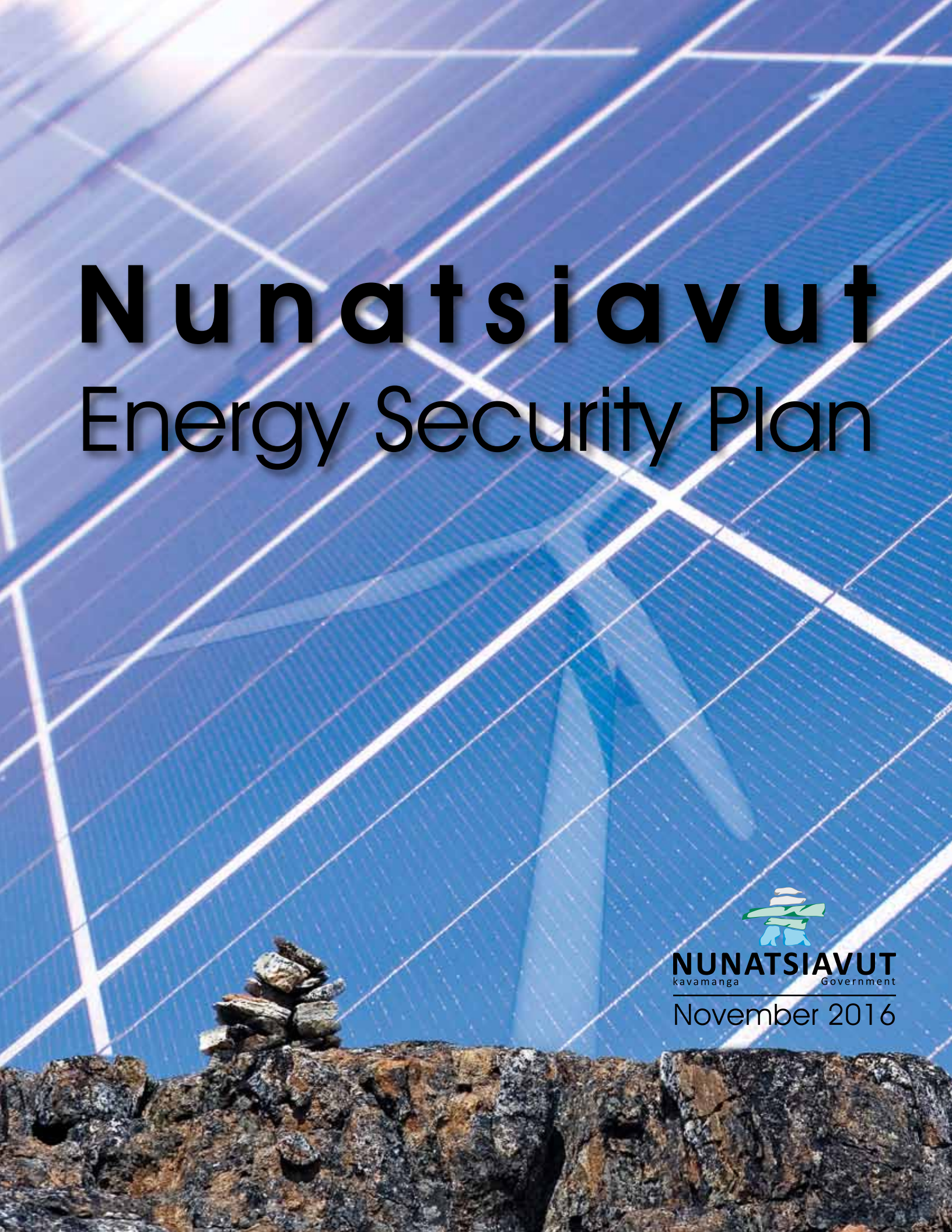
Nunatsiavut
Energy Security Plan



NUNATSIAVUT
kavamanga Government

November 2016

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Executive Summary

Overview

This Energy Security Plan for Nunatsiavut represents a proactive approach to meeting energy needs throughout the region with due recognition of local social and economic conditions. The plan adopts a sustainable development approach in addressing energy security in Nunatsiavut that also touches on other community infrastructure dimensions, notably housing and community facilities.

The Energy Security Plan has been initiated by the Nunatsiavut Government and has been produced through extensive national and global research on sustainable energy in remote and northern communities, and local consultations in Nunatsiavut.

Through a comprehensive, inclusive and substantive process, the Energy Security Plan directly addresses community needs for Nunatsiavut in a manner that considers the social, economic and environmental dimensions of energy. Equally important, the plan is grounded in the regulatory and policy umbrella of the Government of Newfoundland and Labrador, and the economics of energy that are a reality for all.

The preparation of this Energy Security Plan is a "first step" towards forging a more sustainable energy future in Nunatsiavut. Effort has been taken to ensure that the proposed actions can produce a range of energy security benefits for Nunatsiavummiut and businesses, and are community-centered and achievable over the short and medium-terms.

Energy Security Plan Goals

The objectives of the Nunatsiavut Energy Security Plan are to:

1. Project the short and medium-term energy demand trends and requirements in Nunatsiavut;
2. Document the impacts of diesel power reliance and supply constraints on social conditions, the environment, economic activity and economic development in Nunatsiavut;
3. Identify options for energy demand reductions, enhanced productivity of diesel systems and energy distribution systems, peak shaving, improved demand-side energy efficiency, and renewable energy over the short- and medium-terms; and
4. Prepare a Nunatsiavut Energy Security Plan through research and discussions between government and partner organizations with the ultimate aim of putting the plan into action and securing adequate capital and capacity for implementation.

Strategic Perspective

The Nunatsiavut Energy Security Plan adopts a strategic perspective on energy that goes beyond the traditional parameters of energy reliability and cost. This is not to suggest that reliability and cost are unimportant; these are critical factors, and fully considered in the plan. However, energy security as a concept incorporates the importance of delivering energy value that reflects local interests and needs, and promotes a range of social, economic and environmental outcomes which are key interests for the Nunatsiavut region. The Nunatsiavut Energy Security Plan is guided by the strategic perspective flowchart illustrated below.

Nunatsiavut Energy Security Plan Strategic Perspective

Key Findings

The Nunatsiavut Energy Security Plan is based on the following key findings:

Finding #1 – Nunatsiavut's energy situation is precarious: The energy situation in Nunatsiavut exhibits vulnerabilities and weaknesses. Expansion of diesel plants in some communities holds the potential to reduce gaps between demand and supply, however capacity limitations and constraints exacerbate social and economic conditions, including health, safety and community quality of life.

Finding #2 – Nunatsiavummiut and businesses face very high and rising energy costs: Energy costs for Nunatsiavut residents and businesses are among the highest in Canada. The combined cost of electricity and heating puts an enormous economic burden on individuals and families, especially seniors and those in economically-challenging situations.

Finding #3 –Energy availability and costs impact economic development: Energy costs and constraints are a major barrier to economic development, and on-going activity in Nunatsiavut communities. Some communities have limited their economic activity due to power limitations (e.g. the fish plant in Makkovik).

Finding #4 – Energy costs compromise accessibility to affordable heat: A high percentage of families in the region face cost barriers to maintaining liveable, heated indoor environments year-round. In Nain and Hopedale in particular, the majority of homes are inadequately heated.

Finding #5 – Energy regulatory and policy structure: Nunatsiavut is subject to a relatively conventional energy regulatory and policy structure that is seen across Canada. Provincial government departments and agencies play key roles.

Finding #6 – Prime role of Newfoundland and Labrador Hydro: As in many remote regions of Canada, a provincial utility has a monopoly position for power generation and distribution. The difference for Nunatsiavut is that Newfoundland and Labrador Hydro is a subsidiary of Nalcor, a crown corporation which appears to operate as a private company. In other regions, utilities are mostly crown agencies with clearer direction from provincial government.

Finding #7 - Regional electricity generating capacity: Within Nunatsiavut, generation capacity for electricity is virtually 100% diesel reliant. Newfoundland and Labrador Hydro and the provincial government have made only basic efforts to explore renewable generating options.

Finding #8 - Energy demand patterns: The consumption of energy in Nunatsiavut is greatly influenced by climatic conditions, community layout, housing design, and economic conditions. Seasonal temperatures mean that consumption of fuel and electricity for heating is high, but actually less than might be expected as residents with lower incomes tend to limit fuel consumption due to family budget constraints.

Finding #9 – Service conditions and pricing: While load constraints have been the case for some communities in the recent past (e.g. Makkovik), Newfoundland and Labrador Hydro is upgrading diesel plants. There have also been instances of multiple, major outages notably in Nain and Hopedale. Electricity pricing is subsidized by the provincial government's Northern programs, however, the total energy budget faced by residents and businesses is prohibitive and of very high cost when space heating and electricity needs are considered together. Energy costs are a very high percentage of household budgets.

Finding #10 - Regional energy economics: The only energy economy that exists in the region is for wood harvesting in winter months with residents often travelling over 100 km (round-trip) to source burnable wood. A small informal economy exists where some residents sell wood they have harvested to neighbours. There is potential for enhancing business competitiveness and establishing targeted enterprises and employment that can support an energy economy that is more oriented to sustainability.

Finding #11 - Heat sources, economics and affordable heat: Buildings in Nunatsiavut are heated with heating oil, wood and electricity, with most residents relying on wood heat. More than half of the dwellings in Nain and Hopedale are inadequately heated (57 per cent in Nain and 63 per cent in Hopedale), with the average for all Nunatsiavut communities being 43 per cent. The largest single energy challenge for Nunatsiavummiut is access to clean, reliable, and affordable heat.

Finding #12 - Energy security 'gaps'/shortfalls: The major energy security 'gaps' or shortfalls in the region include the:

- High cost of affordable heat;
- Cost of electricity, especially for users consuming above 1,500 kWh per month, and businesses;
- Impact of heating and electricity costs on other necessities, notably food;
- Limited efforts to improve energy conservation and efficiency in communities; and
- Very limited examination of the potential for renewable energy generation.

Finding #13 - Energy impacts on communities: Simply put, the absence of a holistic and comprehensive sustainable energy strategy has had major impacts on Nunatsiavut. The high cost of the total energy budget is a significant burden on family budgets and business operations resulting in poor heating and housing conditions, business attraction and competitiveness, as well as reduced capacity to meet other social and economic necessities.

Finding #14 - Off-grid energy innovations across Canada: Off-grid energy innovations are occurring at a rapid rate across the country. There is much potential for Nunatsiavut and the provincial government to learn from other jurisdictions and projects, and to collaborate on new sustainable ideas, sharing demonstrations and pilot initiatives in areas such as: housing energy efficiency, renewable energy (small solar and wind), more efficient diesel systems, local bioenergy extraction and consumption, and energy education and management.

Finding #15 - Success factors for sustainable energy in remote communities: Three factors underpin successful sustainable energy innovations in remote communities:

1. Strategic planning including targeted goals and initiatives;
2. Collaboration amongst all parties including local and provincial governments, utilities, residents and businesses; and
3. Planned demonstration and pilot projects that prove sustainable energy alternatives, and then programs that support their distribution and expansion.

Nunatsiavut Energy Security Plan Initiatives, Projects & Framework

The Nunatsiavut Government shall promote the implementation of the following Energy Security Plan initiatives, and projects through the guidance of an Energy Security Plan Framework. Implementing the plan requires collaboration with the Government of Newfoundland and Labrador, Newfoundland and Labrador Hydro, the provincial Public Utilities Board, the Government of Canada, and various public and private agencies. Above all, implementation of the plan requires the participation and guidance of the regional and community governments in Nunatsiavut.

Initiative #1 – Promotion of the 10 Nunatsiavut Sustainable Energy Principles: The Nunatsiavut region will be guided by 10 Nunatsiavut Sustainable Energy Principles which seek to address the following issues:

1. Energy security outcomes;
2. Community involvement in energy planning and management;
3. Socially-sensitive energy decision-making;
4. Efficiency in energy services and delivery;
5. Sustainable energy technologies and innovation;
6. Long-term investment orientation;
7. Utilization of local skills and knowledge;
8. Energy-oriented infrastructure planning and development; and
9. Promoting energy for economic development; and
10. Sustainable energy partnerships.

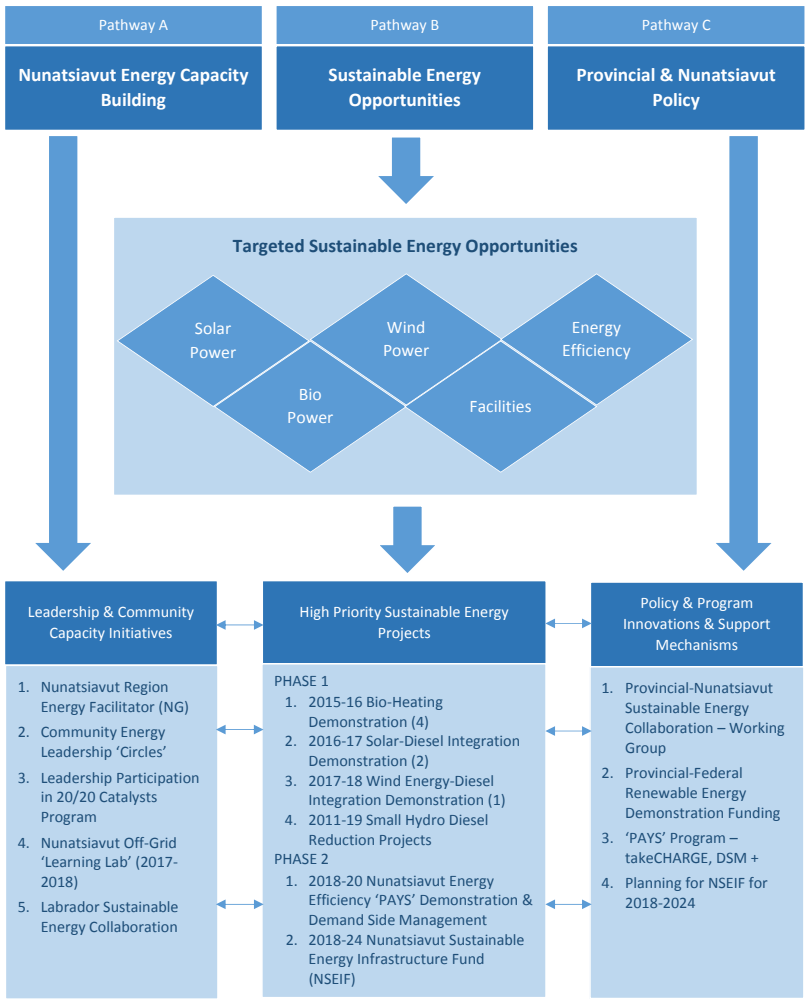
Initiative #2 – Communication to communities and residents: The Nunatsiavut Government will share the summary contents of the Energy Security Plan with Nunatsiavummiut, the community governments, businesses, and regional agencies. This process will include briefings on the plan's findings, and overview the proposed initiatives; and will seek input into the design and planning for implementation of the proposed initiatives.

Initiative #3 – Engagement of provincial departments, agencies and utilities: The Nunatsiavut Government will share the Energy Security Plan with the Government of Newfoundland and Labrador, the provincial Public Utilities Board, Newfoundland and Labrador Hydro, and other provincial agencies. Sharing the plan will be the basis for future planning on energy in Nunatsiavut, and assist in developing collaborations and partnerships to action the proposed initiatives.

Initiative #4 - Develop a sustainable energy 'Pathways' Framework: Beginning in 2015-16 the Nunatsiavut Government will implement the Energy Security Plan based on the 'Pathways' Framework (an illustration of the Framework as below). Implementation initiatives and projects within this framework fall into one of three tracks:

1. Nunatsiavut Energy Capacity Building;
2. Sustainable Energy Opportunities; and
3. Provincial and Nunatsiavut Policy/Programs.

Nunatsiavut Energy Security Plan Framework



Initiative #5 - Target sustainable energy opportunities: The Nunatsiavut Government intends to work in collaboration with the provincial government, agencies and Newfoundland and Labrador Hydro, and the federal government to promote sustainable energy projects related to wind, solar, biopower, energy efficiency and facilities.

Initiative #6 - Implement high priority sustainable energy projects: The Nunatsiavut Government intends to work in collaboration with the provincial government and agencies, Newfoundland and Labrador Hydro, the federal government, and renewable energy companies to implement specific sustainable energy projects in two phases:

Phase 1:

- 2015-16 Bio-Heating Demonstration (4 installations: high efficiency wood burning stoves)
- 2016-17 Solar - Diesel Integration Demonstration (2 installations)
- 2017-18 Wind Energy - Diesel Integration Demonstration (1 installation)
- 2018-20 Nunatsiavut Energy Efficiency 'PAYS' Demonstration & Demand Side Management

Phase 2:

- 2018-2024 Nunatsiavut Sustainable Energy Infrastructure Fund (NSEIF)

Details on these projects are presented in later sections of the Energy Security Plan.

Initiative #7 - Promote energy leadership and capacity: The Nunatsiavut Government intends to work in collaboration with the provincial government and agencies, Newfoundland and Labrador Hydro, and the federal government to promote energy leadership and capacity within the region. This will entail:

1. Seeking financial support from governments for a Nunatsiavut Region Energy Facilitator;
2. Establishing Community Energy Leadership 'Circles' in each community;
3. Nunatsiavut leadership participation in the 20/20 Catalysts Program (a community readiness, skills and capacity development initiative for clean energy);
4. Presentation of the Nunatsiavut Off-Grid 'Learning Lab' (2017-18) to obtain and share experiences from across Canada; and
5. Promotion of the Labrador Sustainable Energy Collaboration along with remote and grid-connected communities.

Initiative #8 - Consider Policy/Program Support Mechanisms: The Nunatsiavut Government intends to work in collaboration with the provincial government and agencies, Newfoundland and Labrador Hydro, and the federal government to promote energy leadership and capacity within the region, to:

1. Establish a Provincial – Nunatsiavut Sustainable Energy Collaboration – Working Group;
2. Seek Provincial-Federal Renewable Energy Demonstration Funding;
3. Explore the establishment of a 'PAYS' Program (Pays-As-You-Save) that expands on and increases the impact the current *Take CHARGE* program of Newfoundland and Labrador Hydro; and
4. Engage in dialogue with government regarding the development of a prospective Nunatsiavut Sustainable Energy Infrastructure Fund (NSEIF) for the 2018-2024 period.

Initiative #9 – Provide annual summary to communities and residents: The Nunatsiavut Government will provide an annual summary of Energy Security Plan initiatives to Nunatsiavummiut and community governments, the federal and provincial governments, and other partners.

Initiative #10 - Review and revise: Review progress on the Energy Security Plan at the end of 2017-18 to determine any necessary adjustments for future years.

Towards a Nunatsiavut Energy Security Plan Implementation Strategy

The development of an Implementation Strategy for the Nunatsiavut Energy Security Plan will follow a step-wise process:

Step #1: Present the Nunatsiavut Energy Security Plan to provincial departments and agencies to inform and engage provincial authorities with the intention of collaborating on a holistic approach to meeting energy needs in Nunatsiavut.

Step #2: Engage Newfoundland and Labrador Hydro to be a part of the Nunatsiavut Energy Security Plan process.

Step #3: Propose a Provincial – Nunatsiavut Sustainable Energy Collaboration Working Group to consider and implement specific projects, policies and programs.

Step #4: Consider proposed capacity-building initiatives to strengthen sustainable energy action in Nunatsiavut.

Step #5: Communicate sustainable energy developments to communities through information sessions with the Inuit Community Governments.

Energy Security Plan Methodology

The Nunatsiavut Energy Security Plan has been prepared with expert advice from Lumos Energy, Clean Energy Advisor to the Nunatsiavut Government.

The Methodology underlying the production of this Energy Security Plan has included:

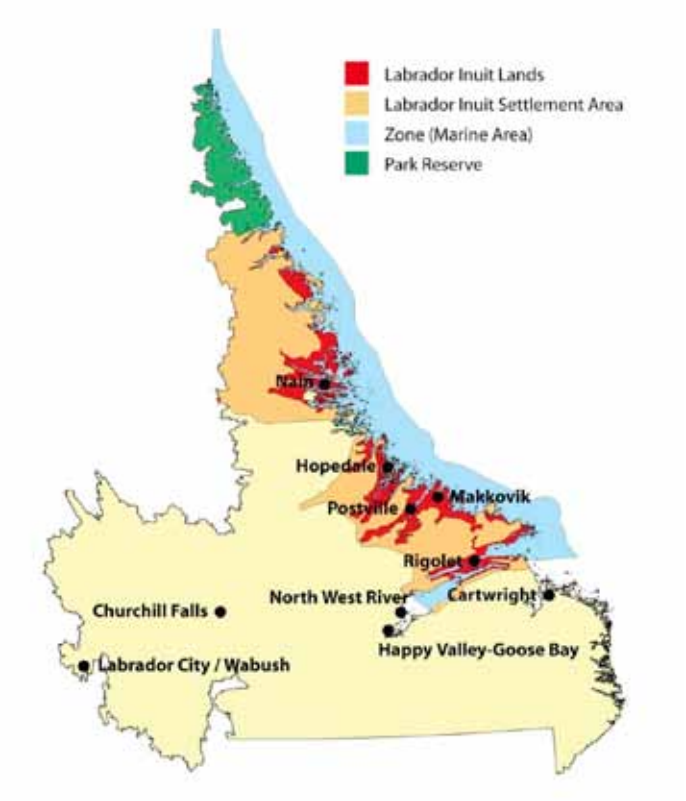
- Site visits to Nunatsiavut to assess energy demand patterns, and identify options for energy efficiency, renewable energy and energy infrastructure;
- Meetings with Nunatsiavut Government officials, and local government representatives;
- Research on off-grid energy innovations across Canada;
- Meetings Government of Newfoundland and Labrador officials;
- Consultations with representatives of Newfoundland and Labrador Hydro;
- Consultations with the provincial Public Utilities Board (PUB);
- Identification of energy gaps and needs;
- Development of a Sustainable Energy Strategic Framework for Nunatsiavut; and
- Development of project communications and implementation plans, and report preparation and presentation.

Energy for Nunatsiavut's Future

The Nunatsiavut Region

Nunatsiavut, "Our Beautiful Land" in Inuktitut, is Canada's first Inuit self-government region and includes the communities of Nain, Hopedale, Makkovik, Postville and Rigolet.

The Nunatsiavut Government was established in 2005 following the successful negotiation of the Labrador Inuit Land Claims Agreement (LILCA). LILCA includes self-government provisions rendering the Nunatsiavut Government a regional Inuit government within the province of Newfoundland and Labrador. The Nunatsiavut Government has authority over many central governance areas including health, education, housing, culture and language, justice and community matters.



The Energy Situation in Nunatsiavut

The energy situation in Nunatsiavut is precarious:

- Power demand is growing and putting pressure on diesel plant capacity in several communities;
- The cost of energy for electricity and heating puts an enormous financial burden on families and individuals, especially seniors and those in economically-challenging situations;
- Capacity limitations, the high cost of diesel fuel, and the limitations of remote diesel systems (such as power outages) is exacerbating social and economic conditions throughout the region including safety, health, and community quality of life;
- Energy costs and constraints are a major barrier to economic development, and on-going activity in Nunatsiavut communities, and;
- The lack of cleaner, reliable, and cost-competitive power is having an increasingly profound impact on communities and their residents.

Energy cost concerns are particularly pressing. A large and growing percentage of families in the region face cost barriers to maintaining liveable and heated indoor homes year-round. Certain communities, such as Nain and Hopedale, have a high percentage of homes with inadequate heating capacity.

To date, Nunatsiavut beneficiaries and the Nunatsiavut Government have not been extensively involved with energy planning in the region. The Nunatsiavut Energy Security Plan and associated Implementation Strategy place high value on Inuit involvement in energy planning; there are substantive benefits in adopting a sustainable development approach to address energy security in the region, while also touching on other community infrastructure dimensions, notably housing and community facilities.

Forging a Sustainable Energy Future for Nunatsiavut

The Nunatsiavut Government's implementation of the Energy Security Plan will be guided by the following 10 principles:

10 Nunatsiavut Sustainable Energy Principles

1. Energy security outcomes: Action on energy in Nunatsiavut's communities is guided by energy security outcomes.
2. Community involvement in energy planning and management: The involvement of communities is proactively sought and supported.
3. Socially-sensitive energy decision-making: Energy decision-making is sensitive to the social impacts of energy policy, pricing and delivery decisions.
4. Efficiency in energy services and delivery: Enhancing efficiency in the delivery of energy services is pursued on an incremental basis.
5. Sustainable energy technologies and innovation: The potential of new energy technologies and innovations are essential to the region's energy planning.
6. Long-term investment orientation: Energy decisions and capital planning adopt a long-term, life-cycle orientation.
7. Utilization of local skills and knowledge: To the fullest extent possible, local skills and knowledge is used to guide planning and services delivery, and for employment.
8. Energy-oriented infrastructure planning and development: Infrastructure strategies and investment in the region shall integrate and consider energy factors and consequences.
9. Promoting energy for economic development: A prime energy security outcome will be to explore and pursue how sustainable energy systems can support regional and local economic development.
10. Sustainable Energy Partnerships: Creative and innovative energy and energy demand/supply partnerships are a foundation for the region's sustainable energy future.

The Nunatsiavut Sustainable Energy Principles will be:

- Subject to policy and program review across Nunatsiavut Government;
- Shared with Nunatsiavut communities and local government;
- The basis of discussions between Nunatsiavut Government and the Government of Newfoundland and Labrador and agencies, in the development of an Implementation Strategy for the Nunatsiavut Energy Security Plan;
- Utilized for planning by Newfoundland and Labrador Hydro, and other organizations and companies involved with energy services, investment and delivery;
- Submitted to the provincial Public Utilities Board for consideration in their decisions concerning Nunatsiavut; and
- The basis of future planning for energy in Nunatsiavut.

Energy Regulatory and Policy Framework

To date, Nunatsiavut beneficiaries and the Nunatsiavut Government have not been extensively involved with energy planning in the region. There is substantive benefit in adopting a sustainable development approach in addressing energy security in Nunatsiavut, which will touch on other community infrastructure dimensions, notably housing and community facilities.

The energy system in Nunatsiavut is characterized by the following features and provisions:

- Electricity in the region is regulated by the provincial Electrical Power Control Act and the Public Utilities Act;
- The Government of Newfoundland and Labrador's energy policy for the region is through Cabinet directives (Orders in Council) and the Ministry of Natural Resources;
- Newfoundland and Labrador Hydro, as utility for the region, has a monopoly position under a range of regulatory frameworks;
- To reduce energy costs for Nunatsiavut residents the provincial government has established a Northern Subsidy for remote Labrador communities;
- The Public Utilities Board has the regulatory role to set electricity rates for users in various regions of the provinces, including Nunatsiavut;
- Orders in Council electricity rates have been set for Labrador on the regional grid; and
- The Nunatsiavut Government and regional stakeholders are able to intervene in rate review and setting processes through the Public Utilities Board.

The Prime Role of Newfoundland & Labrador Hydro

The following defines the prime energy role played by Newfoundland and Labrador Hydro:

- Newfoundland and Labrador Hydro is a subsidiary of Nalcor;
- Newfoundland and Labrador Hydro is mandated to provide "least cost reliable power" under provincial legislation, an objective referenced in the Labrador Inuit Land Claims Agreement;
- Newfoundland and Labrador Hydro's planning and management personnel are based in St. John's;
- Newfoundland and Labrador Hydro's operations for Nunatsiavut are based in Goose Bay;
- Each Nunatsiavut community has locally-based Diesel Service Representatives (DSRs) and Diesel Plant Operators (DPOs); and
- Diesel plants are semi-attended (i.e. not full time in person but a combination of site and remote management) and there is overlap in coverage between DSR's and DPO's to ensure that local capacity always exists.

Regional Generating Capacity

Regional generating capacity can be summarized as:

- Diesel generation sets operate in 15 Labrador communities, including all Nunatsiavut communities;
- 'Firm Capacity" is defined as the amount of power available after the largest diesel engine in the GenSet in each community is deducted;
- Diesel engines include Caterpillars and Detroit Diesels, the latter of which is now industry preferred;
- Diesel tank farms are resupplied twice-yearly, and the preferred standard is seven months of fuel capacity in reserve;
- Load capacity is planned in one, five and 20 year projections, and upgrades including engine, transformers, line or plant take a minimum of two years lead time to consider and install; and
- No renewable energy generation is currently in the system.

Energy Demand Patterns

Features of energy demand in the region are:

- Newfoundland and Labrador Hydro has estimated the long-term demand growth rate at 2% per year;
- Drivers for increased electricity demand include population growth, as well as electric space and water heating;
- A slight downward trend in wood for space heating due to resource availability, noting that the cost of wood for space heating is a barrier to energy security, and that there is a lack of a bioenergy system for the region, including advanced energy conversion devices;
- Demand in Nain and Hopedale has been growing, demand in Rigolet and Makkovik is stable, and recently, there has been a slight decrease in energy demand in Postville.
- There is limited knowledge or data regarding community energy demand patterns (e.g. percentage of consumers using wood or electricity for space heating), observations in the plan are based on empirical, case and anecdotal evidence; and
- Both the Nunatsiavut and provincial governments primarily use oil furnaces for space heating.

Service Conditions & Pricing

Service conditions and pricing of electricity can be summarized as:

- There are three "blocks" in electricity pricing; power prices are relative to different levels of household consumption with higher levels of consumption entailing higher per unit power prices:
  - Life Line Block (800-1000 Kwh/month) per customer, pay the Island Interconnected Rate;
  - Life Line Black Limit (800-1000 Kwh) corresponds to base power requirements for a household excluding electric space and water heating;
  - The 2nd and 3rd blocks pay higher rates
- The Northern Subsidy from the provincial government is intended to reduce Life Block Rate to the Labrador Interconnected Rate, but given consumption limitations, this rate subsidy does not extend to electric space and water heating usages; and
- Most power quality is three-phase, but parts of some communities only receive one-phase power; three phase power is higher quality and similar to that on the main provincial grid, while one-phase power is of lower quality and not conducive to some end use systems, like computers.

Regional Energy Economics

Regional energy economic factors include:

- Nunatsiavut consumers pay ~30% of costs associated with electricity generation/delivery to Nunatsiavut;
- The remainder (~70%) is covered by Island ratepayers through the Northern Subsidy;
- However, when space heating is factored into the equation, Nunatsiavut residents are in fact covering an estimated 65-75% of all energy costs, as Nunatsiavummiut cover a higher proportion of space heating costs by buying wood and diesel for furnaces;
- Electricity rates are approved by the PUB through annual budgets submitted by Newfoundland and Labrador Hydro and subject to rate review processes;
- Newfoundland and Labrador Hydro's focus on the diesel electricity system is on maintaining service reliability and responding in a reasonable timeline to load growth; impact on residents (i.e. costs), life cycle assessment, environmental issues, renewable energy objectives and local energy-supported economic development are currently not considered;
- The primary local energy economy that exists in the region is for wood harvesting which is done in the winter months with residents travelling many kilometers from communities to source burnable wood; a small informal economy exists where some residents sell wood they have harvested to neighbours; and

- Economic development for the region is not a major factor in energy systems planning on the part of Newfoundland and Labrador Hydro, or the province, yet there is potential for enhancing business competitiveness and establishing targeted enterprises and employment that can support a more sustainably-oriented energy economy.

Heat Sources, Economics & Affordable Heat

The following points are pertinent with regards to heat sources, economics and affordable heat:

- Buildings in Nunatsiavut are heated with heating oil, wood and electricity;
- 55% of residents rely on wood as their primary source of home heating;
- More than half of the dwellings in Nain and Hopedale are inadequately heated (57% in Nain and 63% in Hopedale), and the average for all Nunatsiavut is 43%; and
- The largest single energy challenge for Nunatsiavut residents is access to clean, reliable, affordable heat.

Energy Security Gaps/Shortfalls

Critical energy security gaps/shortfalls in the region are:

- Energy efficiency and conservation efforts are relatively modest;
- Load demands do stress diesel systems, especially during cold periods, and peak loads are a major stressor;
- Data on demand patterns and usages is not being shared with Nunatsiavut communities;
- Better coordination of load growth and systems planning would be beneficial;
- There are concerns about the impact on diesel engines of the fuel quality provided through Woodward's Oil (Woodward Group of Companies);
- Bringing diesels back on line after an outage is a growing challenge due to electric space/water heating; and
- There is a need for better load data (i.e. data every 15 minutes).

Energy Service Developments

Ongoing and future energy service developments include:

- New 750 Kwh engines were received in Nain and Hopedale in 2016;
- Newfoundland and Labrador Hydro made a new electricity rate submission which is currently under the Public Utilities Board process of review; the proposed rate increase would substantially increase energy costs for Nunatsiavummiut and regional businesses;
- The provincial government has twice studied a potential transmission connection with the southern Labrador Grid but it has not passed the test of an economic business case;
- Meteoroidal Towers (anemometers) have been installed in Makkovik, Postville and Nain at airstrips/weather stations, but they do not appear to be operating or generating data;
- The provincial government studied potential for renewable energy in 2009, yet very limited action has occurred on any of the recommendations;
- Newfoundland and Labrador Hydro are developing plans for diesel fuel quality testing;
- Recently, and soon to be completed recreation facilities in all five communities add to load;
- Load growth for mining is possible; and
- The Nain system is being split into two feeders from the plant to allow for greater systems flexibility.

Energy Patterns & Impacts in Nunatsiavut

Energy's Social Impacts on Nunatsiavummiut

Providing electricity and space/water heating to off-grid communities across Nunatsiavut is a major challenge. Communities are reliant on diesel-generated power for base-load electricity, and fuel for space/water heating. Fuel is shipped via barges in the late summer and early fall, and stored in tank farms in each community.

The transport, storage, handling and consumption of fossil fuels for electricity leads to a range of environmental, social and economic impacts that affect quality of life for Nunatsiavummiut.

Environmental impacts include:

- Risks associated with fuel transportation: These risks include accidental spills and boat/vehicle accidents;
- Impacts associated with generator/heating fuel oil storage: A significant volume of fuel must be stored in each community for the year; fuel oil can be accidentally released into the environment during transfer or by leaks from faulty storage tanks and fuel lines;
- Environmental risks associated with fuel oil for home heating: When accidently spilled over soil or rock fuel oil can penetrate into the ground water, flowing into lakes and rivers, damaging habitat, and it can also penetrate into building footprints creating odour and generating hazardous emissions; and
- Greenhouse gas emissions: Reliance on fuel for power and heat leads to high per capita greenhouse gas (GHG) emissions.

Social impacts include:

- Human and environmental health impacts: Fuel oil can present a risk to human and environmental health once in soil or water; one liter of fuel oil can contaminate one million liters of drinking water;
- Occupational risks associated with off-grid energy systems: There are recognized occupational health risks with the operation and maintenance of diesel generators used to electrify micro grids, and the use of fuel for heating; these range from burns and abrasions to exposure to noxious fumes;
- Emissions exposure: Prolonged exposure to diesel fumes, carbon monoxide, and inhalable particulate matter as well as other air borne pollutants can result in respiratory disease or potential asphyxiation if ventilation is unavailable or insufficient to remove the pollutants;
- Noise impacts: Diesel engines operating near community facilities can disrupt natural environments; and
- Health risks from poor indoor air quality: Use of oil burners for home heating and domestic hot water can contribute significant volumes of pollutants to indoor environments that can have short- and long-term health effects depending on the type of pollutant, concentration and duration of exposure.

Economic impacts include:

- Power quality: Poor quality one or two phase power is unconducive to a host of operations from building maintenance to electronic systems (e.g. computers, medical equipment etc.) and communications systems;
- Brownouts and blackouts: Unreliable power supply due to brownouts and blackouts severely impacts the functioning of schools, clinics, community centres, government and community offices, and economic development services, and load restrictions can exacerbate this situation; and
- Power supply: Lack of good quality, reliable power is a major barrier to economic development and job creation.

Energy & Economic Development in Nunatsiavut

These environmental, social and economic impacts of fuel reliance for off-grid power and heat provide a strong rationale for improving energy security in Nunatsiavut.

Off-Grid Energy Innovations Across Canada

Off-Grid Sustainable Energy a Growing National Focus

The current policy, technological and economic situation in northern and remote communities means that:

- Energy is inefficiently used;
- Excess diesel fuel is often consumed;
- Power quality and reliability is less than optimal;
- Capital planning is challenging;
- The introduction of proven technologies, including renewable energy systems is very difficult; and
- Environmental impacts are higher than necessary.

Through collaboration between communities, governments and energy agencies, a set of policy, planning and energy system innovations can be created to provide a more sustainable energy future for northern communities. This will require long-term planning, community infrastructure and energy system investment, local coordination and capacity-building, and implementation management.

Given these circumstances, there are current efforts in almost every region of Canada to alter the energy situation in remote communities. These include the following developments:

- Quebec is introducing innovations in northern communities in Nunavik and Northern Cree territory, and the Tlugliq wind energy projects for the Raglan mine near Salluit is one such example. Further demonstration/pilot projects were expected to be announced in 2016 associated with the rollout of Plan Nord.
- Ontario is considering two major remote energy innovations. The first is a set of transmission lines that would connect 21 of 25 remote Indigenous communities to the provincial grid; championed by First Nations-owned Wataynikaneyap Power, this project is in bilateral discussions with the provincial and federal governments. Secondly, the integration of renewable energy technologies (i.e. solar, wind) is being planned in the four northernmost communities on the Western shore of Hudson's Bay. Other renewable energy and energy efficiency projects and initiatives in remote communities are also being supported by the Government of Ontario and the Ontario Power Authority.
- Manitoba is in the Request for Proposal (RFP) stage for introducing renewable energy in the four remaining remote Indigenous communities in the province (all platforms are being considered, including hydro, wind, solar and biomass).
- British Columbia continues its efforts to introduce renewable energy in off-grid coastal and interior communities, albeit at a slightly slower pace than in the past. Communities on Gwaii Haanas (Haida Gwaii) and other island/coastal communities like Hartley Bay are looking at wind and hydro options.
- Yukon has a long-term hydro planning initiative to improve the electricity supply configuration for several off-grid communities.
- The Northwest Territories continues its efforts to introduce wind energy into remote communities (as was recently done for several of the diamond mines northeast of Yellowknife). Additional projects are being considered for wind and solar integration with diesel, as well as small hydro linked to a potential southern Slave transmission line.

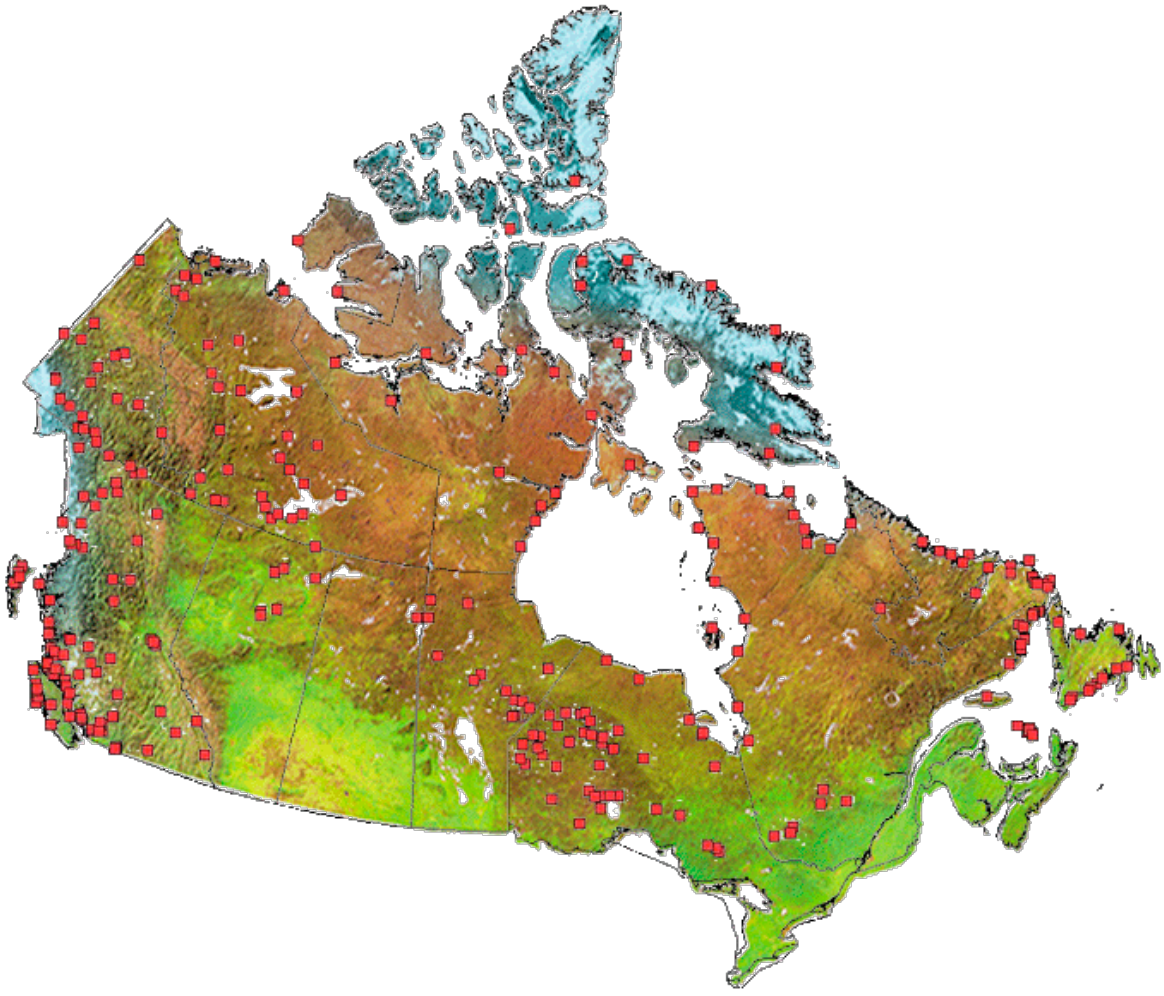
In effect, Nunatsiavut's efforts to promote a sustainable energy future mirrors developments elsewhere in Canada.

Canada's Off-Grid, Northern & Remote Communities

In total, there are some 130+ significant Indigenous remote and northern off-grid communities across Canada. There are an additional 220+ remote operating sites, largely natural resources operations, and hunting and fishing camps of scale (this excludes tens of thousands of small remote camps/cabins owned by communities and families).

The map below illustrates the location of major remote and northern off-grid communities across Canada.

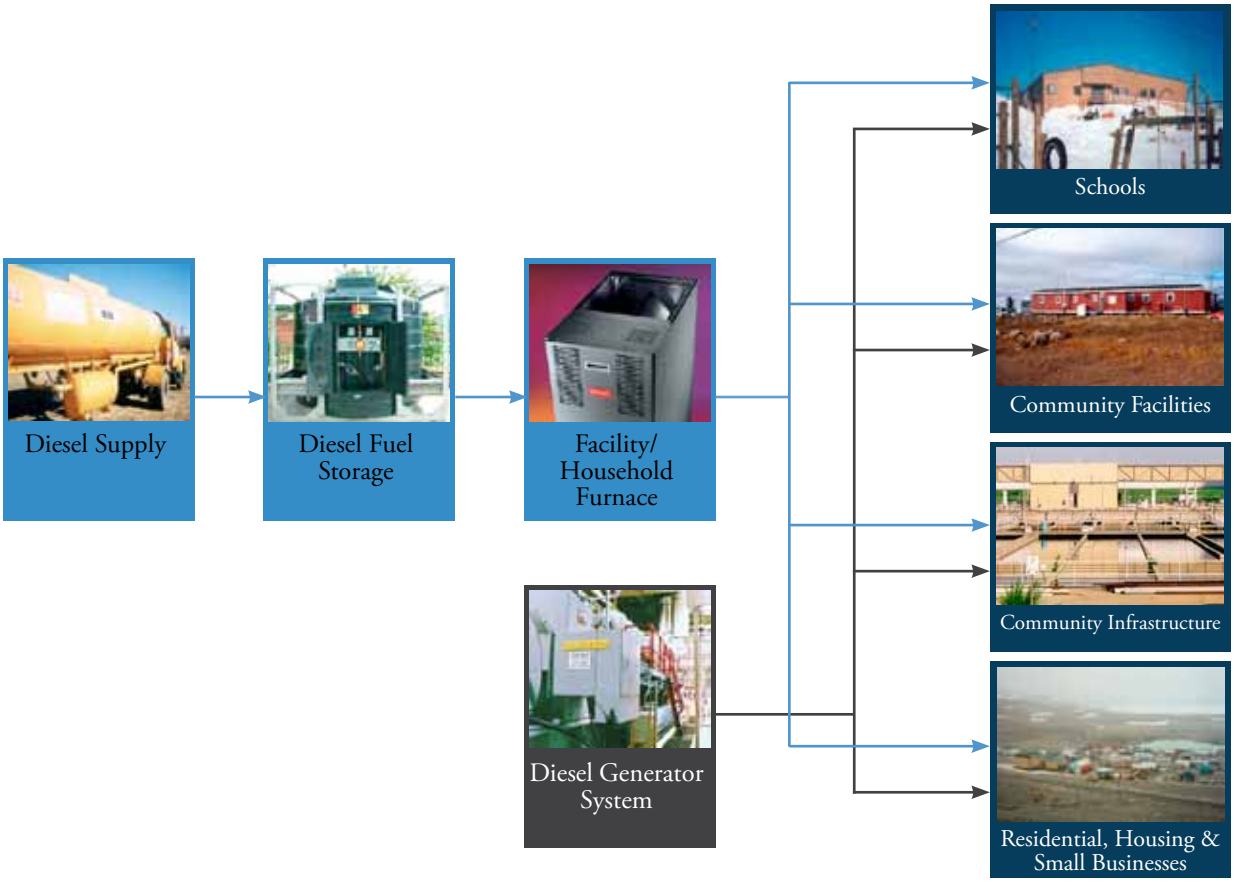
Canadian Remote and Northern Off-Grid Communities



Source: Natural Resources Canada, 2012

The conventional design and makeup of energy systems for remote and northern communities is illustrated below.

Conventional Remote and Northern Off-Grid Energy System Design



The energy make-up of Canada's remote and northern off-grid communities, the vast majority of which are Indigenous, is characterized by the following:

- Lack of power reliability: short- and long-term;
- Limited demand side management to reduce peak load;
- Major untapped energy efficiency potential (estimated to be in excess of 40% by Lumos Energy) relating to community facilities, infrastructure, buildings and residences;
- No major efforts at long-term capital life cycle planning integrating energy conditions and costs;
- Over-consumption of diesel fuel due to demand and supply configurations;
- Limited development of renewable power to date, though that situation is rapidly changing; and
- High per capita and total greenhouse gas and criteria air contaminants emissions, and related fuel (transport/storage) environmental impacts.

Remote & Northern Off-Grid Energy Innovation Efforts

There are a number of remote and northern off-grid energy innovations occurring across Canada.

Grid transmission connections: In some instances, grid connection for remote communities is an economically viable option. However, the test for this type of project generally requires: large, rapidly growing electricity/heating demand from multiple communities, coupled with very high diesel energy costs, and related environmental, economic, and social impacts.

Biomass options: Biomass feedstock supply is a potentially attractive sustainable energy option for off-grid communities. Efforts in this domain are continuing in a number of provinces and territories. Key economic issues include the availability and transport costs for biomass feedstock, and the nature and reliability of conversion technology.

Project Profile
Wataynikaneyap Power – Ontario

Wataynikaneyap Power plans to construct almost 600 (km) in transmission lines to connect 21 remote and northern, off-grid First Nation communities in Ontario. The company is 100% Indigenous-owned and governed with some participation from mining companies (Teck). In addition to providing cheaper, cleaner and more reliable grid power for communities, the energy infrastructure will support mineral development in Ontario's Ring of Fire region.

FreeImages.com/Joe Zlomek.

Project Profile
Whitesands Biomass Pellet Plant - Ontario

Whitesands First Nation is developing a biomass pellet plant served by forest product tenures owned by the Band and private interests. The pellets will replace diesel fuel in the Band's diesel generating plant, as well as supplying feedstock for the Atikokan Thermal Plant run by Ontario Power Generation.

FreeImages.com/Michal K.

Small hydro hybrids & 100% diesel replacement: Small hydro can be an effective diesel substitute or displacement technology provided hydrology is consistent and reliable, and distance between the generating site and the community does not make a local transmission line uneconomic.

Project Profile
Taku River T'Lingit Hydro - BC

The Taku River Tlingit developed a 3 MW Hydro project that now replaces 100% of the diesel fuel that used to be required to generate the off-grid community's energy. Operating since 2009, the new system is 100% community-owned.

FreeImages.com/dlee.

Indigenous-mining energy partnerships: The proximity of mining operations to remote Indigenous communities has promoted consideration of options which add energy value to both communities and mining operations.

Solar-diesel hybrid systems: The price of solar power has rapidly declined, and is almost 55% less per KwH than even five years ago, and further cost declines are expected (15% over the course of 2015-18). This situation, and improved integration of solar with existing diesel systems means that this technology is becoming more realistic for remote and northern communities.

Project Profile
Tlugliq Wind Energy System - Salluit/Raglan, Quebec

In 2014, a unique wind energy system was installed beside the Raglan mine near the Nunavik community of Salluit. The Tlugliq project's unique features include permafrost anchors, and diesel integration in Arctic conditions.

FreeImages.com/Janusz Dymidziuk.

Project Profile
The Deer Lake First Nation – Ontario

The project involved the installation of a 152 KwH solar rooftop system on the community school. Annual Benefits include: $112,000 reduction in the community's energy bill (5 year payback); 3 part-time jobs during the installation of the system, and another 2 part-time jobs to support the O&M throughout the year; displacement of 31,000 liters of diesel fuel; and, 99 tons of reduced GHG emissions, equivalent to the carbon emissions of 20 cars every year.

FreeImages.com/Neville Micallef

Remote wind energy: Wind energy in remote locations has had a checkered history. Several sites in the Canadian Arctic and Boreal regions are orphaned and non-operational. Better systems, planning and technologies are changing that situation as manufacturers, installers and operators have made adjustments to meet the harsh climatic and operating demands of remote and northern communities.

Project Profile
Alaskan Wind Power Case Study

The 350-resident village of Kwigillingok, Alaska, beside the Bering Sea has recently erected five 100-foot-tall wind turbines. With help from Anchorage-based Intelligent Energy Systems, the village raised $12 million and built a total of 15 wind turbines. Since their debut in 2012, the new wind-diesel systems have displaced 30 percent of the fuel used for electricity, an amount that Dennis Meiners, the company's project manager, says will increase to 50 percent after new batteries are installed in all the villages. At the same time, excess wind is being harnessed to run new electric heating units that have been put into people's homes.

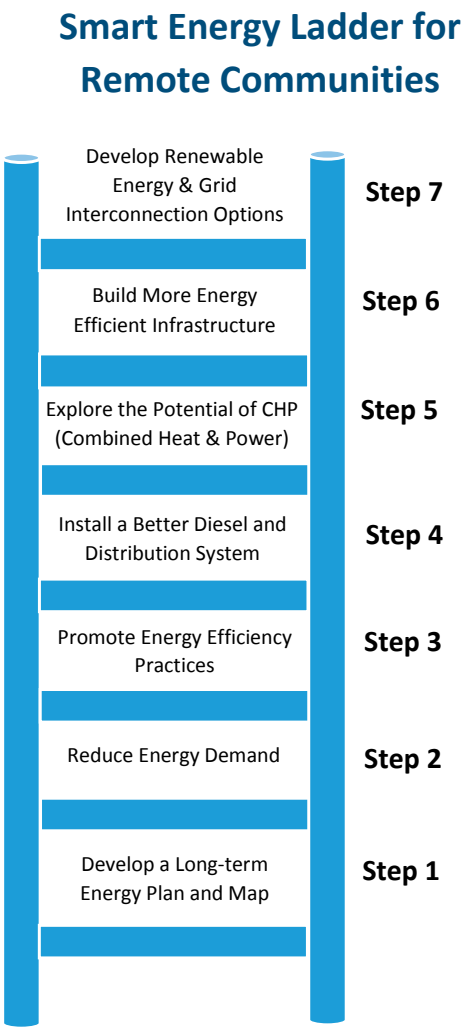
FreeImages.com/Andrea Kratzenberg.

Kinetic turbines: A new hydro technology that is on the cusp of being validated by private companies are kinetic hydro turbines. Conventional hydro turbines create electricity by water passing through one-dimensional blades, creating power through magnetism, and requiring the system be placed in an expensive structure that can tap into water flow (and water drop, or head). In contrast kinetic turbines "sit" on the bottom of a river or tidal bed and create energy through multi-dimensional vibration. Kinetic turbines are low maintenance and can be calibrated to meet the smaller power demand of remote communities.

Energy efficiency: There is a tendency to focus on renewable energy opportunities for remote and northern communities. However, there is no doubt that the most effective sustainable energy action potential lies with energy efficiency, which reduces energy consumption through: energy conservation, demand side management/peak shaving, end use technologies and energy systems management. Attributes of energy efficiency that make it a necessary and vital component of Nunatsiavut's Energy Security Plan include:

- Yielding the highest rates of return for investment in energy;
- A more streamlined installation process than for renewable energy;
- Support of energy efforts taken by utilities and utilities regulatory boards;
- Generating additional energy security benefits;
- Utilizing local personnel for installation and operation;
- Not being technologically complex, and;
- Being relevant to both residential & community infrastructure.

Below is an illustration of a *'Smart Energy Ladder for Remote Communities*, a conceptual framework developed by Lumos Energy showing the logic and importance of pursuing energy efficiency and other lower cost/high return initiatives before jumping to only consider renewable energy options. This is not to suggest that renewable energy should not be part of the solution for remote and northern communities, but that it should be considered in a sequence, at the right time.



Sustainable Energy in Remote Communities – Success Factors

The examples of sustainable energy innovation covered in the previous section, shine a spotlight on the success factors that are critical to sustainable energy initiatives and projects in remote and northern communities. These success factors include:

- **Joint planning and decision-making:** There is generally joint planning and decision-making between power utilities and local communities;
- **Strategic approach to energy security/reliability:** A strategic and planned, rather than a reactive approach, is adopted to energy planning, financing, installation, partnerships and operations to achieve security/reliability goals;
- **'Smart Energy' Ladder adoption:** The 'Smart Energy' Ladder mindset shapes sustainable energy efforts;
- **Long-term infrastructure planning:** There is a clear link between investments in community infrastructure (notably housing and systems like water and wastewater) and energy supply, costs and technologies. This requires housing corporations or delivery agencies to be partners in planning and implementation;
- **Power reliability a core goal:** Power reliability is always a core goal;
- **Power cost/energy security focus medium-long-term:** When making economic decisions, life cycle assessments are employed with a medium to long-term horizon; and
- **Focus on critical game-changing projects:** There is a focus on game-changing projects, in addition to incremental energy improvements.

Barriers to a secure and sustainable energy supply for remote and northern communities include:

- Institutional, energy regulation/policy, cultural and technological barriers;
- Energy management which is often fragmented and varies from community to community;
- Resource constraints and a lack of investment capital (at least initially or in the current scenario);
- Lack of clarity and/or accountability amongst various energy system players;
- Pricing/charging structures that are barriers to energy efficiency and renewable energy; and
- Often a lack of policy/program direction by governments.

3i Sustainable Energy Approach

It is proposed that the Nunatsiavut Energy Security Plan adopt a 3i Sustainable Energy Approach which ensures that actions taken and projects pursued are:

- **Integrated** such that all the planning, project management, technology solutions, technical services, financial, project development and engineering, structuring, financing, construction and operational issues are considered to enhance successful projects.
- **Implementable** in a fashion that moves projects from concept to reality in a staged manner, which accommodates for technical and regulatory processes, and considers the need to implement projects that are shorter term and incremental to a comprehensive sustainable energy solution for communities, while also tackling larger more complex projects over the medium-term.
- **Impactful** to ensure that all project goals are realized, including energy reliability, capital costs, technological robustness, and operational effectiveness, in addition to community, social, environmental and economic development goals.

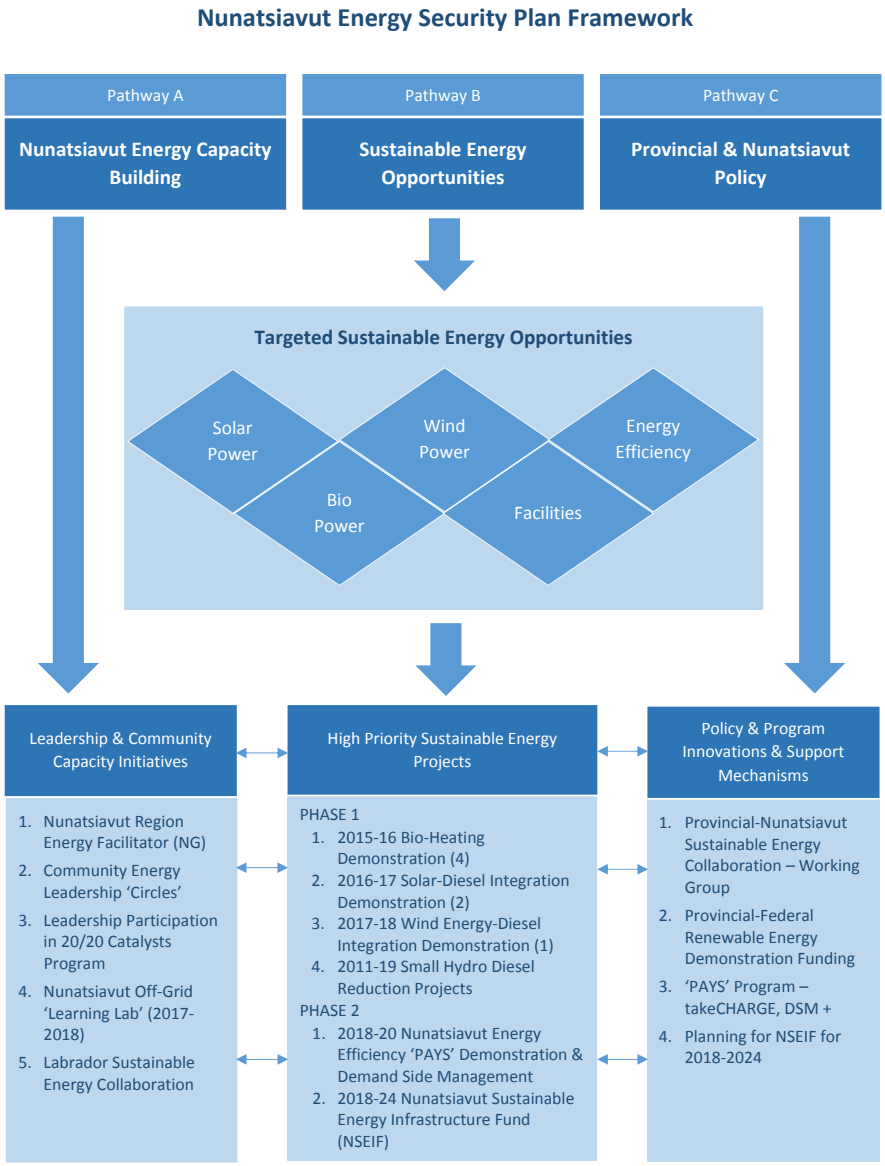
An essential component of a 3i Sustainable Energy Approach is to work with Nunatsiavut community leadership, and engage residents to build knowledge and capacity in renewable energy. Activities and programming, such as those identified below will be part of Pathway A: Nunatsiavut Energy Capacity Building.

1. Presentations (audio and video) from other off-grid communities that have made transitions away from diesel and heating fuel;
2. Project profiles on Indigenous clean energy projects;
3. Teleconferences with local/regional governments and other off-grid Indigenous communities which have taken action on sustainable energy; and
4. Topical presentations on subjects such as community energy planning, Greenhouse Gas offsets, renewable energy technologies, environmental impact reduction, project development, logistics, financing, and governance.

The above outreach and engagement of Nunatsiavut project partners ensures that that off-grid energy security, energy efficiency, renewable energy and micro-grid initiatives truly reflect community interests and garner support from residents and leadership. Above all, implementation of the plan shall be done through, and require the participation and guidance of the Nunatsiavut Government and Inuit Community Governments.

Nunatsiavut Energy Security Plan Framework

The Nunatsiavut Energy Security Plan Framework (as below) will guide and promote the implementation of specific initiatives. Implementing the plan will require collaboration with the Government of Newfoundland and Labrador, Newfoundland and Labrador Hydro, the provincial Public Utilities Board, the Government of Canada, and various public and private agencies.



Pathway A: Nunatsiavut Energy Capacity Building

1. Nunatsiavut Energy Facilitator

Purpose: An in-house resource within Nunatsiavut Government to coordinate energy security initiatives, and support communities.

Function: In-region knowledge and administrative capacity for sustainable energy.

Timeline: 2016-17.

Resources: Full-time equivalent position with application for funding for a 3-year period to the governments of Newfoundland and Labrador, and Canada.

Outcome: Increasing the success of initiatives by ensuring coordination both within Nunatsiavut Government, and with its partners.

2. Community Energy Leadership 'Circles'

Purpose: Local energy capacity building, and ensuring energy security initiatives reflect local conditions, concerns and interests.

Function: Engagement of the Inuit Community Governments, residents and businesses in energy security initiatives.

Timeline: Beginning in 2017-18, meeting twice annually or as needed for energy security initiatives.

Resources: Linked to role of Energy Facilitator; may require some travel resources.

Outcome: Grounding of initiatives in local conditions, and buy-in/participation of communities in energy security initiatives.

3. Leadership Participation in 20/20 Catalysts Program

Purpose: Increasing community readiness, skills development and capacity building for energy security initiatives within Nunatsiavut Government and communities, particularly through connection with Indigenous communities and mentors that are developing clean energy projects elsewhere in Canada.

Function: Participation in 20/20 Catalysts Program.

Timeline: 2016-17.

Resources: $15,000/individual; could be part of a community energy capacity proposal to the federal government.

Outcome: Enhanced local capacity, and connection with a Canada-wide network for clean energy efforts.

4. Nunatsiavut Off-Grid 'Learning Lab' (2015-16)

Purpose: To profile Energy Security initiatives in Nunatsiavut, and engage experts and resources for application in the region, including the provincial government.

Function: Attract visitors and promote the region with specific high profile/visibility energy security initiatives.

Timeline: Proposed for 2017-18.

Resources: Openness to support such an initiative from the federal government, its agencies, private corporations and foundations.

Outcome: Gaining input and connection for energy security initiatives in the region.

5. Labrador Sustainable Energy Collaboration

Purpose: Promotion of clean energy initiatives along with the Innu Nation and remote communities throughout Labrador, and building connections with larger Labrador centres.

Function: Technical and utility resources will be easier to attract to projects with a pan-Labrador focus.

Timeline: 2016-17.

Resources: Linked to role of Energy Facilitator; may require some travel resources.

Outcome: A pan-Labrador sustainable energy perspective.

Pathway B: Sustainable Energy Opportunities & Project Opportunities

PHASE 1:

1. 2015-16 Bio-Heating Demonstration

Purpose: Testing the potential of more energy efficient stoves in terms of wood fuel requirements, cost, indoor air quality and space heating quality.

Function: For 2015-16: Installation and evaluation of 4 test high efficiency stoves. For 2016-17: Installation and evaluation of 2 biomass-based household district heating systems.

Timeline: 2015-16 and 2016-17.

Resources: Applied to Biomass Initiative led by NRCan.

Outcome: Demonstration of technical and economic viability and performance of high energy efficiency stoves.

For further details see the Biomass-to-Energy Conversion to Promote Economic Development and Social Well-Being in Nunatsiavut prepared for Nunatsiavut Government and NRCan, March 2015.

2. Solar - Diesel Integration Demonstration

Purpose: To demonstrate the integration of solar array into a diesel reliant isolated system.

Function: Installation of PV panels on the Illusuak Cultural Centre.

Timeline: 2015-16.

Resources: Supported by the federal government and industry contributions.

Outcome: Solar demonstration in Nunatsiavut.

3. 2016-17 Wind Energy - Diesel Integration Demonstration

Purpose: To demonstrate the effectiveness of integrating a wind turbine into a diesel reliant isolated system.

Function: Small scale wind-diesel hybrid in a Nunatsiavut community (potentially Hopedale).

Timeline: 2016-17.

Resources: TBD.

Outcome: Wind energy demonstration in Nunatsiavut.

2. Nunatsiavut Sustainable Energy Infrastructure Fund (NSEIF)

Purpose: Establishment of a long-term infrastructure fund to improve the energy efficiency of new and existing buildings in the region; could be linked to a larger infrastructure fund.

Function: Promotion of system-oriented, community and new building design with energy consumption benefits into regional facilities and buildings.

Timeline: 2018-24.

Resources: To be determined.

Outcome: Community and building infrastructure that is more energy efficient.

4. 2011-19 Small Hydro Diesel Reduction Projects

Purpose To examine the technical and economic value/feasibility of developing small hydro projects in the region, including potentially for Makkovik, Nain and Hopedale.

Function: Supply of local/region owned small hydro systems to reduce diesel consumption in communities.

Timeline: 2017-19.

Resources: Funding for site-specific pre-feasibility planning will be required, including integration issues between small hydro projects and local community grids.

Outcome: Small hydro project development: reducing diesel demand, and prompting local ownership and employment.

PHASE 2:

1. Nunatsiavut Energy Efficiency 'PAYS' Demonstration/Demand Side Management

Purpose: To promote programming and financing through a new stand-alone program, or through Newfoundland and Labrador Hydro whereby capital would be available to install more energy efficiency devices (lighting, water heating, etc.) and improved building insulation.

Function: To reduce heating and electricity bills through energy cost savings.

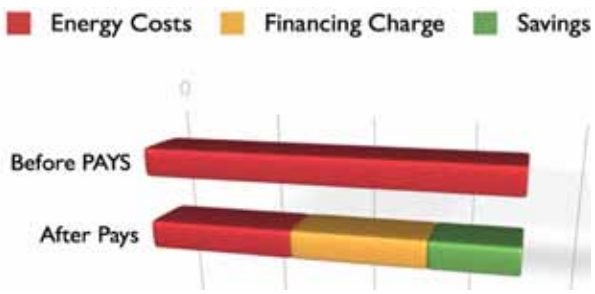
Timeline: 2016-17 and onwards.

Resources: To be determined through discussion with the provincial government and Newfoundland and Labrador Hydro.

Outcome: Improved energy efficiency and reduced energy costs.

Overview of a Pay-As-You-Save (PAYS) System

PAYS financing is an on-bill utility financing program, usually offered at relatively low interest rates, over a relatively long-term. The purpose of PAYS financing is to remove the upfront cost barrier to households looking to invest in energy-saving technologies. PAYS programs are designed so that the household sees immediate energy bill reductions, even if they are small. Bills are often guaranteed not to increase. The illustration below highlights the cost distributions of a PAYS system.



Pay-As-You-Save (PAYS) is a mechanism adopted in a number of North American jurisdictions whereby homeowners can access financing through a utility, government program or utility-related entity to make investments in energy conservation and efficiency. Over time, this financing is paid back through electricity bill payments. However, it is important to note that the homeowner does not pay any more than they would have paid in the past. Rather, they make the same (or slightly lower) historical level of utility payments, even when the investments in energy conservation and efficiency lead to lower power consumption and costs. The difference between the historical levels of electricity consumption, and the lower conservation/efficiency generated consumption, is used to pay back the financing as well as the slightly decreased energy bills. Once the financing is paid back from electricity consumption savings, the homeowner benefits from a lower electricity bill, and an improved and more energy-efficient dwelling.

Manitoba is a jurisdiction which has a robust, well-operating and proven PAYS system. Power Smart PAYS Financing is a convenient and affordable financing option if homeowners wish to make energy efficiency upgrades to their home, such as space heating equipment, insulation, water heating and water conservation, water heating equipment, toilets, etc. The PAYS mechanism is tied to the residence or business, and continues in force if the property is sold or transferred.

Consideration of developing a PAYS system for Labrador Isolated Customers has substantive merit. It is a means of catalyzing untapped energy efficiency opportunities. Regionally, all homeowners, including the Nunatsiavut and Innu governments should have access to a PAYS program.

Pathway C: Provincial & Nunatsiavut Policy & Programs

1. Provincial – Nunatsiavut Sustainable Energy Collaboration – Working Group

Purpose: Ensure energy security collaboration between Nunatsiavut Government, communities, and the provincial government.

Function: A collaborative working group that convenes to consider energy security initiatives and policies for the region.

Timeline: 2017-18.

Resources: Part of regular functions.

Outcome: Joint energy security efforts.

2. Provincial-Federal Renewable Energy Demonstration Funding

Purpose: Approaching the provincial and federal governments to consider a "package" of support for a bundle of energy security initiatives with continued funding determined by initiative success and performance.

Function: Adoption of a portfolio approach to energy security in the region.

Timeline: 2016-17.

Resources: Based on initiative budgets; explore resourcing from multiple program and funding arrangements.

Outcome: More effective implementation of projects on a portfolio rather than a one-off basis.

3. 'PAYS' Program – take CHARGE, DSM +

As discussed under Pathway B.

4. Planning for NSEIF for 2018-2024

As discussed under Pathway B.

Appendix

Nunatsiavut Community Profiles

Site visits and community consultations were an integral part of the development of the Nunatsiavut Energy Security Plan. Chris Henderson of Lumos Energy visited communities and met with local leadership. Profiles of each community are included below.

Nain Community Profile

Photo by Lumos Energy

Nain Community Overview

- Population: 1,117 Beneficiaries + non-beneficiaries (October 2016)
- K-12 schools: 231 students, two separate buildings (November 2016)
- Number of residents has slightly increased over the past 5 years, and number of homes has increased with efforts to reduce the number of homes with multiple family units
- Seniors comprise 20% of residents
- Fire Hall has been renovated
- New Illusuak Cultural Centre
- New recreation centre
- Multi-unit residential facility is being built
- Climate change effects seen in community (e.g. extreme weather events and seasons)

Community Energy System

- Newfoundland & Labrador Hydro Power Plant
- Plant upgrades started in 2015
- Configuration: 3 engines
- Local electrician in community
- Majority wood burning stoves and oil furnace, with a trend towards electric heat, and almost all electric water heating

- Community government partnered with Newfoundland and Labrador Hydro on energy efficient lighting, window insulation etc.
- Most wood stoves are basic
- Wood requirements 6-8 cords per year per household
- Oil tanks have to have an inspection sticker to be re-filled, which can require households to spend money
- Nunatsiavut Group of Companies sometimes sends in wood to the community government; older people and single parent families are priority recipients
- People will scavenge wood from the dump, with all potential supply utilized
- Generally, people do not have electricity "cut off" during the winter months for non-payment of bills, however cutsoffs do occur in the summer
- When in arears people sometimes use income tax refunds to catch up on electricity bills

Community Energy Needs

- New demand from the recreation centre, and Illusuak Cultural Centre (2017 opening)
- Need for a new arena to replace Husky Centre (rink not regular size, no space for events)
- Wood extensively used for space heating; local supply limited and requires lengthy snowmobile trips in the winter months
- Seniors and low income households often looking for wood
- Some households purchase wood from Postville shipped up by barge, high cost impact
- Strong and definite trend towards electric heat
- New water reservoir built; community government incurred $100,000 cost to install hydro polls to water system
- Electric heat being used in recreation centre
- Electric heat much more convenient, and fewer problems, especially important for seniors, single parent households etc.
- More people building their own homes after obtaining land from community government requiring survey and registration costs (~$2,500/property)

Community Energy 'Gaps'

- Last series of major outages in late 2012; significant negative impact on the community
- Notification system for outages deficient; people call the community government, and other offices
- Energy efficiency is not being fully considered in the design and construction of homes and facilities
- Electric stove/ovens used by some families when wood unavailable
- Oil furnaces are difficult to maintain
- People are often unable to "bleed" furnaces for servicing; need to pay someone to do it, or it can be done improperly

Community Energy Opportunities

- Wind met tower installed near reservoir; data gathering needs to be verified
- More efficient wood to energy conversion
- Potential for solar power
- Use of biomass for heating of multi-unit facilities
- Using new facilities (e.g. Illusuak Cultural Centre) to showcase energy opportunities

Key Informants

- Samuel Dicker: Town Maintenance Supervisor, Nain Inuit Community Government
- Dasi Ikkusek: Town Manager, Nain Inuit Community Government
- Joe Dicker: AngajukKâk, Nain Inuit Community Government

Hopedale Community Profile

Photo by Chris Sampson

Hopedale Community Overview

- Population: 592 Beneficiaries + non-beneficiaries (October 2016)
- K-12 school: 130 students (November 2016)
- Community spread out 1-2 km along harbours (from older Village to newer pier)
- Infrastructure examples: playgrounds, court surface, new recreation centre
- Old US base near community
- Legislative capital of Nunatsiavut; Nunatsiavut Assembly building
- Limited local economic development

Community Energy System

- Newfoundland & Labrador Hydro Power Plant
- Configuration: 3 current engines
- Power used for water heating
- More demand from new recreation centre
- On-going housing construction: 11 homes added over the last two years
- Plant going through a major upgrade
- A new MTH 1200, 935 kWh engine is being installed with a German design
- New automated and fuel feed system also being installed
- New emissions stack being added to meet regulations
- Other motors CAT's (2 – 545 kWh (3412), 1 – 445 kWh (3504))

- 10-15% annual growth in load
- System switches on next engine at 80-85% load
- Current load ~ 500 kWh summer, 1 mWh winter
- 22,000 liters of fuel tank refilled 3 times a week in summer; tank refilled when at 9,000 – 11,000 liters
- Fuel feeds into each engine
- Filled from adjacent Woodward Tank Farm
- Fuel quality is low (Arctic Grade Fuel)
- "Take Charge" energy efficiency program for Newfoundland at play – not too effective
- Major factor transition from oil (and some wood) for space heating due to the lower cost of energy (given 70% NL subsidy) relative to oil
- Systems quality high, including local distribution lines

Community Energy Needs

- The community is growing; there are lots of young families with children
- Homes are built with a medium-level of energy efficiency
- Payments for electricity go to Newfoundland and Labrador Hydro
- Wind energy anemometer is working on the bluffs over the community (no data setup appears to be in place); local knowledge suggests that wind blows a lot in the fall and "a bit" in the winter

Community Energy 'Gaps'

- Main pressures are senior and low income households that find it difficult to cover heating and electricity costs: oil or oil/power
- When people convert their homes from oil to electric baseboard heat, it costs several thousand dollars, and sometimes an electrician needs to be hired from outside of the community
- Many families continue to use to wood for space heating; they have to travel approximately 150 km (round-trip) on snowmobile to find enough wood supply
- Hopedale used to have some power outages, however, this is less of a problem recently
- The community government uses operating funds to cover its own energy costs (from the Nunatsiavut Government and Government of Newfoundland and Labrador)
- New recreation centre will add to load demand
- Homes are energy inefficient and have significant mould problems

Community Energy Opportunities

- Wind energy potential
- Excellent siting for solar array near diesel plant
- More efficient conversion of wood to energy
- Energy efficiency, especially in older part of town

Key Informants

- Kitura Abel: Town Manager, Hopedale Inuit Community Government
- Rob Abbot: Regional Supervisor, Newfoundland and Labrador Hydro

Makkovik Community Profile

Photo by Lumos Energy

Makkovik Community Overview

- Population: 344 Beneficiaries + non-beneficiaries (October 2016)
- Stable community population
- K-12 school: 71 students (November 2016)
- Some duplexes
- Main coast road 2.5 km long
- New South Coast snowmobile trail built
- Water supply built in 1970's; sufficient supply
- Lots of community facilities developed in the last few years: $14m rink prepped for artificial ice, new Craft Centre, Youth Centre and upgraded Fire Hall

Community Energy System

- Newfoundland & Labrador Hydro Power Plant
- Wood stoves (basic) very common; some wood stoves are hybrids (oil/wood)
- Wood supply mostly obtained locally, at a distance (Southbrook/Burntwood)
- Purchasing wood costs $5 a stick; 100 sticks for the winter
- Problems getting wood for low income households, especially in seasons when ice not freezing early enough

Community Energy Needs

- Two seafood plants: one for snow crab, the other for halibut and turbot, but insufficient load to run both at the same time
- Plants employment potential 30-40, but now ~ 15 people
- 8 leased long liners in community
- Private grocery store

Community Energy Gaps

- Oil heat costs large; $305/barrel, 1 barrel/week in winter, monthly costs of $1,200 versus $200-400 month for electric heat
- Not as many outages as in the past
- Difficult to obtain home insurance, especially with wood stoves; have to get an assessor in from outside the community
- In late 2013 monthly bills skyrocketed, apparently based on some meter readings, but no explanations given (~30% higher)
- Water pipes still freezing; some people not using drip valves effectively
- Oil furnaces are difficult to maintain; people are often unable to "bleed" furnaces for servicing; need to pay someone to do it, or it can be done improperly

Community Energy Opportunities

- Makkovik Brook, ~ 3 km from community
- No info on hydrology surveying
- May be some wind energy potential
- Concept of a Community Wood Box

Key Informants

- Terry Rice: Town Manager, Makkovik Inuit Community Government
- Makkovik Inuit Community Government Staff

Postville Community Profile

Photo by Chris Sampson

Postville Community Overview

- Population: 171 Beneficiaries + non-beneficiaries (October 2016)
- K-12 school: 32 students (November 2016)
- Steady population, neither increasing nor decreasing in recent years; approximately 17% seniors (65 years and older)
- New community center (2015)
- New fire hall (2016)
- Labrador Winter Trail runs through Postville, with lots of snowmobilers passing through the community
- 2 km of main road through town
- 10 km of road to quarry
- Outdoor rink with lighting
- Playground and ball field
- Need for new landfill site

Community Energy System

- Newfoundland and Labrador Hydro Power Plant
- Configuration: 3 engines, sufficient for current load
- Recently built community center and 18 new fire hydrants
- Some homes use electric heat as an alternate but fire wood is the main source of heating

Community Energy Needs

- More housing and housing repairs (more efficient heating)
- Plans for an Interpretation Center and Craft Shop (2017, if funding available)
- Firewood is the main source of home heat, while some homes burn stove oil and electric heat is an alternative method for some households

Community Energy Gap

- Some households have financial difficulties related to the cost of gas required to harvest wood, or the purchasing of stove oil (seniors, low income families, single parents, widows etc.)
- Home repairs to improve heating efficiency and reducing the overall cost of heating

Key Informants

- Diane Gear: AngajukKâk, Postville Inuit Community Government
- Shirley Goudie: Town Manager, Postville Inuit Community Government
- Terry Gear: Supervisor of Works, Postville Inuit Community Government

Rigolet Community Profile

Photo by Celes Davar

Rigolet Community Overview

- Population: 302 Beneficiaries + non-beneficiaries (October 2016)
- K-12 school: 61 students (November 2016)
- New multi-purpose centre (completion 2016); new fire hall under construction
- Limited local economic development
- Craft Shop, and outdoor rink and playground

Community Energy System

- Newfoundland and Labrador Hydro Power Plant
- Configuration: 3 engines, one was upgraded Fall 2016
- Power use to heat homes with electric baseboard heating
- Increase in demand due to new multi-purpose centre and fire hall
- Ongoing housing construction, two new builds by Torngat Regional Housing Association in 2016

Community Energy Needs

- Low-level energy efficiency common, even in new and recently built homes
- Most households rely on wood burning stoves or oil heat
- Winter wood collection by skidoo

Community Energy Gaps:

- Pressure on seniors and low income households to meet heating needs; in competition with high cost of living, especially food security

Key Informants

- Kara Berthiaume: Town Manager, Rigolet Inuit Community Government
- Rigolet Inuit Community Government Staff