

## Investigating an On-Shore Wind Project Site on Banks Island, BC.



## Crown Land Application Investigative Plan for Wind Data Collection



#### Investigating an On-Shore Wind Project Site on Banks Island, BC.

## 1.0 Background

#### **1.1 Project Overview**

Proposed and primary work is to conduct a multi-year wind assessment campaign and perform site suitability for a 2000 MW - 3000 MW wind energy farm.

#### 1.1.1 Land Management Plans and Regional Growth Strategies

To our knowledge there are no management plans, zoning or use restrictions in place that limit or preclude proposed use of the land.

#### **1.2 Seasonal Expectations of Proposed Use**

Activities planned needs use of the land for all seasons.

#### **1.3 Engagement with First Nations**

As a proponent, it is our policy to engage with First Nations early.

In engaging with First Nations we aim to listen to a community's needs and concerns while collaborating in an open and inclusive manner. First Nations engagement is the first step in any development we have undertaken. Our most recent success of early and success engagement is demonstrated by participation of Miawpukek First Nation ("MFN") of Newfoundland and Labrador in a large-scale renewable energy project.

This project a first of its kind in Canada. A meaningful project equity participation was agreed upon with MFN from an early-stage of development.

Our commitment to early and transparent engagement with the First Nations is continued with engagement in British Columbia, as demonstrated below:

- **1.3.1 Gitxaala First Nation:** Gitxaala First Nation's economic development authority, the Gixtaala Enterprises Corporation ("GEC") was first contacted by the CEO of Source3 Energy, M. Ayaz Khokhar, on March 20, 2022.
  - 1. CEO of Gitxaala Enterprises was provided with preliminary details on intent to establish renewable energy generation project on Banks Island. Periodically since then, and as plans progressed, details of a proposed wind measurement campaign and, if suitable, a wind generation facility were communicated to the CEO and Advisors of GEC.



- 2. The feedback was positive with respect to a wind farm in Banks Island and GEC welcomed and appreciated early engagement.
- 3. Frequent and transparent communications continued through summer and fall of 2023.
- 4. In the true spirit of partnership and in line with our vision and development strategy of early and full engagement with First Nations, Source3 Energy presented GEC with an offer/option to participate as an equity holder in project.
- 5. In person meeting with Michael Uehara, CEO of GEC was held on October 18<sup>th</sup>, 2023, where an intent to sign MoU was discussed. Follow up exchanges of information and all up to date details regarding project and schedule were shared subsequently.
- 6.
- Meeting to discuss and understand environmental and cultural aspects of the land and it's ancestorial uses was conducted on January 29<sup>th</sup>, 2024 with Gitxaala Land Management Agency ("GTMA").
- 8. Contact for GEC and GTMA:
  - a. Michael A. Uehara, CEO, <u>ceo@gitxaalanation.com</u>, 604-551-0145.
  - b. Samantha Wagner <a href="mailto:regaffairs.gtma@gitxaalanation.com">regaffairs.gtma@gitxaalanation.com</a>
  - c. Craig Bolton, referrals.gtma@gitxaalanation.com
  - d. James Herbert <u>senioradvisor.gtma@gitxaalanation.com</u>
- **1.3.2** Kitselas First Nations: Kitselas First Nation was first contacted on October 10<sup>th</sup>, 2023.
  - 1. In person meeting with Darrin McCormack, CEO of Kitselas Development Corporation ("KDC") was held on October 17<sup>th</sup> and second meeting on October 19<sup>th</sup>.
  - 2. Chad Penneg, KDC's Head of Business Development and CEO of Source3 Energy have been engaged on bilateral discussions on involvement of KDC and CEO of Source3 Energy has offered an equity participation on a future project to KDC.
  - 3. An in-person meeting is planned in Q1, 2024 to progress discussions.
  - 4. Contact for KDC:
    - a. Chad Penneg, Head BDO: <u>BDO@kitselasdlp.ca</u>; 250-638-8881.
    - b. Darrin McCormack: CEO KDC: <u>ceo@kitselasdlp.ca</u>; 250-638-8881.
- **1.3.3** Consultation with Lax Kw'Alaams and Metlakatla First Nation is anticipated to commence in early 2024.

## Investigating an On-Shore Wind Project Site on Banks Island, BC.

## 2.0 Location

Proposed location is an area on Crown Lands on the island of Banks Island, south of the Banks Nii Łuutiksm Conservancy ("Project Site"). GeoMark location of the Project Site is: https://apps.gov.bc.ca/pub/geomark/geomarks/gm-B8AD6C709CF542BD8C3330825E9E0030 Also, shown below for reference:



Figure 2.0.1: General Location Map



Figure 2.0.2: Detailed Map of the Investigative Use Area





Figure 2.0.3: Detailed Map of the IUA – North Island with Critical Habitat Buffer



Figure 2.0.4: Detailed Map of the IUA – South Island with Critical Habitat Buffer



#### Investigating an On-Shore Wind Project Site on Banks Island, BC.

#### 2.1 Description

Banks Island is a large, isolated, exposed and wild island on the north coast of the Province of British Columbia. It is located approximately 146 km west of Kitimat and 90 km south of Prince Rupert. BC.

The proposed Investigative Area is 48,617 Hectares with a perimeter of 777.23 kilometers.

The Investigative Area is show as a polygon in the Shapefile submitted along with this application.

#### 2.2 Location

#### 2.2.1 Location Justification

- 1. Banks Island exhibits suitable wind conditions for production of electricity using wind resource. Electricity produced from wind can be utilized to produce clean, green hydrogen to supply to the growing hydrogen demand.
- 2. The location can serve BC mainland as well as Asia Pacific export markets for green hydrogen.
- 3. BC government's CleanBC plan and Roadmap to 2030 aims to increase the use of clean and renewable energy and reduce greenhouse gas (GHG) emissions by 80 percent by 2050.

https://www.bcuc.com/AboutUs/EnergyTransition#:~:text=The%20BC%20government 's%20CleanBC%20plan,to%20achieve%20the%20government's%20objectives

- 4. It is important to note the future demand for clean, green hydrogen as a cornerstone in Province's decarbonization plan, evidenced by Province's support for green hydrogen's future growth through the formation of BC Hydrogen office and BC Hydrogen Strategy. <u>BC Hydrogen Strategy</u>. <u>BC Hydrogen Office</u>.
- 5. This demand is also clear by BC Hydro's call for power to electrify and also meet the demand of locally produced green hydrogen from renewable sources. BC Hydro has recently launched a call for power process <u>https://www.bchydro.com/work-with-us/selling-clean-energy/meeting-energy-needs/consultation.html</u>

#### 2.2.2 Wind Energy's Role

- 1. The long-term potential to supply clean renewable energy using wind power for hydrogen production is in line with the Province's Hydrogen and Renewable energy strategy, as noted above.
- 2. Wind energy has advanced over the last decade, it had become more efficient and also larger size wind turbines are now commonplace, which are almost twice the size of the ones operating currently in the province. Wind energy is a natural resource for



#### Investigating an On-Shore Wind Project Site on Banks Island, BC.

generating electricity that requires less intervention in nature than hydropower, for example.

3. Large wind farm installations are required to make green hydrogen at large scale to be market competitive. The north coast of British Columbia offers excellent conditions for this. A wind farm for the production of hydrogen requires space, a relatively flat terrain (no high mountains), stable winds and direct access to the sea for export.

#### 2.2.3 Area required for Investigative license

- 1. This coincidently requires a substantial number of on-shore area of study to ensure the location selected is making best use of the wind resource while minimizing any environmental impacts.
- 2. Banks Island is close enough to the demand center yet uninhabited which can make the location of Banks Island quite suitable to supply the energy demands of the future.
- 3. A thorough, multi-year wind assessment campaign over a large area of land is required to progress any major wind energy project. The north coast of British Columbia offers excellent conditions for this. A wind farm for the production of hydrogen requires space, a moderately flat terrain (no high mountains), stable winds and direct access to the sea for export.
- 4. We envision to develop a total of between 2,000 and 3,000 MW (possibly more or less) of wind energy-based power generation facility on Banks Island.
- 5. Most areas in eastern part of the area requested on Banks Island includes higher hills which have the potential for significant topographic speed-up and higher turbine energy production. While this is reasonable, it is important to note, that most of the terrain in this area is characterized by slopes greater than 12°. It is therefore, it is also important to study these locations further for wind characteristics to determine whether these locations will be suitable for a wind farm installation.
- 6. Once the wind measurements and environmental assessments have been completed, we will define the areas required for the erection of wind turbines and ancillary facilities. The area that will be required for the construction of wind turbines and ancillary facilities following the investigative license will be significantly smaller.
- 7. The reasons for developing such a large wind farm, which we have learned through experience of developing other projects of same size, is driven by two factors:
  - a. Economics:

Hydrogen and Ammonia plants are not economical under the size of 1000 MW. A wind farm with nameplate capacity of 2000-3000 MW would yield 1000-1500 MW of total power, assuming a capacity factor of 50% or less. If this assumption was true, a wind farm of nameplate capacity between 2000 – 3000 MW would be sufficient for an economical hydrogen and ammonia plant. Since there is no grid power on Banks Island, in order to generate our own 1000-1500MW of power, we'd need to conduct



#### Investigating an On-Shore Wind Project Site on Banks Island, BC.

a proper study of the wind regime over a large area to determine whether this much power can be generated.

2. Construction:

From construction and procurement perspective, Wind farms are modular but hydrogen and especially ammonia plants are not. Sizing has to be spot on, a smaller hydrogen and ammonia plant can't be doubled by just adding some equipment. For instance, doubling a hydrogen / ammonia plant would require ground up work and will be a net new project. In this case, optimal sizing or oversizing is better than under-sizing. 1000MW or larger is optimal from construction and procurement perspective.

#### 2.3 Protected Areas

- 1. There is a federally listed species at risk identified in area of the Project Site.
- 2. Specie identified is Marbled Murrelet (Brachyramphus marmoratus)
- 3. Province of British Columbia's Species at Risk Biologist was consulted in co-ordination with BC Crown Lands team, who identified the following:

The activities with greatest potential to disturb nesting murrelets are:

- Use of heavy-lift helicopters to transport equipment to sites
- Use of rock-drilling equipment (proposed 6 test holes at each site)

For both of these activities, occurring in an area with relatively low background noise from other human activities, the recommended buffer distance from potentially occupied nesting habitat (Critical Habitat) during the murrelet nesting season (mid-April to September 1<sup>st</sup>) is 500 m.

Workers operating even in unforested areas of Banks Island would be required to perform due diligence and cease activities if a nest is found or an adult murrelet is seen flushing from the ground

- 4. The Biologist's directions have been incorporated in design of the spatial area.
- 5. In complying to these suggestions, area of 500m buffer around the Critical Habitat areas has been removed from the spatial area under this Investigative Use Area application.
- 6. A 500m vertical no helicopter operation buffer will also be setup and adhered around the nesting sites during the nesting period.
- 7. We have also included in our work plans that workers operating even in unforested areas of Banks Island will perform due diligence and cease activities if a nest is found or an adult murrelet is seen flushing from the ground, noted in Appendix 1.



#### Investigating an On-Shore Wind Project Site on Banks Island, BC.

- 8. In addition, to optimize the areas requested in this application, major bodies of water have also been excluded from the spatial area.
- 9. The resulting spatial area of interest has been defined as noted in Section 2.0.

Biologist has also made us aware of possibility of federal Critical Habitat for Western Screech-Owl to be mapped within the next year. Most of the forested bog areas on Banks Island are likely to be mapped as Critical Habitat for coastal Western Screech-Owl and this should be considered in any planned future development.

10. As such we are aware of the mapping of areas for Western Screech – Owl. We are notified that these areas not excluded from the area of investigative purposes. Ministry of Water, Land, and Natural Resource has suggested we would have further conversations if wind measurement stations are proposed in those areas. We welcome and would work proactively with the Ministry of Water, Land, and Natural Resource in this regard.



## Investigating an On-Shore Wind Project Site on Banks Island, BC.

## **3.0** Infrastructure and Improvements

#### 3.1 Facilities

- 1. Installation of Wind measurement stations is to measure the wind and its characteristics.
- 2. No construction is contemplated.

#### **3.2 Infrastructure/Access**

It is anticipated that access to site will be provided via air (helicopter). No cut trails are anticipated.

#### 3.3 Utility Requirements and Sources

There are no Utility Requirements related to investigative activities identified under this license application.

#### 3.4 Water Supply

There are no special freshwater requirements related to investigative activities identified under this license application.

#### **3.5** Meteorological Tower

- 1. It is anticipated that the tower will be sourced from NRG Systems, a 80m XHD Tall Tower for Met Mast <u>https://www.nrgsystems.com/products/towers/detail/80m-xhd-talltower/</u>
- 2. Towers are packed and delivered to the site with the installation equipment in an Envirocrete. This compact design provides one time delivery of all the equipment, reduces environmental waste and packaging and requires minimal foot print when delivered.
- 3. The packaging will be removed and transported back for proper disposal.
- 4. A helicopter will be used to transport the equipment to the site, no helipad or permanent landing pad is required.
- 5. No storage containers are required at any site.
- The installation and overall program management will be provided by Zephyr North, which Source3 Energy has used in previous engagements. Zephyr North is a leading, reputable and experienced wind resource assessment consultancy in Canada (www.zephyrnorth.com).

# Source<sup>3</sup>

## License of Occupation Application for



Figure 3.5.1: NRG Systems EnviroCrete for 80m Met Tower



Figure 3.5.2: Meteorological Mast – installed site view

## Investigating an On-Shore Wind Project Site on Banks Island, BC.

## 3.5.1 Tower Site Map Layout



Figure: 3.5.1.1: Tower Layout, 2D (dimensional) side view of area per Tower site



Figure: 3.5.1.2: Tower Site Layout, 2D (dimensional) top view of area per Tower site

## Investigating an On-Shore Wind Project Site on Banks Island, BC.

#### 3.6 Anchoring

- 1. Tower Type and Anchoring will be determined based on a site's specific soil type.
- 2. Guidelines will be followed in accordance with NRG Systems Anchoring Guidelines, presented in Annex 3, which outlines factors determine the anchoring system from NRG Systems.
- 3. No concrete or permanent anchoring will be used.

#### **3.7 Wind Monitoring Station Alternatives**

- 1. An alternative to the installation of mast-based wind monitoring stations is remote sensing, in the form of LiDAR (Light Detection and Ranging). In LiDAR, a laser light is sent from a source (transmitter) and reflected from objects in the scene. These are mobile units which do not need permanent installation site. However, Banks Island is very remote (basically uninhabited) location, the operational requirements of instrument care, maintenance, and refueling may significantly impact operational costs. On the other hand, the relative ease of relocation of these devices (particularly LiDAR) can be attractive where a large, complex area requires assessment.
- 2. An option of using this type of monitoring equipment will be considered, wherever possible, after reviewing suitability of a location and if specific site conditions permit such use.

#### **3.8 LiDAR equipment**

LiDAR equipment is a compact, mobile unit which can be transported via a helicopter, installed and moved frequently. A typical unit has the following dimension:

- 55 cm x 56 cm x 55 cm (L, W, H)
- 56kg weight.





Figure 3.8.1: A LiDAR equipment example (WindCUBE)



Figure 3.8.2: Rendition of LiDAR in the Field

## Investigating an On-Shore Wind Project Site on Banks Island, BC.

#### **3.9 Wind Monitoring Stations**

Seventeen (17) sites are identified for the installation of wind monitoring stations ("WM")s, subject to confirmation. Proposed locations are shown below in Figure 3.9.1:



Figure 3.9.1: Wind Monitoring Stations - Proposed locations

#### **3.10** Rock Core Holes (for Geotechnical Analysis)

- 1. A drilling program may be instituted to obtain rock core borings, once an area deemed suitable for wind has been identified. This is required to study the suitability of subsurface conditions of the site for a wind turbine foundation.
- 2. This activity is anticipated to be contracted to a reputable and experienced Engineering firm, such as Jacobs / CH2MHill.
- 3. The boring sites will be selected for spatial coverage of the project site, and in areas that represented a range of predicted subsurface conditions and varying rock types.



- 4. The borings will be advanced by a reputable geotechnical drilling service provider, a number of them are established in Prince Rupert with helicopter support provided by helicopter operators out of either Prince Rupert or Terrace, BC.
- 5. A helicopter-portable drilling equipment, equipped with a triple-tube coring system to collect NQ-size core samples (45 millimetre [mm] diameter) may be utilized. For areas where gravelly overburden may be encountered, an air compressor and percussion hammer (air rotary) will be first used to advance a protective casing to the rock surface.
- 6. It is anticipated the boring will be advanced to depths ranging from 25 to 40 feet (7.5 to 12 m) below ground surface (bgs). Up to 6 bore holes may be drilled.
- 7. This activity is anticipated to commence not before summer 2025 and only after sufficient wind data has been collected from a wind measurement site. Activities will be conducted over a couple of weeks and in the summer time frame of any given year.

## Investigating an On-Shore Wind Project Site on Banks Island, BC.

## 4.0 Schedule

The purpose of this application is to have tenure for the Project Site and Met Mast in order to investigate the prospect of installing and operating a wind farm while we continue to engage with the local First Nations in a way that addresses their concerns and interests. In pursuit of such, the following two main activities are planned:

- 1. Wind measurements, which, if any, site(s) can be suitable for installation of a wind energy-based power generation facility with in the proposed area of this application. Upon identifying such site, a ground level site assessment (geotechnical) may be conducted.
- 2. In parallel, consultation with any and all First Nation concerned will be conducted to ensure all needs are addressed.

Based on positive progress on these two fronts and achieving agreed upon milestones, work on detailed studies required to complete an Environmental Assessment and obtain all required permits will commence in earnest.

It is anticipated that once the necessary precursors in in place, permitting will take up to 3 years followed by up to 3 years of construction and commissioning.

This aligns with the BC Hydro's anticipated timeline of year 2028 a indicated in the current power call and other forecasted demand growth for power in the region.

Annex 1 provides an overview of the key investigative activities planned for the Project Site and for the Monitoring stations, respectively.

Annex 2 provides a schedule for the wind measurement and project development.



## Investigating an On-Shore Wind Project Site on Banks Island, BC.

## 5.0 Diligent Use

#### 5.1 Evidence of Ongoing Diligent Use

As part of our development process, we aim to proactively communicate with rights holders and stakeholders to keep them informed regarding progress being made on the projects we develop. With respect to this application, we will endeavor to keep rights holders and stakeholders informed regarding progress on the activities identified in the Section 4.0.



## Investigating an On-Shore Wind Project Site on Banks Island, BC.

Activity	Brief Description of Activity	Season	Potential Impact	Mitigation/Management of Potential Impact
Met towers, Lidar- Wind Data Collection	Ongoing review of wind resource and other Met data as site suitability, feasibility and design input. Inventory and assess weather anomalies for site assessment.	All	Meteorological data is key to wind and site assessment and any future design and energy output forecasting	Regular review of data gathered. Regular updating of output forecasts.
Met tower, Lidar maintenance	Ensure Met mast, Lidar continutes to provide consistant and reliable data	As needed / required	Reliable data is required over time to ascertain site suitability	Regular review of equipment performance. Maintain preventative maintenance program as recommended by equipment supplier.
Engagement with First Nations	Actively engage First Nations - See section 1.3	All	Partnership is essential to successful development	See Section 1.3
Observing Nesting Marbeled Murrelet in unforested areas	Conduct due diligence if a nest is found or an adult murrelet is seen flushing from the ground.	Nesting period	Preservation of Marbeled Murrelet	Cease activities

## Annex 1







#### Investigating an On-Shore Wind Project Site on Banks Island, BC.

## Annex 3

Anchoring will be done in accordance with NRG Systems Anchoring Guidelines

#### https://www.nrgsystems.com/support/product-support/manuals/manual-80m-talltower-installation/)

#### Appendix B: Anchoring Guidelines

**B.1 Determine site soil and anchor type before you order your tower.** Per ANSI/TIA-222-G, for design purposes, one can assume Class 6 soils. However, the Standard requires that soil parameters and assumptions be validated prior to installing the tower. Before your tower is ordered, determine the soil type, preferably through soil sampling. Order the correct anchors based on the results of the soil sample.

The purpose of this section is to give you the information needed to provide suitable anchoring for your 80m Tall Tower. Because anchor requirements are site specific, it is the responsibility of the customer to determine suitable anchors. If you are not sure what is required, seek professional guidance.

Local utility companies can often provide useful information regarding anchoring used in the site area. Do not use rebar anchors, especially when the surface soils are loose or wet.

Table B-1: Soil Classes Class	Common Soil Types	Geological Soil Classification
3	Dense clays, sands and gravel; hard silts and clays	Glacial till; weathered shales, schist, gneiss and siltstone
4	Medium dense sandy gravel; very stiff to hard silts and clays	Glacial till; hardpan; marls
5	Medium dense coarse sand and sandy gravels; stiff to very stiff silts and clays	Saprolites, residual soils
6	Loose to medium dense fine to coarse sand; firm to stiff clays and silts	Dense hydraulic fill; compacted fill; residual soils
7**	Loose fine sand; Alluvium; loess; soil-firm clays; varied clays; fill	Flood plain soils; lake clays; adobe; gumbo; fill

\*\* In class 7 soils, it is advisable to place anchors deep enough to penetrate underlying class 5 or 6 soil. Charts reproduced by permission, The A.B. Chance Company.

**B.2 Anchor Choices and other considerations** The choice of anchors must take into consideration soil type, maximum winds expected, icing or other weather that may affect the tower, and a safety factor suitable for the location and to meet any legal requirements. Considerations include but are not limited to: tornadoes, hurricanes or typhoons, locations where very high winds are expected, potential for flooding or periodic soaking of the soil, soil erosion, and icing events.

#### **B.3 Screw-In Anchor Description**

Screw-in anchors are the most commonly used anchors for normal clay soils without rocks. The 8 inch single helix anchors are installed by hand, using a cross bar to screw them into the earth like a corkscrew. The 8 inch twin helix anchors require machinery. The 80m tower employs two (2), 8 inch diameter screw-in anchors and sixteen (16) 8 inch twin helix anchors.

Table B-2: Specifications for 203mm (8 inches) diameter Screw-InAnchors Length Overall:	203 mm (8 inches) Anchor
Helix diameter:	203 mm (8.0 inches)
Length Overall:	1.65 m (66 inches)
Rod diameter:	25 mm (1 inch)
Material:	Galvanized steel



#### Investigating an On-Shore Wind Project Site on Banks Island, BC.

<b>Holding Power:</b> (These anchors are not suitable for soils denser than class 5.)		
Class 5 soils *	44.5 kN (10000 pounds)	
Class 6 soils *	31.1 kN (7000 pounds)	
Class 7 soils **	17.8 kN (4000 pounds)	

\* See Table B-1 for soil class descriptions

\*\* In class 7 soils, it is advisable to place anchors deep enough to penetrate underlying class 5 or 6 soil.

#### B.4 Rock Anchor Description

Rock anchors are placed into solid rock, when anchoring to either bare rock, or thin soils with solid rock near the surface. They are constructed of a threaded rod with integral eye, and two opposing wedge halves. The anchor is placed in a hole pre-drilled in the rock. Twisting the eye of the anchor forces the wedges against the sides of the hole and locks the anchor in place. Load actually increases the wedging force, developing holding power equal to the full tensile strength of the rod.

#### **B.5 Installing Screw-In Anchors**

Note: Unlike a tent stake, screw-in anchors are installed in line with the pull of the guy wires from the tower. It is important to install the anchor at an angle, so the eye of the anchor is toward the tower and the helix screws are away from the tower

Table B-4: Specifications for Rock Anchors	
Holding Power:	9072 kgf (20,000 pounds)
Rod Length Overall:	0.38 m (15 inches), 0.76 m (30 inches) or 1.35
	m (53 inches), other lengths available
Anchor Diameter:	44 mm (1.75 inches) as supplied, 60 mm (2.375
	inches) max. expanded
Rod Diameter:	19 mm (.75 inches)
Materials:	Malleable iron, dipped in rust-resisting black
	paint
Required Hole Size:	50 mm (2 inches) diameter (nominal)
Use Rock Drill Size:	50 mm (2 inches) diameter

NRG Systems provides a full kit to anchor the met masts (depending on the soil conditions), which includes:

- Curtis Bridle Assembly to the 3 block pulley anchors The NRG Systems supplied Bridle kit (NRG Kit # 18046) consists of the following equipment:
- (3) 5/8" Shackles
- (2) Ten foot lengths of 3/8" wire rope
- (4) 3/8" Thimbles
- (2) 3/8" Sleeves (already swaged)
- (4) 3/8" Wire rope clips