NORTHERN ENERGY CAPITAL

Nunavut Clean Energy Project

Rankin Inlet and Baker Lake

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WHITEHORSE:NARROW GAUGE STATION, 7209 7 AVE. WHITEHORSE, YT Y1A 1R8
VANCOUVER:INNOVATION BLVD SUITE 1500, 13737-96TH AVE. SURREY, BC V3V 0C6
+1 250 213 8185 CONTACT@NORTHERNENERGYCAPITAL.COM
NORTHERNENERGYCAPITAL.COM

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Rankin Inlet and Baker Lake Wind Energy Project Overview

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1 Introduction

Northern Energy Capital Inc. (NEC) is proposing the development of two, ~2 MW wind energy developments located on the traditional lands of the Kivalliq Inuit peoples and within the municipalities of Rankin Inlet and Baker Lake, Nunavut. In total, this proposal includes the construction and operation of four 900 kW wind turbines (~60 m in height); two will be located near the community of Rankin Inlet and two near the community of Baker Lake. Both Rankin Inlet and Baker Lake were listed among the top 5 communities identified as having the greatest potential for wind energy development in the study *Potential for Wind Energy in Nunavut Communities*, commissioned by the Qulliq Energy Corporation. The following sections outline the vision for this project along with detailed descriptions of the various components.

1.1 Our Vision

As a corporation, NEC exists to empower and enable community-owned renewable energy projects that transform the way energy is delivered in our northern communities, and in the process leave citizens with greater reliability, resilience, and economic opportunities.

Our advanced wind turbine de-icing and anti-icing technology will allow our Nunavut Clean Energy projects to continue to generate power during an icing event. Internal hardware, software and gearboxes are internally heated to enable the wind turbine to operate in temperatures down to -40°C. The result is more power when it's needed most.

In the sections that follow, we will outline the opportunities for renewable energy at two sites located near the communities of Rankin Inlet and Baker Lake, Nunavut. For these two sites, we propose the installation and operation of two 900 kW wind turbines to bring clean, renewable energy to these communities for this generation and those to follow.

1.1.1 Rankin Inlet

The Rankin Inlet Clean Energy Project will be the first renewable energy development in Nunavut capable of displacing fossil fuel on a commercial scale. With a population of 2,700 and an annual energy demand of over 18 GWh, the 2 MW project has the capacity to generate over 30% of Rankin Inlet's total electricity.

A 2 MW wind farm provides the capacity to displace 37 million litres of diesel (100 000 tonnes of carbon emissions) over its lifetime and in the process, generate new economic opportunities for citizens and business to participate in renewable energy production.

1.1.1.1 Site Location

The proposed lease site is located approximately 6.3 km north west of the community of Rankin Inlet. Because the lease site is within the municipal boundaries, this measurement was taken from the southwest corner of the proposed lease site to the approximate center of town. Approximate coordinates for the proposed tower locations are:

62° 51' 26.3'' N; 92° 09' 20.7'' W

The proposed lease site is approximately 6 ha in size. Approximate coordinates of the lease site are listed in Table (1) below.

Table 1: *Rankin Inlet proposed lease site coordinates*

NW Corner	62° 51' 24.8'' N; 92° 09' 43.5'' W
NE Corner	62° 51' 27.6'' N; 92° 09' 09.1'' W

SE Corner	62° 51’ 24.0’’ N; 92° 09’ 03.4’’ W
SW Corner	62° 51’ 21.2’’ N; 92° 09’ 33.3’’ W

Figure (1) below shows the proposed location of towers and lease area relative to the community of Rankin Inlet. Figure (2) shows the proposed site layout.

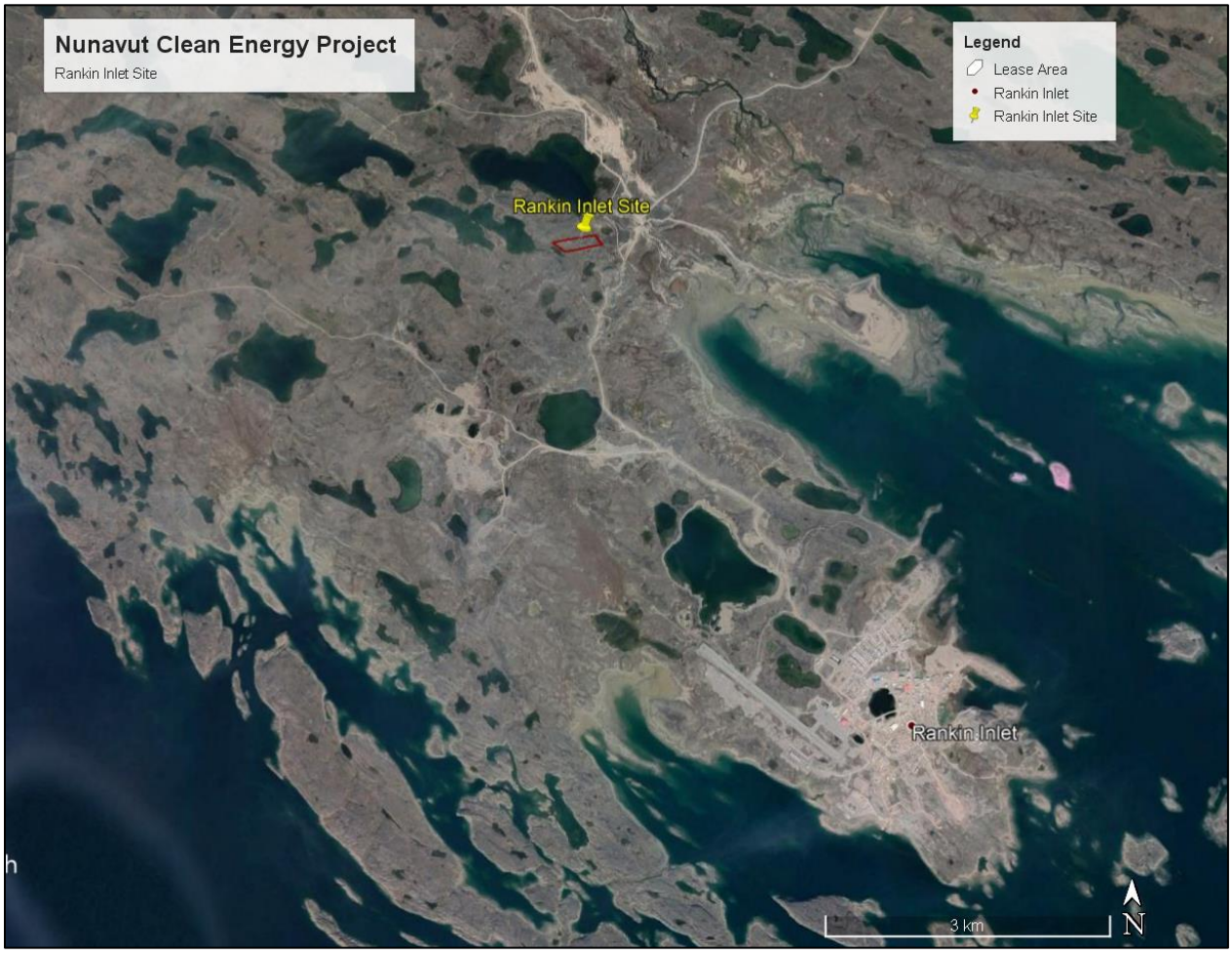

Figure 1: Location of Rankin Inlet Clean Energy Project

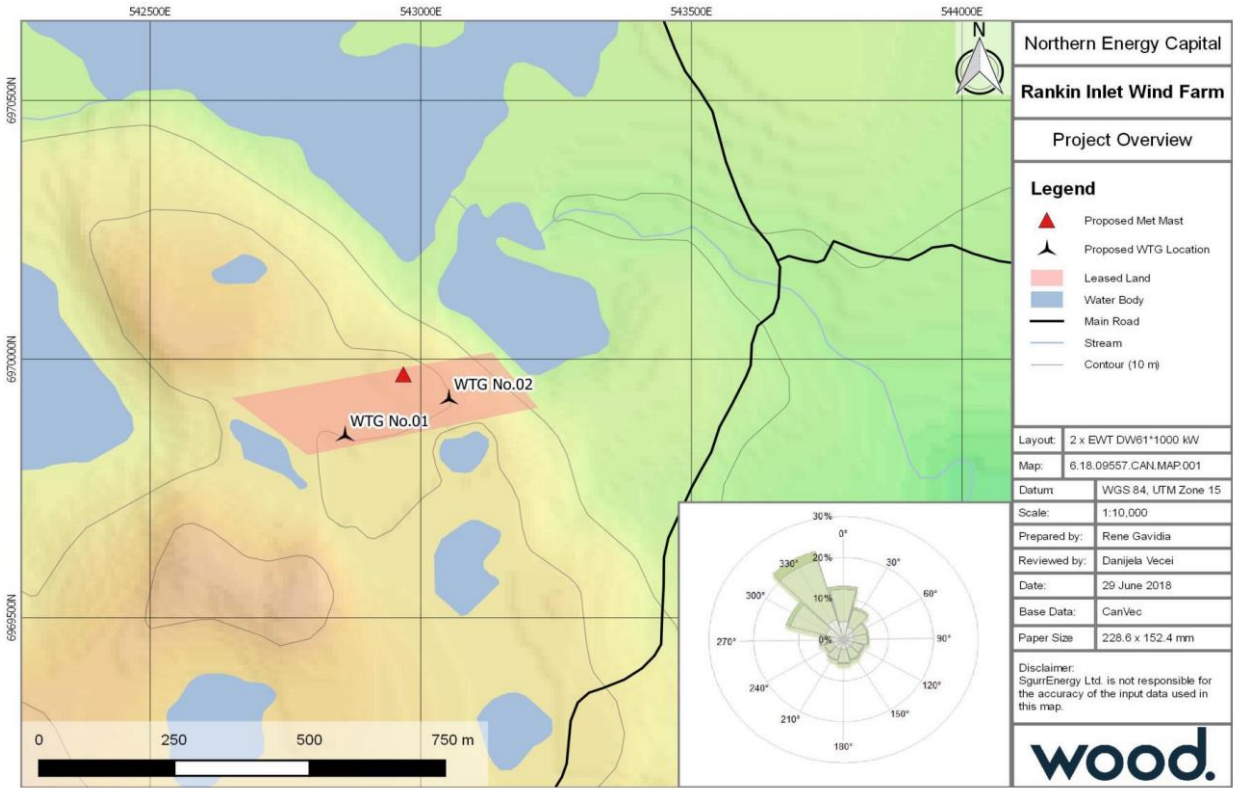

Figure 2: Site plan for Rankin Inlet location

1.1.2 Baker Lake

With an average annual wind speed of 7.4 m/s, Bake Lake is the perfect candidate for a wind energy project. Energy demand in Baker Lake is approximately 8.9 GWh annually, and a 2 MW project will have the capacity to generate over 50% of Baker Lake's total electricity. This will reduce carbon emissions by over 4 000 tonnes annually, or over 1.5 tonnes per person per year.

1.1.2.1 Site Location

The proposed lease site is located approximately 2.3 km north east of the community of Baker Lake. Because the lease site is within the municipal boundaries, this measurement was taken from the southwest corner of the proposed lease site to the approximate center of town. Approximate coordinates for the proposed *tower* locations are:

64° 20' 17.7'' N; 96° 00' 16.3'' W

The proposed lease site is approximately 3 ha in size. Approximate coordinates of the lease site are listed in Table (2) below.

Table 2: Baker Lake proposed lease site coordinates

NW Corner	64° 20' 16.6'' N; 96° 00' 28.5'' W
NE Corner	64° 20' 21.9'' N; 96° 00' 09.6'' W
SE Corner	64° 20' 19.5'' N; 96° 00' 05.5'' W
SW Corner	64° 20' 14.4'' N; 96° 00' 22.2'' W

Figure (3) below shows the proposed location of towers and lease area relative to the community of Baker Lake and Figure (3) shows the site plan for Rankin Inlet with the layout of the towers.

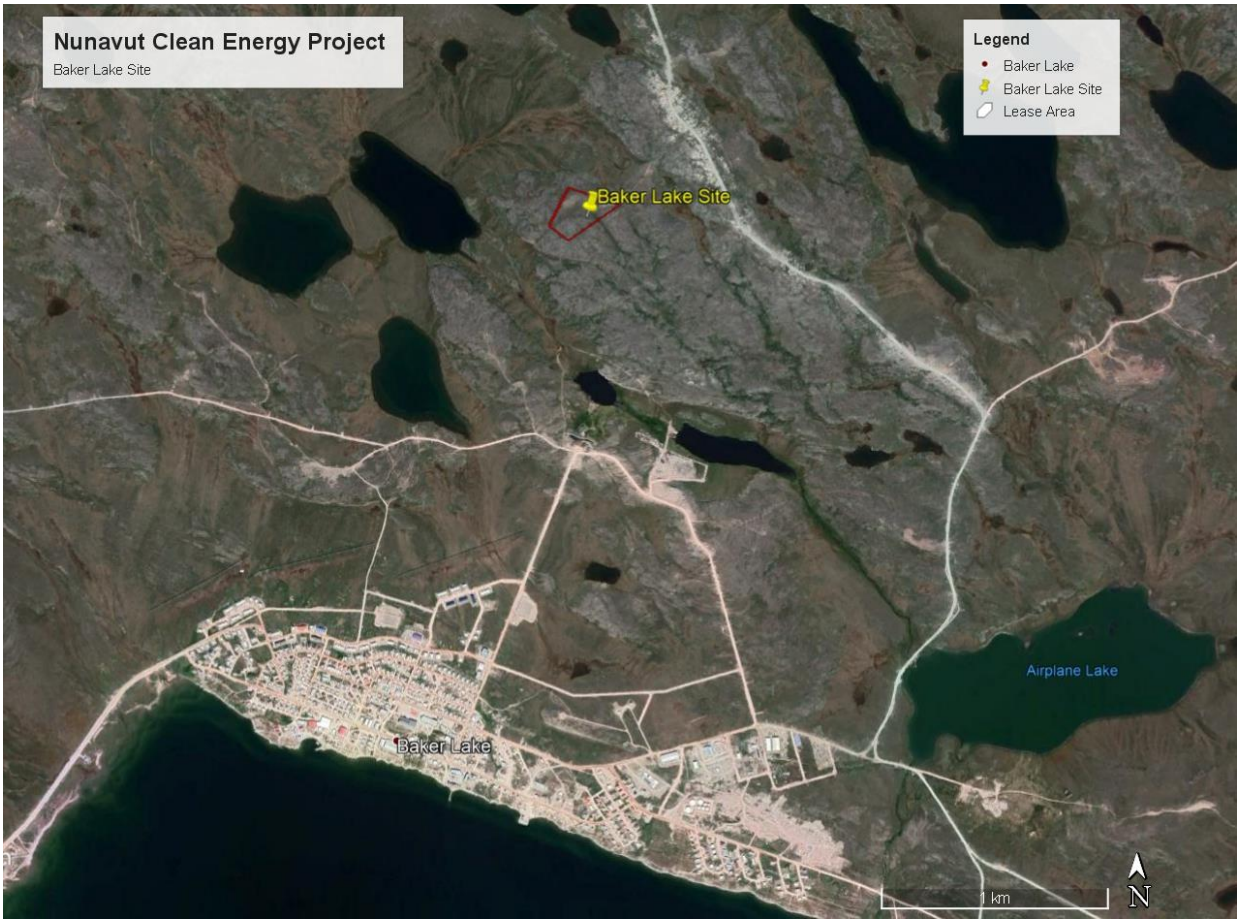

Figure 3: Satellite image depicting location of Rankin Inlet Clean Energy Project

1.2 Construction Details

The following sections detail the equipment and installation necessary for this proposed development. Note that the information provided is applicable to both sites as the same towers will be installed at each site with the same general construction procedure. The primary differences may be the final engineering designs for the individual tower foundations and specific access and power line routing at each site.

Both of these proposed installations are permanent. Development of these two installations include two distinct phases: construction and on-going operation and maintenance. Activity at the sites is essentially restricted to the construction phase. Periodic inspection and maintenance will require physical access to the site; however, following construction, the sites will remain largely unoccupied.

No aircraft will be used in the development of these sites. Equipment, crews and supplies will be mobilized to the site using existing road networks from the respective communities and new access developed within the lease sites.

Up to 25 people may be on site at any given time during construction. All crews will be housed in existing accommodations in the respective communities. No camps are required for this development.

1.2.1 Existing Site Conditions

This section outlines the general condition of each site including existing infrastructure and physiological characteristics. Both the Rankin Inlet and Baker Lake sites exist within the local municipal boundaries for those respective communities (see Section 1.1) and within pre-disturbed areas. Both sites consist of gently undulating shallow soils with little to no vegetation. Bedrock exists at or near ground surface at both sites.

Existing road networks enter both proposed lease sites and evidence of past surface disturbances exist in and around the sites. Part of this development includes the collection of one year of meteorological baseline data to confirm and refine existing wind production estimates. A 50 m tower was erected by NEC at the Rankin Inlet site in August, 2018. This is a temporary installation and will be dismantled prior to construction. For the Baker lake site, an identical meteorological tower is required and is proposed to be erected during the summer of 2019.

1.2.2 Seasonal Timing and Duration

The construction phase of this development will occur during the spring, summer and fall seasons. Construction may occur over multiple sequential years within the same seasonal window; however, the current schedule is to complete the works in their entirety the spring, summer and fall of 2021 for both sites. Though these projections are true to the best of our knowledge, construction could be delayed by one to two years depending on availability of tower components and financing.

Access road development and site preparations at both sites, including foundation construction for the towers, will occur in the spring and summer (May 15 – August 1), with tower erection to occur early fall (August 1 – September 1). Total construction time for both sites is approximately 14 weeks though the intensity of activity at the site throughout this period will vary substantially.

1.2.3 Access

Each tower will require access for the crane, trucks, and for future maintenance. Given the very shallow soils of the site, access development will consist of placement of soil material from foundation construction. Each turbine will have an access road that connects to the existing access to the lease site. Once the access and foundations are in place, the tower components will be brought to the site by special transport trucks.

Tower components will be shipped to either Quebec or Manitoba and then shipped to Rankin Inlet by barge. From there the equipment for Baker Lake will be brought back to the barge, and the barge will then travel through the Chesterfield Inlet to Baker Lake. From the barge, all equipment will be transported overland on existing road networks to the respective sites. Once on site, the components will be staged in a lay-down area adjacent to the foundation prior to assembly.

1.2.3.1 Rankin Inlet

Existing road networks exist to the proposed lease site. However, these roads will need to be upgraded to accommodate the mobilization of the tower components and equipment to the site. Road widths will be increased to ~7 m to accommodate the necessary construction equipment,

including a 400-tonne crane and transport trucks with tower components. Existing corners will be increased to a radius of approximately 24 m. No watercourse crossings exist along the portion of the access road where upgrading is proposed.

Road widening will be accomplished by hauling in gravel from existing licenced quarries in the project area. Final gravel sources and volumes will be determined during the final engineering design for the road upgrades. Regular highway gravel trucks and heavy machinery will be used to complete necessary upgrades (e.g. 30-40 tonne excavators, bulldozer – D7 or equivalent, grader, etc.). Local contractors will be utilized to perform upgrading.

In total, an estimated 500 m of existing road will require upgrading to access the proposed lease site. An additional ~200 m of access may be constructed within the proposed lease site as well as a level lay down area adjacent to the tower site itself to facilitate construction activities.

1.2.3.2 Baker Lake Site

Existing roads exist to the proposed Baker Lake site as well. Upgrading of existing roads will be the same as described in Section 1.2.2.1 above. In total, an estimated 1000 m of existing road will require upgrading to access the proposed lease site. An additional ~200 m of access may be constructed within the proposed lease site as well as a level lay down area adjacent to the tower site itself to facilitate construction activities.

1.2.4 Foundation Construction

Circular re-enforced concrete pads will form the foundation for the towers. Precise pad sizes will be determined during final engineering design and will vary depending upon the competency of bedrock at each site. Foundations will be smaller at sites with highly competent bedrock as they will be directly bolted to the bedrock for added strength. In the event that bedrock is less competent, the pad size will increase.

For each tower the foundation area will be excavated to bedrock. Bedrock will be drilled and blasted to prepare the surface for foundation placement. Spoil material will be spread along the on-site access road, facilitating level access to each tower base for later stages of construction.

Blasting will be completed by a licenced blaster. Explosives will **NOT** be manufactured or stored on site. Precise volumes of explosives will depend primarily on the nature of the bedrock at each site.

The circular steel re-enforced concrete pads will be poured on site with concrete hauled in by trucks from existing batch plants in respective communities. Pads will be poured in stages with engineering oversite to ensure quality control for each pad. Once the pads have sufficiently cured, the tower components will be mobilized to the site for the next stage of development.

1.2.5 Tower Installation

The new towers will be transported to the site in pieces and erected using a 500 tonne crane and other equipment on site. The proposed towers are free-standing towers with constant revolution turbine blades. These towers will not require any lattice or guy wire supports.

Tower erection will occur in stages, with installation of the blades and turbine following tower installation. Figure (4) shows a schematic of the tower and turbine components.

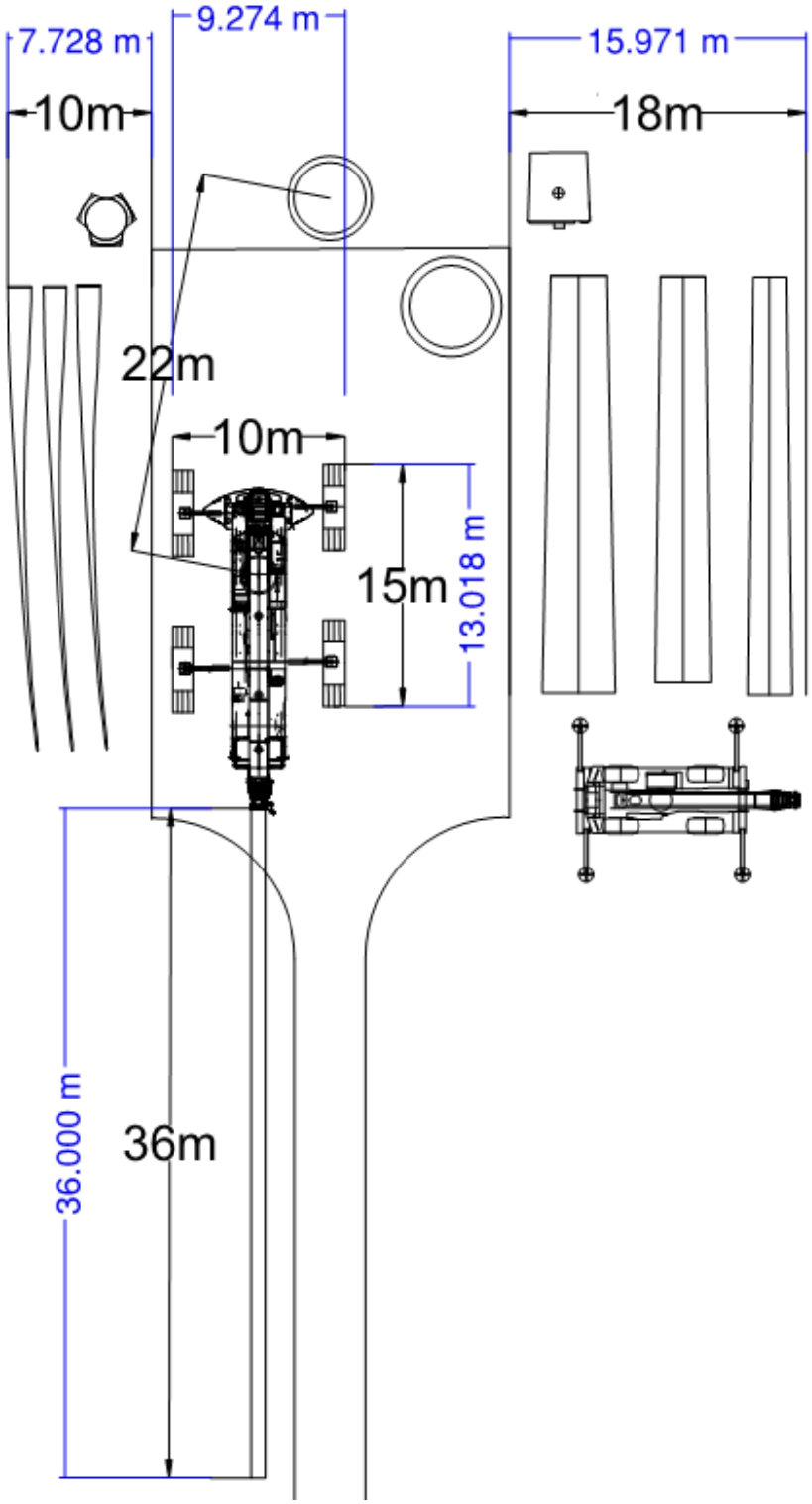

Figure 4: Schematic of proposed wind turbines to be installed at Rankin Inlet and Baker Lake with sizes of component parts

1.2.6 Substations and Powerlines

Each tower will have its own transforming unit. Both turbines at each site will be connected via underground high voltage cables to a new substation to be built within each proposed lease site. The new substations will be connected to the existing electrical grid by way of a 25 kV line.

Interconnection with the grid will be via underground lines to the existing grid at both sites. However, a short overhead line may be necessary to cross a ravine between the Baker Lake site and the grid interconnection. Final details on this will be determined during the engineering phase with the power utility. For this proposal we wish for both options to be considered.

Approximately 3.5 km of power line is required to connect the Rankin Inlet site to the existing grid infrastructure located northwest of the community. Figure (5) below depicts an approximate routing for this line.

Figure 5: Satellite image showing approximate routing of proposed powerline from the Rankin Inlet site to interconnection with existing power distribution network

Approximately 1 km of new powerline is required to connect the Baker Lake site to the existing grid infrastructure. Figure (6) below outlines an approximate routing. Again, this particular line may be a combination of underground and overhead line.

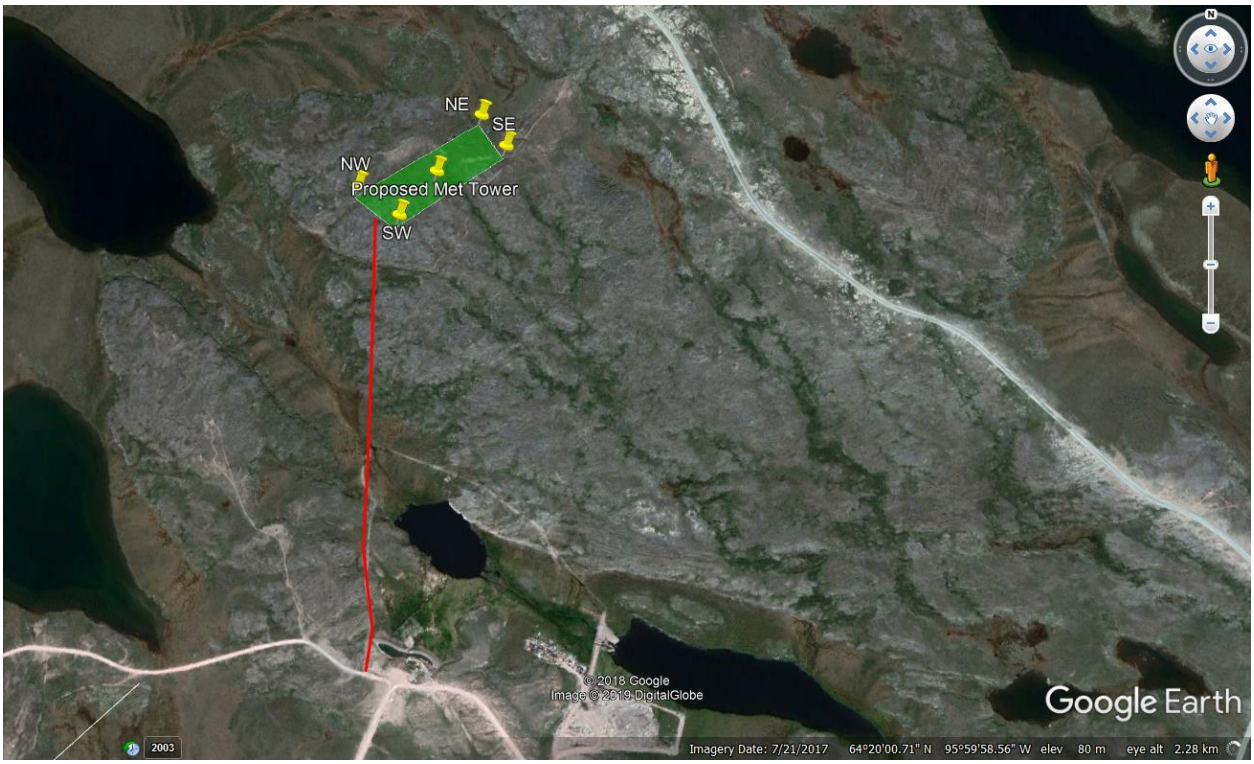

Figure 6: Satellite image showing approximate routing of proposed powerline from Baker Lake site to interconnection with existing power distribution network

1.2.7 Access Control

For public safety, access to each turbine site and the new transforming station at the lease sites will be restricted using chain link fencing and barbed wire. This is a necessary precaution against un-authorized access and potential injury to public.

1.2.8 Fuel and waste management

No on-site fuel storage is required for this project. Fuel will be transported to site daily in approved slip tanks in pickups. Diesel fuel will be the primary energy source required. Fuel will be supplied by the individual contractors for their equipment. Fuel volumes burned will vary widely depending on the equipment used, but will be supplied directly to the equipment on an as needed basis. The truck mounted tanks may vary in size, but are generally between 200 L and 500 L. Total diesel fuel consumption for the project is not anticipated to exceed 15 000 L. Lesser amounts of gasoline and propane may be required to operate small gas-powered equipment, propane heaters, etc. Gasoline and propane requirements are unlikely to exceed 1000 L each. Gasoline will be transported to site in a combination of 205 L drums and 20 L portable containers. Propane will be transported to site in 20 lb and 100 lb portable tanks.

No waste storage will occur on site. Waste will consist of general construction waste and will be disposed of at the local municipal waste facilities. Total construction waste is not expected to exceed one tonne. During construction, portable toilets will be provided for construction crews on site.

1.2.9 Equipment Requirements

Numerous pieces of equipment will be required to complete the project (Table 3). Note that wherever possible, local equipment contractors will be employed to complete the necessary works. Table (3) provides an overview of the equipment required. Not all listed equipment will be in use simultaneously. Some equipment will only be used for specific tasks (e.g. the cranes will only be used for tower assembly).

Table 3: General equipment list with proposed use

Equipment	Description	Use
Bulldozer	Up to D8 or equivalent (up to two at each location)	Road upgrading, site preparation
Excavators	300 series or smaller (up to two at each location)	Site preparation, road building, equipment handling etc.
Dump truck	On or off road (up to two at each site)	Moving material around for access upgrading and site preparation
Road grader	Standard road grader as available (up to one at each site)	Access upgrading and development
Cement trucks	Standard cement trucks (several for each site)	Used to pour tower foundations
Water tender	Water tender truck	To supply water to rock drills on site from a municipal source
Rock drills	Tracked or wheeled rock drills	To drill bedrock for blasting or direct anchor placement
Skid steer and or boom lift	A wheel boom lift and or skid steer (one of each at each location)	These will be used to move materials around at the laydown areas
General construction equipment	This includes all small tools, generators etc. (numerous)	This is all of the numerous small tools required for general construction
Cranes	250 - 400 tonne main crane with a 90 tonne tail crane (two - one large and one small)	The cranes will be shared between the two sites and used for tower assembly

No hazardous waste will be generated or disposed of on site. Heavy equipment maintenance and servicing will occur off-site at the contractor's typical service area.

1.3 Operation & Maintenance

Once commissioned, the towers will require periodic (bi-annual) maintenance. This routine maintenance may include:

- Access grading and repair;
- Power line maintenance including pole replacement;
- Turbine inspection and maintenance of components.

Regular inspection and maintenance of the towers will occur year-round. Access to the site will be by way of the access road.

1.4 Project Scope

Table (4) lists the primary activities that comprise the project scope along with the approximate timing and duration of each.

Table 4: Primary activities comprising the project scope

Activity	Approximate Timing and Duration
Road upgrading (~7 m x 1 500 m total for both sites)	Will occur early in the snow free season of the year foundation work is proposed – will take ~2 weeks to complete
Use of various heavy equipment including up to 400 tonne crane	Will occur during construction phase of late summer/fall
Foundation construction for new towers	Will occur early during the snow free season – will take up to one month to complete
Blasting	Used as required for foundation construction prior to foundation construction (*does NOT include manufacture or storage at site*)
Erection of new towers	During snow-free period
Installation of new transforming station within existing lease site	During snow-free period
Upgrading of existing transmission line to 25 kv or construction of new line	Between spring and fall
Ongoing operation and maintenance of wind towers and turbines	Indefinitely

1.5 Decommissioning

This is considered a permanent installation and decommissioning of the site is not anticipated in the foreseeable future. However, for completeness of this proposal, potential decommissioning after 20 years is included.

Decommissioning would include the removal of the towers and all other equipment and debris around the sites. At that time all materials will be disposed of at appropriate licenced facilities. Much of the material would likely be recycled. The tower foundation anchors would be trimmed smooth and the concrete pads abandoned in place.

1.6 Stakeholder Engagement and Outreach

This section highlights significant engagement and outreach regarding the proposed project so far. We continue to meet regularly with affected parties and members of the public. Our next scheduled visit will be to Baker Lake to discuss the project with that community. Most of the engagement and outreach to date has occurred for the Rankin Inlet site as this is the most advanced of the two sites.

Highlights of NEC's engagement and outreach thus far include:

- Several meetings in person and over the phone with several representatives from Sakku, the development arm of the Kivalliq Inuit Association (KIA). Discussions have included both sites.
- A presentation to Mayor and Council of the Hamlet of Rankin Inlet (Presentation Attached)

- Circulation of a general information poster when we were erecting the Rankin Inlet Met Tower in both Inuktitut and English on social media as well as the Hamlet (Attached).
- Issuance of a press briefing when the tower was completed and we spent some time on the local Radio with an open Q&A session (Briefing Attached).
- Regular communication with Qulliq Energy Corporation (QEC) about the development of the projects, and the project in Rankin Inlet has official approval from QEC (letter attached).
- Regular contact with the Lands Administrator for the Kivalliq Region with the CGS Planning and Lands Division.