clean power projects (via an IPP or direct investment approach) will require them to increase their rate base. A utility's rate base is the cumulative value of invested assets (power plants, grid ties, substations, etc.) less the depreciated value of equipment. Depreciated value is accrued as the asset ages. When the utility invests in clean power, this investment is in addition to existing diesel power plants at their depreciated values. When existing assets have not fully depreciated, this increases the rate base. This is true whether clean power is purchased from IPPs or the utility invests directly.

It is understood that increased rates might be counter to legislated mandates (and utility regulation), but several jurisdictions have been successful in advancing clean energy policies using a variety of strategies. Governments may establish granting programs, or utilities may argue that investments are necessary to achieve environmental goals. Indeed, finding ways to support new policies and programs requires innovation and thinking on how to pay for clean power, in addition to paying for existing assets. This thinking needs to not only evaluate the pure economics of diesel systems versus clean power, but internalize the many other environmental and social consequences of continued reliance on diesel systems.

Access to capital

Even though power purchase policies can be instrumental in guaranteeing a revenue stream for a clean power projects, it is still very challenging for proponents to find necessary investment capital. PPAs do not completely solve this problem, although a guaranteed revenue stream goes a long way. The additional revenue is somewhat reduced if the project is formed using a partnership model, joint venture or utility-owned, but it is not completely removed. Remaining challenges relate to development, construction and operation in harsh northern climates and in communities with limited (although not always) capacity for clean power. This was one barrier expressed as to why the REINDEER program uptake has been low: First Nations in Ontario find it difficult to find the capital to install even net metering projects and historically have needed to rely on further government support, such as the INAC's ecoENERGY for Aboriginal and Northern Communities Program.[215]

Utilities not wanting to strike PPA contracts with guaranteed purchases

Some policies, such as Yukon's IPP and BC Hydro's micro-SOP policy, exclude remote communities from SOP-type programs because of the standing perspective that unconditional purchase of clean power will compromise the reliability of a microgrid. (See example in Section 3.1.2.2 where supply of variable clean power may be constrained when it exceeds the community's load.)

5.4 Opportunities and next steps

The following paragraphs outline the top opportunities and next steps for advancing IPP policies for remote Indigenous communities in Canada.

5.4.1 IPP policies

$0.30 / kWh PPA rate is only the starting point

Utilities need to break away from using avoided cost of diesel calculations for setting PPA contract rates. This requires innovative thinking on behalf of the utility, in co-ordination with governments, to find ways that can incorporate a new policy

[215] Indigenous and Northern Affairs Canada, "ecoENERGY for Aboriginal and Northern Communities Program." http://www.aadnc-aandc.gc.ca/eng/1100100034258/1100100034259

perspective that successfully, and cost-efficiently, incents more clean power to reduce reliance on diesel power plants in remote communities.

Jurisdictions including B.C. and NWT have shown leadership by looking beyond avoided costs of diesel in setting PPA prices, and including capacity payments and top-ups. Going a step further and offering guaranteed higher PPA rates above status quo would take into account currently externalized factors such as shadow carbon price, reduced downstream subsidies to diesel fuel, and avoided costs related to upgrades or replacements of diesel power plant equipment. This currently low PPA rate is also possibly a reflection of limited experience in integrating variable solar and wind into microgrids and the benefits these technologies can bring.

Developing a strong business case that incorporates a fair PPA rate will attract private industry and investment, and open the door for joint ventures with Indigenous communities to develop high-penetration clean power projects at scale.

Government mandates to include mandatory criteria

Government mandates set out in energy strategies or legislated through energy acts could include evaluation criteria that consider various benefits of community ownership. These include more local power, job creation opportunities, and reduced environmental impacts (e.g. diesel spills, noise). Each northern Canadian jurisdiction has developed rules (statutes) to govern the utility sector, often with established objectives to provide affordable and reliable power to all customers. A mandate, with or without the context of an IPP policy, may be best aligned with a utility's decision-making actions to grasp the benefits of community renewable energy. Mandates are also the most hands-off way for governments to support renewable energy projects, because the price is set by competing project developers rather than government rate schedules or contracts.

Exploring IPP policy approaches with provincial and territorial governments

RPS / RECS

Territorial and provincial governments could potentially establish a mandate with specific criteria, as above, whereby utilities are obliged to procure clean power in each remote community served. Similar to how many U.S. states use an RPS to mandate renewable power purchase, northern utilities could be obliged to purchase RECs from clean projects in addition to the generated electricity.

The federal government could also be involved in a REC market. Instead of utilities purchasing RECs, the federal government may choose to fund clean power projects directly by signing long-term contracts for RECs. Purchase may help satisfy future federal government mandates for renewable power purchase (regardless whether a mandate is in place, this direct funding method is a feasible option).

Instead of communities selling RECs on an individual basis, utilities can work with territorial and provincial governments to aggregate REC sales. In each of the above examples, economies of scale for purchase of RECs will help reduce transaction costs.

RFPs

A provincial / territorial government mandate for clean power purchase may also be achieved directly through scheduled procurement of clean power. Procurement would follow selection criteria, as per mandate, and PPAs between utility and clean power projects represents the true cost of clean power (LCOE). Funding to bridge the gap between avoided cost of diesel and the LCOE cost could be covered through various means, such as recycling government revenues from carbon pricing, federal government grants and/or re-allocation of downstream diesel subsidies.

Production incentive

The federal government may establish a flat premium ("adder") that is paid out to all suitable clean power projects and PPAs signed between utilities and IPPs that are based on avoided cost of diesel. While this is a simple and functional approach, it may be challenging considering the wide range of diesel costs in various communities. This federal government productive incentive policy for remote communities was explored several years ago by the Pembina Institute. This research explored the potential of a $0.15 / kWh adder to support northern and remote mining renewable energy projects.[216]

Contract for Differences

A CfD typically involves the government signing a contract to cover the difference in price between the clean power project's LCOE needed for a financially viable project and the actual price received. Actual price received typically conforms to the avoided cost of diesel for each jurisdiction. Using a CfD, as opposed to a generic production premium/incentive, means that the price received for clean power reflects the LCOE of projects regardless of jurisdiction or geography (remoteness).

[216] Tim Weis and John Maissan, *Assessing the Potential Uptake for a Remote Community Wind Incentive Program in Canada*, (Pembina Institute 2007). http://www.pembina.org/pub/1929

SOP-type programs

While utilities do not currently offer SOP-type programs for remote communities, a scaled-back (pilot) approach may prove to be a good first step to bringing these programs forward. Utilities can use SOPs to support small-scale clean power projects without involving large-scale government procurement programs (RFP, CfD, RPS). To help mitigate reliability concerns, the SOP could be contingent on similar restrictions used by remote community net metering programs. These restrictions may include system size, percentage of community load and/or rules for curtailment.

Specifically, in B.C., an existing micro-SOP may be extended to First Nation communities, similar to Ontario's REINDEER program. The above restrictions may be applied to alleviate concerns for microgrid reliability.

Special consideration for INAC-funded communities

In jurisdictions such as B.C. and Manitoba, many communities still rely on INAC for full or partial funding of power generation (including capital, operating and maintenance costs). Because many of these communities receive funding through legacy arrangements, discussions involving IPP policies at all levels of government would need to be considered.

5.4.2 Funding commitments

Alaska's RE Fund program is a great example of using capital grants to effectively advance clean power production in Alaska. The RE Fund program has invested approximately US$250 million since 2008, not just for capital investment in development stages of projects, but in vital earlier stages including detailed feasibility studies and economic analysis. With a remote community population of 60,000, this represents an annual per capita investment of $521 per person.

Applying Alaska's $521 per person investment metric to the population of Canada's remote Indigenous communities (approximately 170,000) means an annual $66 million investment — far more than the federal government's current 2016 budget commitment of:

- $5.5 million per year ($11 million over two years) for INAC to implement renewable energy projects in off-grid Indigenous and northern communities, and
- $26 million per year ($129 million over five years) for NRCan to support energy efficiency and renewable energy policies and programs and maintain clean

energy policy to Indigenous and northern investments (not necessarily remote communities).[217]

Dedicating $5.5 million per year to off-grid Indigenous communities for renewable energy systems is a start, but much more is needed. It is unknown at this point what amount of the $26 million / year from NRCan will go to supporting renewable energy policies and programs specifically for remote communities.

5.4.3 Climate leadership

Territorial leadership

With Yukon and NWT governments developing net metering and IPP policies in recent years, and Nunavut developing a net metering policy and considering an IPP policy, the territories are in a good position to build on policies that significantly advance northern clean power production. Considering the bulk of diesel fuel consumption in Canada takes place in its northern territories (67%), its people and representative governments are well positioned to build off existing, and growing, local capacity to develop, construct and operate clean power projects. Still, the necessary clean power purchase policies need to be developed for IPP and utility-owned project success. Yukon's government provides a good example IPP policy with a goal of 10% new renewable energy from IPPs, of which 50% must include Indigenous partnerships. The policy is guided by government support for local economic development and job creation, in addition to reducing reliance on 1970s and 80s diesel power plants.

Alberta

Alberta is ripe to develop a provincial program supporting its eight remote First Nations in transitioning away from diesel fuel reliance. Its Climate Leadership Plan establishes a 30% renewable energy target by 2030 with special consideration for First Nation community involvement in clean power projects. Supporting programs are current being developed that will utilize revenues raised from an economy-wide carbon price. A specific program may be designed that caters to First Nation communities, and incorporates PPA contract pricing based on project LCOE.

[217] Indigenous and Northern Affairs Canada, "Budget 2016 Highlights – Indigenous and Northern Investments." https://www.aadnc-aandc.gc.ca/eng/1458682313288/1458682419457

B.C.

For 11 remote communities not serviced by BC Hydro (in consequence of missing B.C.'s RCEP), provincial and/or federal government policies are needed to support local clean power projects. For RCEP communities, the at-hand policy choice is to extend micro-SOP support to remote First Nation communities. Apart from such decisions, the B.C. First Nation Clean Energy Business Fund may be an avenue to directly support First Nation ownership of IPPs. In all cases, learning experiences and capacity building from RCEP-participating communities may be translated to others.

Manitoba

The clean power research conducted by Manitoba Hydro, complementary to their desire to demonstrate high penetration clean power projects (up to 40% with bio-energy, wind and solar), bodes well for transitioning Manitoba's four remote communities away from diesel power generation. A working funding relationship with INAC means that subsequent pilot project execution may readily entail a combined Manitoba Hydro-INAC effort.

Knowledge and information sharing

Provincial and territorial governments are advancing IPP policies for remote communities; however, there seems to be a lack of co-ordination and information sharing on what has been learned from specific pilot projects, PPA contract pricing, and specific policies and programs, and with regards to financing and developing commercial projects. Although utilities offer a general understanding of PPA contract prices and terms, specific details are not available. Lack of specifics makes it particularly challenging to replicate successful examples.