

2020



# Resource Planning - August 2020 update

**RESOURCE PLANNING – AUGUST 2020 UPDATE**

NIHTAT ENERGY LTD

NIHTAT ENERGY LTD | Box 2570, Inuvik, NT, X0E 0T0

NIHTAT ENERGY LTD

**1.0 INTRODUCTION & OVERVIEW**



Nihtat Energy Ltd (NEL), a subsidiary of Nihtat Corporation (Nihtat) is a northern, Indigenous owned and operated company focused on developing and operating clean energy alternatives and energy

efficiency projects in the Beaufort Delta region of Northwest Territories (NWT) as well as other areas of northern Canada. NEL is focused on working with Indigenous and other northern stakeholders to create sustainable and environmentally responsible and meaningful economic opportunities across the north.

In order to understand where NEL is today, and where it plans to go in the future, it is important to understand why it was conceived in 2018, its rapid evolution over a short period since then, and how hard lessons learned over this period are providing guidance for its next stage of renewable planning activities.

This initial resource planning update outlines Nihtat and NEL’s resource planning journey so far and how it provides the foundation for the next stage of planning in the Beaufort Delta region of NWT.

NEL’s planning process is necessarily iterative, and it is expected that the next iteration of planning will be informed by:

- 1** Engagement with key stakeholders in Beaufort Delta communities, relevant utilities, territorial governments and Canada over 2020/21;
- 2** The results from further studies and assessments currently underway in 2020; and
- 3** Ongoing learning as NEL proceeds with committed projects in 2020/21.

The next stage of NEL’s renewable resource plan is expected to be completed before March 31, 2021.

**Who are the Nihtat Gwich’in?**

Nihtat Corporation is wholly owned by the Nihtat Gwich’in Council located in Inuvik, NWT. The Nihtat Gwich’in Council is one of four designated Gwich’in organizations established under the Gwich’in Comprehensive Land Claim Agreement and located within the Gwich’in Settlement Region (see Figure 1 below).

As noted in Figure 1, the communities of Inuvik, Aklavik, Fort McPherson, and Tsiigehtchic are within the Gwich’in settlement region in NT.

**Figure 1: Gwich’in Settlement Region**



The mandate of Nihtat is to enhance the quality of life of its participants through creation of, and participation in, meaningful economic opportunities in a sustainable and responsible environment.

In accordance with its mandate, the Nihtat Corporation is seeking opportunities to create and participate in economic activity within the Gwich’in Settlement Area.

## 2.0 UNDERSTANDING THE BEAUFORT DELTA CONTEXT

Starting in 2016, with Indigenous and Northern Affairs Canada (INAC) funding support, Gwich'in Council International (GCI) led two studies designed to facilitate Indigenous communities/organizations in the Canadian North to assess economic feasibility of alternative energy projects (solar/wind/biomass) in reducing current reliance on fossil fuel.

- The **2016 True Cost of Diesel Study** looked at cost of fossil fuels used to provide power to nine remote off-grid northern communities in NWT, Yukon, and NU, and estimated utility and social costs of diesel fuel use in power generation.
- The **2017/18 Beaufort Delta Off-grid Fossil Fuels Study** reviewed fossil fuel uses, costs and GHG emissions by sector for each community in the Beaufort Delta region, and options to reduce fossil fuel uses. Study information was used to further understand opportunities for local community involvement in renewable energy projects to reduce fossil fuel use in northern off-grid communities.

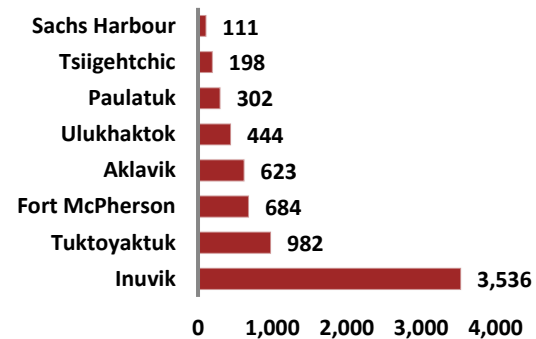
The GCI studies outline the following important planning context for Beaufort Delta communities:

- **Population:** The Town of Inuvik, the largest community in the Beaufort Delta Region, accounts for 51% of the 6,880 people in the Beaufort Delta Region. The communities of Inuvik, Aklavik, Fort McPherson, and Tsiigehtchic are within the Gwich'in settlement region in NT. Aklavik is a mixed community of Gwich'in and Inuvialuit, while Inuvik has a mixed population that includes Gwich'in, Inuvialuit and non-Indigenous people. Fort McPherson and Tsiigehtchic are predominantly Gwich'in communities. Other Beaufort Delta communities are primarily Inuvialuit.
- **Access:** Only four communities are accessible by road most of the year via the Dempster Highway through Yukon: Inuvik, Fort McPherson, Tsiigehtchic and Tuktoyaktuk. During spring break-up and fall freeze up communities to the east of the Mackenzie River are not accessible by road or ferry. Summer (June to August) water access (via barge or ship) and air transport are other existing access infrastructure options for fossil fuel energy supply to these communities.
- **Power Generation:** Each community has its own isolated power generation with no transmission connection between communities in the region. Excluding locally supplied natural gas available for use in Inuvik for heating, fossil fuels from external sources (e.g., diesel and other oil fuels, LNG, and propane) are relied upon for electricity generation, heating and transportation.

Figure 2: Beaufort Delta Region



Figure 3: Beaufort Delta Region Population



### 3.0 FINDING A ROLE IN RENEWABLES DEVELOPMENT

The first major renewable planning project in the Beaufort Delta that Nihtat gained experience with was the Government of Northwest Territories (GNWT) High Point Wind Project – a 2 to 4 MW wind project planned for the Inuvik electricity grid.

Two stages of feasibility assessment were undertaken for the project between 2016 and 2018. For each feasibility assessment a competitive tender was issued, and in each case Nihtat brought together a team with the necessary skills and expertise to win the work. Winning the contract for the feasibility assessments was critical to Nihtat having an active role in the initial project planning and development stages of the project.

Involvement in this project's planning enabled Nihtat to gain an understanding of both the project and planning issues surrounding the Inuvik electrical grid. However, while Nihtat was keenly interested in being involved in advancing the Project – there was no long term GNWT strategy to ensure an ongoing role for Nihtat (or the community) in this project's development.

In 2018, \$30 million of federal funding was announced for the project, and GNWT proposed a potential long-term investment opportunity for the local Gwich'in in the project. However, the terms offered by the GNWT provided negligible, if any, benefits for the community and were not considered reasonable, attractive or acceptable. Ultimately, issues related to Nihtat gaining a financial interest in the project could not be resolved.

GNWT and Northwest Territories Power Corporation (NTPC) have continued since 2018 to undertake work on this project without any local Indigenous involvement. The High Point Wind Project is still not committed to proceed as of August 2020.

The experience with the High Point Wind Project led Nihtat to realize the need to find better and more effective ways to ensure Indigenous involvement and engagement on long lived and capital intensive renewable projects to ensure:

1. Local Indigenous communities play an active and meaningful role in the planning process; and
2. Long-lived capital investments provide opportunities for project benefits and community involvement that extend well beyond project planning and construction to equity ownership, partnerships and having Indigenous proponents.

Nihtat planning activities in 2018 and 2019 were driven by its initial resource planning experiences and the above objectives.

#### GNWT Project Partnership Limitations

The GNWT 2030 Energy Strategy outlines investment in large renewable projects as one pathway for Indigenous involvement in major development projects. However, the GNWT's model for Indigenous participation is limited by the following factors:

- The GNWT partnership model notes that community and Indigenous governments can provide debt financing and earn a low risk return consistent with the investment terms available to the GNWT.
- Indigenous communities and Indigenous owned business entities often cannot access financing at the same rates that government can.
- The Indigenous investment context is also constrained by the fact that NTPC does not make a profit on electricity power sales; and GNWT subsidizes renewable generation to keep power rates low.

NEL's experience is that the terms offered by GNWT are not attractive or acceptable to Indigenous communities or businesses.

As opposed to creating an opportunity, the Indigenous investment model established by the GNWT presents a significant barrier to Indigenous involvement in major endeavours occurring in remote NWT communities.

This results in outcomes that can also frustrate both territorial and federal objectives.

**GAINING INITIAL FOOTING...**

The studies initiated by GCI in 2016 provided the necessary foundation for Nihtat Corporation in early 2018 to develop business cases and assess the viability of a number of project concepts focused on reducing fossil fuel use in the electricity and heating sectors in Beaufort Delta communities. The outcomes of these initial assessments provided a foundation for Nihtat to submit two funding applications to the Clean Energy for Rural and Remote Communities (CERRC) program in May 2018:

- **Solar deployment program funding** to install and operate different commercially available approaches to implement photovoltaic (PV) solar to displace diesel and natural gas fossil fuel electricity generation in NT and Nunavut (NU) thermal zone communities.
- **Bioheat deployment program funding** to replace fossil fuel boilers in GNWT buildings with biomass fueled heating systems and to conduct capacity development studies to assess and implement options to reduce costs of biomass supply to the Beaufort Delta region.

In each case, Nihtat’s applications for funding were successful.

By the end of 2018, Nihtat successfully completed CERRC due diligence reviews and by early 2019 had CERRC contribution agreements in place for each project. Given the scale of planning activities involved in implementing these projects and planning for additional future renewable developments, Nihtat created NEL as a separate business entity focused on undertaking the planning and development of these initiatives, and on investigating and planning for the next stage of renewables development in the Beaufort Delta Region.

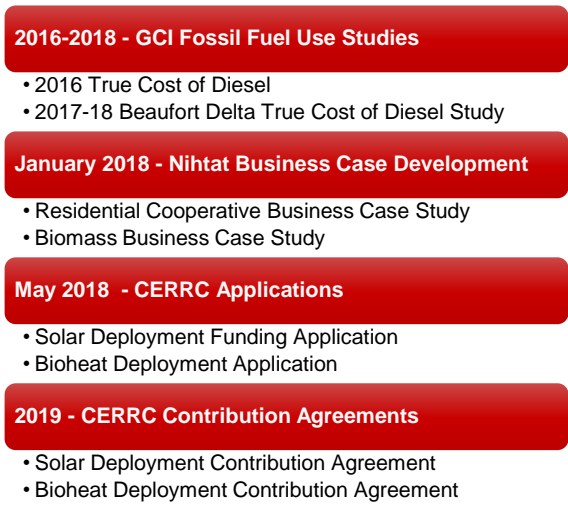
**... STEPPING INTO A NEW ROLE...**

NEL was formed to take on, and solve, the challenges defined by Nihtat’s early experience on the Inuvik Wind Project; and to find opportunities to develop renewable energy projects in Beaufort Delta and other areas of the north that could achieve the following **Core Planning Objectives**:

- |   |   |
|---|---|
| 1 | Facilitate development of renewables that can displace fossil fuels for electricity, heating or transportation uses in remote communities.  |
| 2 | Enhance Indigenous participation in utility project planning and implementation; including ensuring that long term benefits from energy projects also flow to local Indigenous communities. |
| 3 | Ensure that local Indigenous communities have a meaningful role to play in taking action to mitigate climate change impacts.  |

NEL stepping into this new role coincided with federal funding initiatives focused on ensuring involvement of local Indigenous communities in development of renewable resources in remote communities that can displace fossil fuel use. These federal programs provided a critical foundation for NEL to build on in order to achieve planning objectives that included development of a number of renewable solar projects in the Beaufort Delta and Nunavut; and biomass heating installations and supply chain enhancements in Inuvik.

**Figure 4: Nihtat 2016-2018 Planning Process**



**...INITIAL INUVIK SOLAR PV SUCCESSES....**

In funding applications to CERRC in May 2018 Nihtat outlined plans for an initial stage of solar installations in 2019 that included installation of 173 kW AC of solar with net metering in up to 32 homes in Inuvik; and installation of 336 kW AC of Phase 1 solar with net metering in two commercial installations in Inuvik.

Over 2019-2020, NEL completed each of these initiatives with PV solar installed on up to 28 homes (with one home planned to be completed in 2020); and installation of commercial PV solar installations at the Inuvik North Mart and the Mackenzie Hotel.

**1. Inuvik Residential Solar Net Metering** - Nihtat planned and implemented a multi-residential community solar net metering

Project in Inuvik using an informal “co-operative” structure. The approach provided initial cost savings through economies of scale related to bundling of installation orders for customers, and added efficiencies related to labour and mobilization expenses. Nihtat coordinated and managed the purchase and initial ownership of the solar PV units, securing all related approvals and grant funding, installation of units under purchase arrangements on roofs of the participating homes, confirming ongoing O&M services related to the units, and coordinating ongoing monitoring and reporting on the Project.

**2. Inuvik North Mart Store Solar PV Installation** - In summer 2019, NEL installed a 165 kW AC ground mounted PV plant located on a vacant NWC lot adjacent to the Inuvik North Mart store. Nihtat approached Northwest Company (NWC) in late March 2018 to discuss the opportunity, with federal CERRC funding, for Nihtat to deploy solar PV panels under lease to NWC for installation on the roofs of NWC stores in NWT and NU thermal zone communities. The initiative would reduce energy costs for NWC stores and demonstrate partnership with Indigenous organizations. Nihtat and NWC proceeded with a pilot in Inuvik, with the understanding that the concept could be expanded to other NWC stores in NU and NWT.

**3. Inuvik Mackenzie Hotel Solar PV Installation** - In 2019, NEL installed a 99 kW AC ground mounted PV plant located on a vacant lot North-West of the Mackenzie Hotel in Inuvik. The Mackenzie Hotel is a major commercial user of power in Inuvik, with electricity use approximating 490 MW.h/year<sup>1</sup>. Nihtat and the Mackenzie Hotel agreed in April 2018 to work together to investigate a possible solar PV option for the hotel facility, where Nihtat would deploy solar panels under lease to the hotel for installation on the roof or other adjacent property. Investigations confirmed that a vacant site adjacent to the hotel and owned by Gwich'in Development Corporation (GDC) provided the best location for deploying solar PV for use by the hotel.

**Figure 5: Inuvik Projects Completed in 2019-2020**



Figure 5 shows the location of projects completed in Inuvik in 2019-2020. Each yellow pin is a residential project. Green pins are commercial projects.

<sup>1</sup> In addition to purchasing power from NTPC, the hotel uses its own cogen natural gas units during winter months (November through April) to provide self-generation of power plus heating.

These NEL solar installations materially increased the amount of renewable capacity installed in Inuvik, while also providing construction and other longer term benefits to community members and businesses.

**1. Environment/ Climate Impacts:**

Total renewable capacity of 478.2 kW AC was added to the Inuvik grid by May 2020; with expected year 1 fossil fuel displacement of 571.8 MWh./ yr.

**2. Local Economic Impacts:**

Construction employment of 2-4 Indigenous individuals in summer 2019, and seasonal operational employment opportunities related to snow clearing/ maintenance.

**3. Other Economic Benefits:**

NEL negotiated arrangements for lease of the solar equipment to commercial customers will provide revenues to this Indigenous business enterprise over the life of each project. Commercial and residential customers will benefit through reductions in electricity bills.

In addition to meeting NEL’s core planning objectives, implementation of these initiatives has also meaningfully contributed to meeting both territorial and federal climate change initiatives by involving Indigenous and remote communities in installation of renewables that reduce fossil fuel use and GHG emissions.

**Table 1: Key 2019 Inuvik Solar Project Outcomes**

	Renewable Capacity Added	Expected Fossil Fuel Displaced (Yr1)	Expected GHG's Reduced (Yr1)
<b>Environment/ Climate Impacts</b>	478.2 kW AC	571.8 MWh/yr	395.0 tonnes/yr
	Local Spending re: Construction	Jobs During Construction	Jobs During Operation
<b>Local Economic Impacts</b>	\$263,350	2-4	Up to 4
	Investment Benefits	Capacity Development	Other Benefits
<b>Other Social &amp; Economic Impacts</b>	<ul style="list-style-type: none"> <li>✓ NEL Lease Payments</li> <li>✓ Homeowner bill savings</li> <li>✓ Commercial bill savings</li> </ul>	<ul style="list-style-type: none"> <li>✓ NEL experience</li> <li>✓ Training during construction/ operation</li> </ul>	<ul style="list-style-type: none"> <li>✓ Local participation in climate action</li> <li>✓ Homeowner energy literacy</li> </ul>

**Table 2: 2019 Inuvik Solar Project Alignment with Federal/ Territorial Objectives**

Territorial Objectives: Electricity Generation, Leadership and Indigenous Engagement	Residential Net Metering	North Mart Inuvik	Mackenzie Hotel
✓ <i>Reduce GHG emissions from electricity generation in diesel powered communities</i>	<b>154 tonnes/yr</b> reduced GHGs (Yr1)	<b>164.5 tonnes/yr</b> reduced GHGs (Yr1)	<b>76.5 tonnes/yr</b> reduced GHGs (Yr1)
✓ <i>Work together to find solutions: community engagement, participation and empowerment</i>	29 local participants	Local Indigenous developer	Local Indigenous developer
Federal Objectives for Electricity Generation	214 kW AC	165 kW AC	99 kW AC
✓ <i>Increase amount of energy generated from renewable and low-emitting sources</i>	renewable capacity added to remote grid	renewable capacity added to remote grid	renewable capacity added to remote grid
✓ <i>Connected clean power with places that need it</i>	Remote thermal community	Remote thermal community	Remote thermal community
X <i>Modernize electricity systems</i>	n/a	n/a	n/a
✓ <i>Reduce reliance on diesel working with Indigenous Peoples and northern and remote communities</i>	Local participants; Indigenous developer	Indigenous developer	Indigenous developer

n/a is not applicable.

**...INITIAL BIOMASS PLANNING CHALLENGES...**

NEL applied for and was awarded \$5 million in CERRC bioheat funding to install biomass heating systems in up to 24 GNWT buildings in five Beaufort Delta communities to displace diesel and natural gas use. Pursuant to objectives outlined in the 2030 Energy Strategy, the biomass installation project would:

1. Help to increase the share of renewable energy used for space heating; and
2. Encourage GNWT partnerships with Indigenous and community governments and industry.

While GNWT was initially supportive of the program – NEL experienced a number of significant delays with securing a GNWT heat agreement. This delayed project implementation from summer of 2019 to summer of 2020. This delay also resulted in NEL's CERRC funding being reduced to only 31% of the original \$5 million awarded. Due to the reduction in funding NEL is now pursuing replacement of biomass boilers in only up to 6 buildings instead of the original 24 as planned.

A heat agreement with GNWT was concluded in April 2020, and NEL is now proceeding in summer/ fall 2020 with boiler installations in the first two GNWT buildings. The remaining buildings are planned for installation in summer 2021.

**... PLANNING TO IMPROVE BIOMASS SUPPLY CHAIN COSTS...**

Since 2018, NEL has worked to explore ways to optimize the biomass supply chain to the Beaufort Delta in order to reduce delivered costs and make switching to biomass fuel for heating more cost-effective.

Initial assessments completed in June 2019 determined two areas of focus:

1. Optimizing existing trucking of wood pellets from LaCrete, Alberta; and
2. Developing a source of biomass supply in Yukon in order to reduce the trucking distance by half.

**...CURRENT BIOMASS ACTIONS & ASSESSMENTS...**

In addition to installing and operating biomass boilers at six GNWT building in Inuvik, NEL's current biomass actions and assessments include the following three elements.

**1. Optimized biomass delivery**

NEL plans to use 20' sea containers for transport, storage and biomass boiler site supply of wood pellets in order to provide flexibility and reliability for biomass supply to the scale of GNWT buildings selected. A pellet mole mechanism will be used to move wood pellets from the container to the boiler. NEL is also assessing possible purchase of a B-Train chassis trailer in 2021 to enhance biomass supply chain reliability and costing.

**2. Pellet Mill Feasibility Assessment**

Potential Yukon-based wood pellet supply options can reduce the one-way haul distance to Inuvik from 3,100 km (LaCrete, Alta.) to much lower levels (e.g., 1,225 km from Whitehorse, 1,350 km from Haines Junction) and reduce delivered costs of wood pellets to Inuvik and other Beaufort Delta communities.

In summer 2020, with Northern REACHE funding, NEL is assessing the feasibility of developing a pellet mill in Yukon to enhance wood biomass displacement of fossil fuel use for heating in Yukon and Beaufort Delta communities.

**3. District Energy System (DES)**

NEL understands that community-wide, co-operative or municipality-owned district energy systems heated with biomass have helped to facilitate decarbonization of northern communities. A community-wide district energy system (DES) would allow Inuvik to source biomass fuels, whether pellets or chips, in bulk, helping to reduce the delivered cost of heat. In 2020, NEL received northern REACHE funding to undertake a prefeasibility study in summer 2020 for development of a district energy system in Inuvik. NEL's initial study would support potential development of a district heating pilot project.



### ...PLANNING CHALLENGES AND LESSONS LEARNED...

NEL's initial successes in developing renewable energy projects in Inuvik were hard earned; and NEL's experiences over this first year have resulted in a number "lessons learned" (as outlined in Figure 6) that provide the foundation for future planning.

In each case, where delays or other issues or challenges arose during project planning and implementation NEL was able to address the challenge posed and keep the project moving forward.

However, the experience to date highlights the material risks that can be realized in undertaking these types of initiatives.

While a large utility or developer may readily be able to absorb these types of risks, a newly formed small business entity or a remote community cannot take on this level of risk without additional support.

The initiatives implemented by NEL in 2019 are critical to ensuring that remote communities can develop the capacity necessary to play a continuing and meaningful role implementing renewable projects that reduce fossil fuel use and work towards reducing climate change impacts. Projects that meet these objectives will not happen unless Indigenous communities, or small Indigenous owned companies such as NEL, can take on the significant challenges involved. To do this, they require funding support to help them manage the risk inherent in these undertakings.

**Figure 6: NEL Key Lessons Learned from 2019 Planning**

**1**

#### **Expect delays when developing projects**

While construction was completed for all planned solar PV projects in Inuvik; each project experienced delays that pushed completion later into the summer than originally expected (or into 2020) and meant that revenues or savings were deferred.

**2**

#### **Getting project agreements in place can take time and be costly**

Finalizing agreements with clients (be they homeowners, commercial entities, utilities or governments) was the single largest source of delay to moving ahead with these projects. In some cases this has been a key source of added costs; while in others delays in obtaining agreements have resulted in reduced funding and lost opportunities.

**3**

#### **Anticipate that permitting will take longer than anticipated**

Particularly for new projects or approaches that may be unfamiliar to the permitting agencies.

**4**

#### **Making things work takes a committed team.**



*Pictured above: The completed Nihtat Energy Ltd. PV solar installation at Inuvik North Mart.*

## 4.0 RENEWABLE ELECTRICITY PATH FORWARD

### NEW OPPORTUNITIES... AND GREATER CHALLENGES...

Over the 2020-2022 planning period NEL plans to take on new opportunities and greater challenges for developing additional renewable electricity in northern Canada.

This includes existing NEL commitments to advance two solar installations in a planning environment dominated by added COVID-19 travel restrictions and quarantine rules:

1. A 300 kW AC behind-the-meter project with the NorthMart store in Iqaluit; and
2. A 150 kW AC IPP project with NTPC in Aklavik.

Delays to 2021 for these projects highlight ongoing risks and uncertainties related to project permitting, finalizing agreements on a timely basis, and timely execution. Continued development of these projects has been feasible due to stacked funding support adequate to enable NEL to take on the planning challenges that come with these enhanced risks in these remote communities.

### ...ESTABLISHING A NEW PLANNING FOCUS ...

Completing the residential and commercial installations in 2019 was a major achievement for NEL. Ironically, this initial success also lays the foundation for the next key planning challenge to be addressed by NEL to ensure development of further community driven projects on remote grids.

To ensure grid stability, participation in net metering or development of mid-scale renewables in the Beaufort Delta is limited by the allowed intermittent renewable capacity that can be added to community grids.

Inuvik and Aklavik are already at the capacity limit (see Table 3 of right insert). Absent finding ways to overcome the grid renewable capacity limitation for remote grids, this would mean that further development of community driven renewable energy projects or net metering in the Beaufort Delta would be very limited, frustrating community objectives for development of renewables as well as federal and provincial climate change policies and plans.

With Indigenous Off-grid Diesel Initiative (IODI) funding, NEL is advancing in 2020/21 a number of project concepts focused on developing approaches to move beyond current renewable grid penetration limitations and effectively solve this next Beaufort Delta renewable electricity planning challenge (described further in sections that follow).

### The Next Critical Planning Challenge: Grid Renewable Capacity Limits

To ensure grid stability, the ability to participate in the Net Metering Program or in development of mid-scale renewables in NWT is limited by the allowed intermittent renewable capacity that can be added to community grids. Table 3 summarizes the allowed intermittent renewable energy capacity for Beaufort Delta communities.

**Table 3: Allowed Intermittent Renewable Energy Capacity by Community (July 2020)**

	Intermittent Renewable Capacity Allowed (kW)	Total Installed/Planned Capacity (kW)	Capacity Available (kW)
<b>Inuvik</b>	<b>670</b>	<b>670</b>	<b>0</b>
Tuktoyaktuk	96	66	30
Fort McPherson	79	5	74
<b>Aklavik</b>	<b>73</b>	<b>76</b>	<b>0</b>
Ulukhaktok	47	0	47
<b>Paulatuk</b>	<b>33</b>	<b>38</b>	<b>0</b>
<b>Sachs Harbour</b>	<b>22</b>	<b>19</b>	<b>3</b>
Tsiigehtchic	18	0	18

Table 3 highlights the material challenges for development of further renewable electricity in Inuvik, Aklavik, Paulatuk and Sachs Harbour, with additional capacity effectively limited to Tsiigehtchic (18 kW), Ulukhaktok (47 kW), Tuktoyaktuk (51 kW) and Fort McPherson (74 kW).

Absent finding methods to overcome this barrier to renewables development, territorial and federal objectives to reduce fossil fuel use related to electricity generation will be frustrated.

### **...FINDING SOLUTIONS AND OVERCOMING EXISTING BARRIERS TO COMMUNITY DEVELOPMENT ...**

NEL's near term planning process for renewable electricity projects is focused on testing three separate concepts, as detailed in Attachment 1, for advancing high penetration renewable electricity projects on remote community grids.

#### **Three Concepts for Testing High Penetration Renewables in Remote Grids**

- 1** Phased Solar and variable speed diesel generation (VSG) in Aklavik.
- 2** Inuvik High Penetration Renewable concept (solar, wind and energy storage system [ESS]).
- 3** Microgrid concept at Inuvik satellite site facility (ISSF).

The overall goal is to find approaches that expand the capacity limitations on remote grid systems so that community-based renewable electricity projects can continue to be advanced by NEL and other proponents. Each project concept takes a phased approach to project implementation and if successfully demonstrated would:

- ✓ Potentially materially expand the total renewable electricity that could be developed in Inuvik or other Beaufort Delta communities;
- ✓ Be applicable to other remote grids in NWT or across Canada.

As outlined in the discussion that follows, each project concept will be planned and developed in a manner that provides opportunities for local community involvement and access to long term project benefits.

However, while each project concept may potentially increase the amount of additional renewable electricity added to remote grids in the Beaufort Delta, each concept also involves material capital planning requirements and risks. The concepts being pursued as part of NEL's next stage of development are also significantly more ambitious and will require cooperation from the local utility and federal and territorial governments' support.

### **... A NEW FRAMEWORK FOR COOPERATION ...**

In order to support the next stage of NEL renewable electricity development in the Beaufort Delta, on November 7, 2019 NEL entered into a Memorandum of Understanding (MOU) with NTPC to establish a framework for cooperative activities by the Parties related to development of renewable energy projects in remote NWT communities.

Pursuant to the November 7, 2019 MOU with NTPC, NEL is currently finalizing a Power Purchase Agreement (PPA) with NTPC for a 265 kW DC (150 kW AC) Phase 1 expansion of solar PV capacity on the Aklavik community grid (NEL Phase 1 Aklavik Solar Expansion Project) for installation in 2020-2021. The Project will help NTPC to complete initial testing related to determining the capabilities of NTPC's new 590 kW AC variable speed generator (VSG) installed in its Aklavik diesel plant in 2018.

Pursuant to this same MOU, NEL is currently reviewing with NTPC potential projects to implement the Inuvik high penetration renewable concept.

### **...PLANNING FOR LOCAL INVOLVEMENT ...**

NEL's mandate includes working with Indigenous and northern stakeholders to create sustainable, environmentally responsible and meaningful opportunities across the north; and NEL's view is that local involvement in project development should endure for the life of the project. For the three concepts, NEL intends to engage with local communities regarding the following key areas of involvement:

#### **Key Areas of Local Involvement**

- 1** Potential long term economic or other opportunities for involvement in project;
- 2** Training that facilitates development of local capacity that can be deployed on future projects in the region;
- 3** Enhancement of community energy literacy through ongoing engagement related to NEL's resource planning process.

**5.0 PLANNING TO ACHIEVE PROGRESS ON CLIMATE GOALS**

NEL’s planning update outlines three development concepts focused on testing methods to implement high penetration renewables in remote grids (see Attachment 1 for details). Each development concept being pursued at this time tests a different approach for expanding beyond the current capacity limitations presented for remote electricity grids in the Beaufort Delta; and successful near term implementation may have broader and longer term applications for other Beaufort Delta communities and across the north.

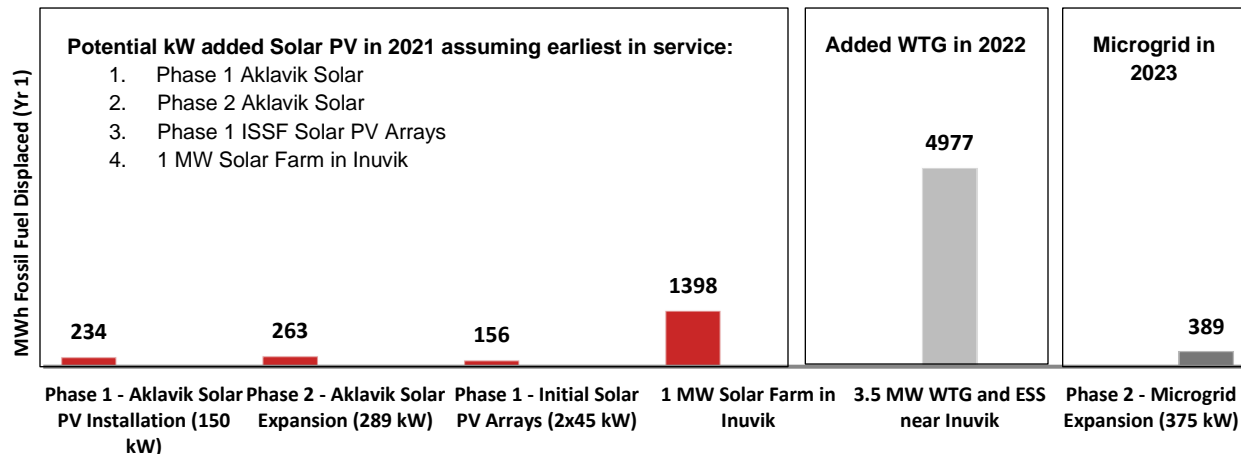
As summarized below – implementation of each project concept would provide for meaningful, near term Indigenous involvement in taking action to meet climate change impacts, including:

- ✓ Increasing the amount of energy generated from renewable and low-emitting resources;
- ✓ Displacing fossil fuel use and reducing related GHG emissions in Beaufort Delta communities;
- ✓ Connecting clean power with places that need it;
- ✓ Modernizing electricity systems; and
- ✓ Reducing reliance on diesel through working with Indigenous Peoples and remote communities to find solutions.

**Table 9: Summary of Potential Near Term Project Benefits**

	Potential Earliest In Service	PV Solar Installed (kW AC)	MWh/yr Fossil Fuel Displaced (Year 1)	GHGs Reduced (Tonnes/yr)
<b>Concept 1 - Staged Solar VSG Project</b>				
Phase 1 - Aklavik Solar PV Installation (150 kW)	2021	150	234	155
Phase 2 - Aklavik Solar Expansion (289 kW)	2021	180	263	174
<b>Concept 2 - Inuvik High Penetration Renewables</b>				
1 MW Solar Farm in Inuvik	2021	1000	1,398	784
3.5 MW WTG and ESS near Inuvik	2022	3500	4,977	2,790
<b>Concept 3 - ISSF Microgrid</b>				
Phase 1 - Initial Solar PV Arrays (2x45 kW)	2021	90	156	89
Phase 2 - Microgrid Expansion (375 kW)	2023	375	389	244

**Figure 11: Summary of MWh of Thermal Fuel Displaced (Year 1)**



## 6.0 PLANNING TO ADDRESS FUTURE CHALLENGES

In the very short time since it was conceived, NEL has worked diligently to build on the foundation provided by GCI through the Beaufort Delta Fossil Fuel Studies and by Nihtat Corporation through identifying a number of renewable energy opportunities and securing initial CERRC funding to realize initial renewable solar electricity as well as wood biomass heating opportunities in Inuvik.

Outcomes of planning and development activities over the past year have also helped to provide a focus for future renewable energy development opportunities that meet the following **Core Planning Objectives**:

- 1 Facilitate development of renewables that can displace fossil fuels for electricity, heating or transportation uses in remote communities.
- 2 Enhance Indigenous participation in utility project planning and implementation; including ensuring that long term benefits from energy projects also flow to local Indigenous communities.
- 3 Ensure that local Indigenous communities have a meaningful role to play in taking action to mitigate climate change impacts.

Activities to date have focused on completing projects that ensure displacement of fossil fuel uses for electricity and heating. NEL planning as reviewed in this update is looking at opportunities to work with NTPC and local communities to test and demonstrate three different concepts for achieving high penetration of renewables on Beaufort Delta community thermal grids.

Each of the development opportunity concepts being pursued, if successful, could materially expand opportunities for renewables on remote thermal community grids in northern Canada. NEL's approach will also expand the role of Indigenous communities in solving issues related to development of renewable energy projects on remote grids, and in having meaningful opportunities for local participation in long term project benefits through an equity or other financial interest.



*Pictured: Installation of PV Solar on home in Inuvik*