NaiKun Wind Project: Haida Gwaii's Path To A Cleaner and More Affordable Future

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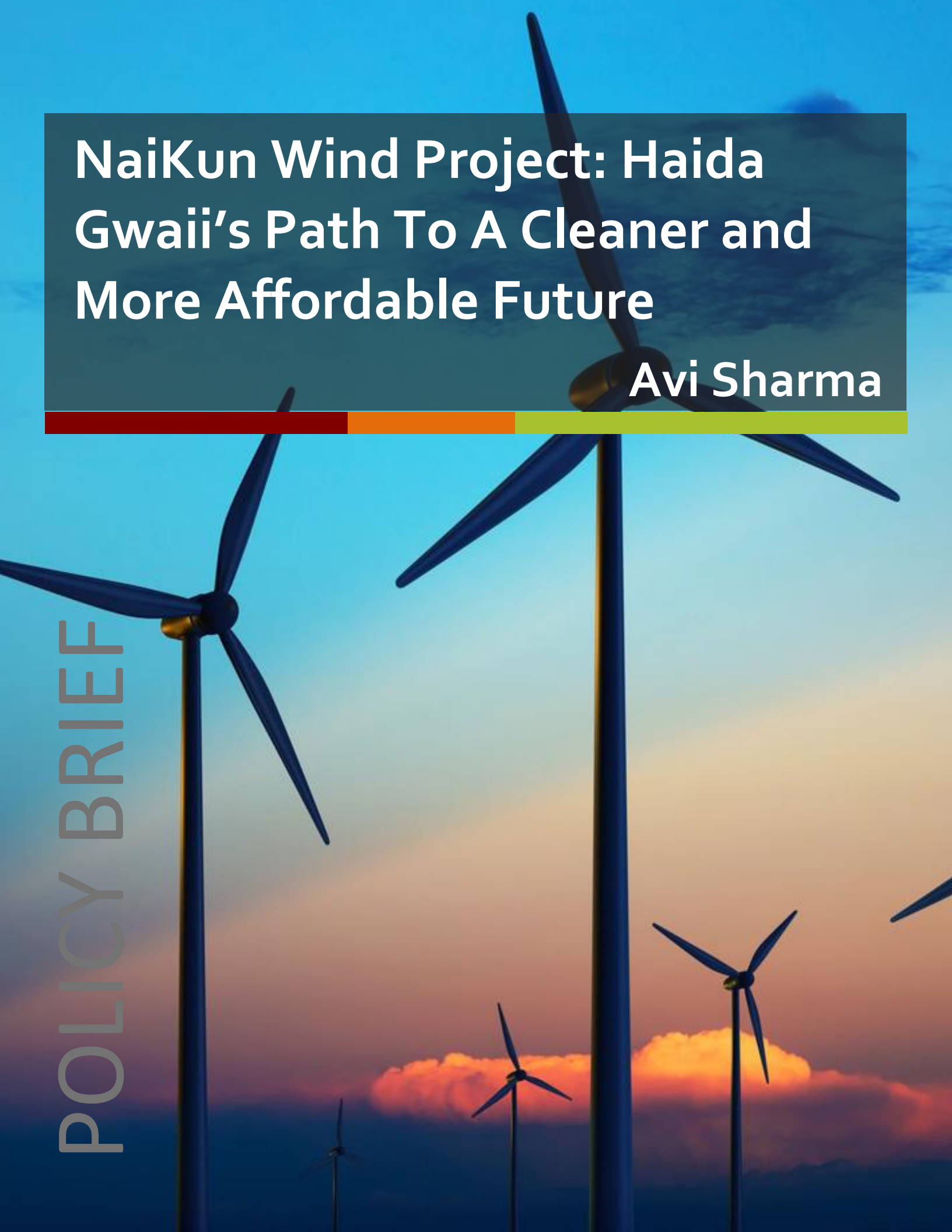
POLICY BRIEF



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Council Haida Nation

NAIKUN Wind Energy Group Inc.

SFU

LIST OF ACRONYMS

BCH	B.C. Hydro
CEP	Clean Energy Plan
CHN	Council of the Haida Nation
CO_2	Carbon Dioxide
CPC	Clean Power Call
DGS	Diesel Generation System
EPA	Energy Purchasing Agreement
GHG	Greenhouse Gas
HaiCo	Haida Enterprise Corporation
HG	Haida Gwaii
IPP	Independent Power Producer
KWh	Kilowatt Hour
MWh	Megawatt Hour
NO_x	Nitrogen Oxides
NWF	NaiKun Wind Farm
NWG	NaiKun Wind Group
NWP	NaiKun Wind Project
NWTL	Northwest Transmission Line
RFEOI	Request For Expressions of Interest

SO_2	Sulfur Dioxide

ABSTRACT

Reforming sources of energy dependence is an issue of major political debate that has daunted both the industrial and rural areas of British Columbia. The far-flung region of Haida Gwaii is one of the largest rural communities in B.C., which is currently experiencing this hardship. If British Columbia thinks it is on route to fulfill its 'Clean Energy Plan' for 2016 – the province has enormous problems coming its way. Rural areas of B.C., in particular Haida Gwaii, depend on diesel generators for their energy production – contributing to drastic amounts of greenhouse gas emissions. Regardless of the many Requests For Expressions of Interest's submitted to B.C. Hydro, the province has denied the proposal to establish a source of renewable energy production in Haida Gwaii[1]. Given that the cost of building a substation is offsetting – the status quo continues to fail the province in its attainment of the Clean Energy Plan of 2016. Therefore, a more robust step is needed. This report performs a cost-benefit analysis of granting an Energy Purchasing Agreement to NaiKun Wind Group in their development of an offshore wind farm in the Hecate Strait, against its three main contenders: solar energy, bioenergy and integration into the transmission grid. Assessments of wind energy against these potential contenders show its viability to serve Haida Gwaii. However, it is key to address the Haida first nations who play a key role in this venture. Working with these critical stakeholders is essential to the future of the NaiKun Wind Project.

EXECUTIVE SUMMARY

There is a total population of approximately 24,068 people living in the off-grid regions of B.C. alone – distributed among 86 communities[2]. Included among this enormous number is the region of Haida Gwaii (HG). Located in Northern British Columbia, it is composed of a population of approximately 5,000 residents; consisting of 55% Haida First Nations and 45% non-first nations[3].

For several years the people of Haida Gwaii have been living upon the dependency of diesel energy – obtained from diesel generators. Currently Haida Gwaii receives its energy from six diesel generators supplied by B.C. Hydro (BCH), which are independent from the electricity grid[4]. The amounts of emissions that are released from this energy generation method are extremely high and not to mention threatening to both wildlife and human life. There have been a number of Requests for Expressions of Interests (RFEOI) submitted to B.C. Hydro regarding the issue, but none of which have been accepted or even considered[5].

[1] B.C. Hydro, "Haida Gwaii RFEOI." (2014). https://www.bchydro.com/energy-in-bc/acquiring_power/closed_offerings/haida_gwaii_rfp.html.

[2] Government Canada, "Status of Remote Communities in Canada." (2011). https://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/canmetenergy/files/pubs/2013-118_en.pdf.

[3] Hello BC, "Haida Gwaii." http://www.hellobc.com/haida-gwaii-queen-charlotte-islands.aspx.

[4] B.C. Hydro, "Technical Information." (2012). https://www.bchydro.com/content/dam/hydro/medialib/internet/documents/planning_regulatory/acquiring_power/2012q4/haida_gwaii_system.pdf.

[5] Hydro, *RFEOI*.

The provincial energy provider – B.C. Hydro has continuously claimed that they are seeking new and improved methods of renewable energy production for Haida Gwaii, however there has been no change in the past four decades other than the implementation of newer diesel generators[6].

The people of Haida Gwaii live on low-income levels. One of the key issues here is that the price of diesel is constantly fluctuating, which forces residents to pay more – minimizing their livable earnings[7]. Although it is understandable that rising and fluctuating diesel prices cannot be controlled but it is also a well-known fact that must be accounted for. With diesel energy generation remaining as the status quo, it is clear that the issue has truly not been accounted for.

Diesel generation is among the most pollutant of energy producers and even more so while it is used on a daily basis by a large amount of B.C. residents[8]. However, the government of British Columbia has proposed the B.C. Energy Plan (CEP) in a quest to be fulfilled by the year 2016.

The plan entails the following policies[9]:

- Maintain public ownership of BC Hydro and the BC Transmission Corporation.
- Maintain our competitive electricity rate advantage.
- Achieve electricity self-sufficiency by 2016.
- Make small power part of the solution through a set purchase price for electricity generated from projects up to 10 megawatts.
- Explore value-added opportunities in the oil and gas industry by examining the viability of a new petroleum refinery and petrochemical industry.
- Be among the most competitive oil and gas jurisdictions in North America.
- BC Hydro and the Province will enter into initial discussions with First Nations, the Province of Alberta and communities to discuss Site C to ensure that communications regarding the potential project and the processes being followed are well known.

It is somewhat tenuous to predict that B.C. would be able to obtain these while 24,000 of its residents are depending on an energy generation method practically designed to pollute the environment. The Council of the Haida Nation expressed that the people of Haida Gwaii are experiencing emotions of isolation and discrimination in response to this issue of not having any source of renewable energy generation mechanism in place[10]. They point to the fact that the rural region of Iskut B.C. was recently integrated onto B.C. Hydro's

[6] Hydro, *Technical Information*.

[7] Franc Pridoelh, "Haida Gwaii Climate Assessment," *Special Report for MIEDS*, (2010). http://www.mieds.ca/images/uploads/docs/Climate_Report_HAIDA_GWAII_CLIMATE_ASSESSMENT_092010.pdf.

[8] Ibid.

[9] B.C. Hydro, "Clean Energy Strategy." (2013). https://www.bchydro.com/content/dam/BCHydro/customer-portal/documents/corporate/regulatory-planning-documents/integrated-resource-plans/current-plan/0008-nov-2013-irp-chap-8.pdf.

[10] CHN, "Special Energy Issue." (2010). http://www.haidanation.ca/Pages/haida_laas/pdfs/newsletters/special_issues/Energy_Issue_HR.pdf

electricity grid via the Bob Quinn substation – however this region comprises of a small population of only 350 people[11]. Compared to the 5000 occupying Haida Gwaii.

The recognition and agreements pertaining to the state of Haida Gwaii is rather abstract. There needs to be reform in the method of energy generation for this region. The implementation of a renewable source of energy will better all sectors of political, economic and social life in HG.

PROBLEMS WITH THE STATUS QUO

This section will address the status quo of Haida Gwaii relative to three key factors: environmental issues, social issues and economic issues.

Haida Gwaii is powered by three unconnected distribution systems, all containing several diesel generators. Two of these belong to B.C Hydro and one to an Independent Power Producer (IPP) [12]. The first BCH owned generator is located in Masset and provides energy to the northern grid via six diesel generators. In 2002-2003 this distribution site consumed 7 million liters of diesel fuel at approximately $0.45/liter, escalating the yearly total for this period to $3 million. Shockingly, these numbers only represent the energy demands for approximately 1,379 residents at a power generation rate of $0.17 per Kilowatt Hour (kWh)[13]. The second distribution system owned by BCH is a backup generation site located in Sandspit containing seven generators. The Sandspit diesel generation system (DGS) buys nearly 70% of the annual demand from EPCOR Power L.P. Meaning energy in the Southern grid is powered, owned and operated by EPCOR Power L.P[14]. The system consumed 1.7 million liters of diesel fuel at the same cost as the Masset site, shifting the yearly cost to $760,000. This seemingly more efficient station than the Masset site, provided energy to approximately 1600 residents at a power generation rate of $0.21/kWh[15]. Together these stations produce approximately 26,000 tonnes of GHG annually[16].

The entire Haida Gwaii region has been dependent on diesel energy generation for centuries. Such dependency has caused daily hardship for residents of the region due to constant blackouts caused by peak overloads as well as increased health concerns[17]. Secondly, the emissions produced by the diesel generators

[11] CHN, *Energy Issue*.

[12] David Molinski, "Strategic Analysis of Renewable Energy Options for the Central Coast, North Coast and Haida Gwaii." OnPoint Consulting: March 2009. http://www.turtleisland.org/news/haidalink.pdf.

[13] Molinski, *Haida Gwaii*.

[14] Ibid.

[15] Ibid.

[16] Sustainable Resource Development Branch, "Haida Gwaii/Queen Charlotte Islands." *Summary of Current Economic Conditions*, (2004). https://www.for.gov.bc.ca/tasb/slrp/lrmp/nanaimo/haidagwaii/docs/Economic_info_summary_CP_Forum_25Nov2004.pdf.

[17] Molinski, *Haida Gwaii*.

in Haida Gwaii are and will continue to have a major impact on the B.C.

Clean Energy Act (CEA)[18]. Sources show that the use of diesel generators on the north grid produces 30 times as much greenhouse gas (GHG) emissions as the B.C. average and the south grid produces 10 times as much GHG emissions as the B.C. average[20]. This shows how severely these emissions can prevent the ability to achieve the CEA.

Table 1.1: Diesel Generating Units/Size in Haida Gwaii

Masset DGS (North Grid)	
Unit	Size (kW)
MASG1	2108
MASG2	2108
MASG3	2108
M125G1	2108
M172G1	2108
M173G1	2108
M165	2108

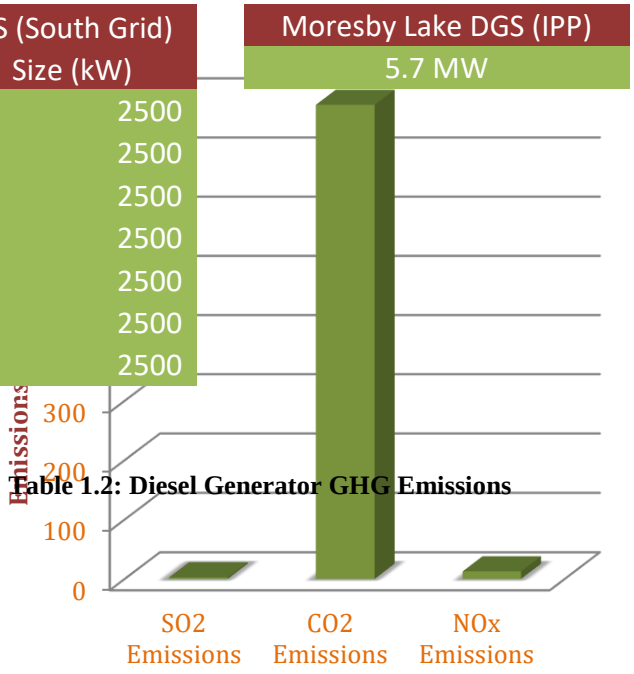
Sandspit DGS (South Grid)	
Unit	Size (kW)
M124G1	2500
M178G1	2500
M167G1	2500
SPTG1	2500
SPTG2	2500
SPTG3	2500
SPTG4	2500

Moresby Lake DGS (IPP)
5.7 MW

Source: Adapted from BC Hydro Haida Gwaii SRFEOI - Feeny

Thirdly, the price for diesel is constantly fluctuating. A drastic impact on the resource economy in Haida Gwaii, resulting in a lack and loss of high paying jobs, has caused a major burden. Statistics in 2011 show that the average Haida Gwaii household earned a median income measuring 78% of the provincial average income[19]. Therefore, with diesel prices constantly fluctuating, it becomes extremely difficult for residents to afford energy produced by these expensive diesel generators. Not to mention, the predicted rate of energy consumption and demand is estimated to spike drastically and with no intention to slow or turn back. The current diesel generators do not have the sufficient capacity to meet that predicament[21].

Table 1.2: Diesel Generator GHG Emissions



Source: Adapted from Power Generation Canada, 2003-2014

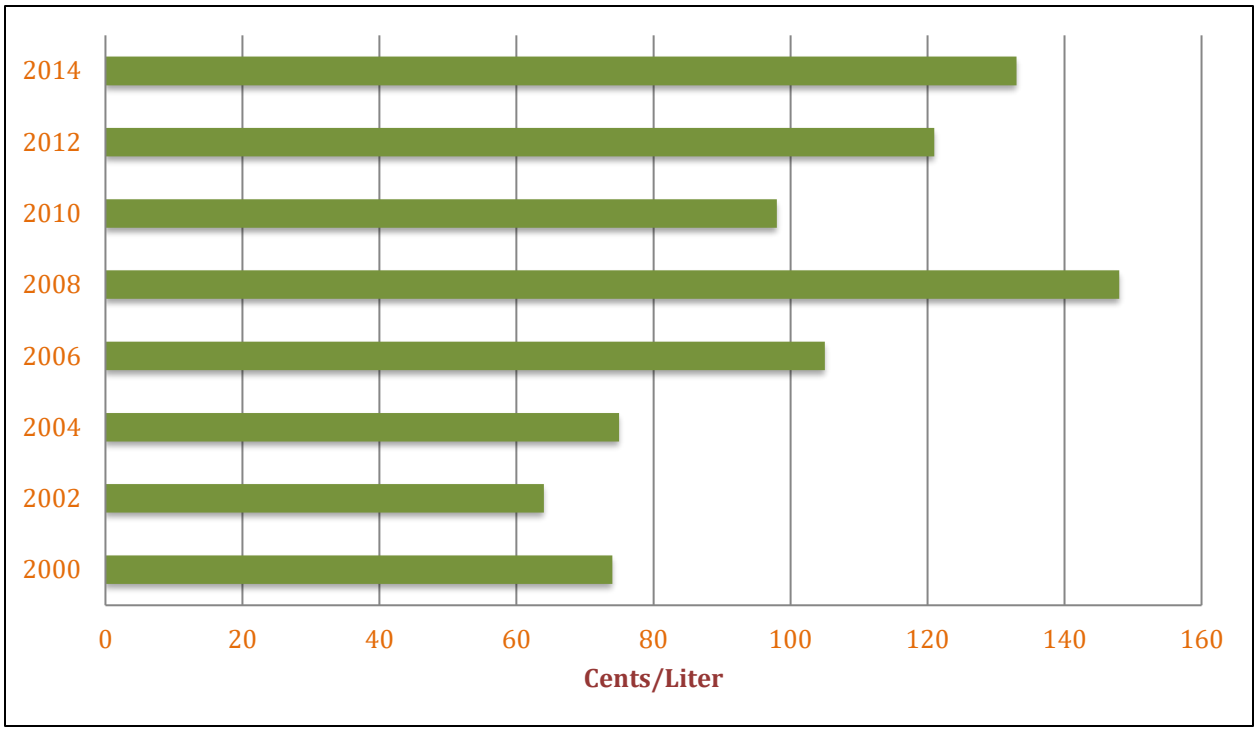
[18] B.C Hydro, "Strengthening B.C. Hydro." https://www.bchydro.com/content/dam/hydro/medialib/internet/documents/news/press_releases/clean_energy_act/background_bch_bctc.pdf.

[19] BCStats. "Canadian Census." *Government Canada*, (1996-2011). http://www.bcstats.gov.bc.ca/Home.aspx.

[20] GVC. "Status of Remote/Off-Grid Communities in Canada." (2011). https://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/canmetenergy/files/pubs/2013-118_en.pdf.

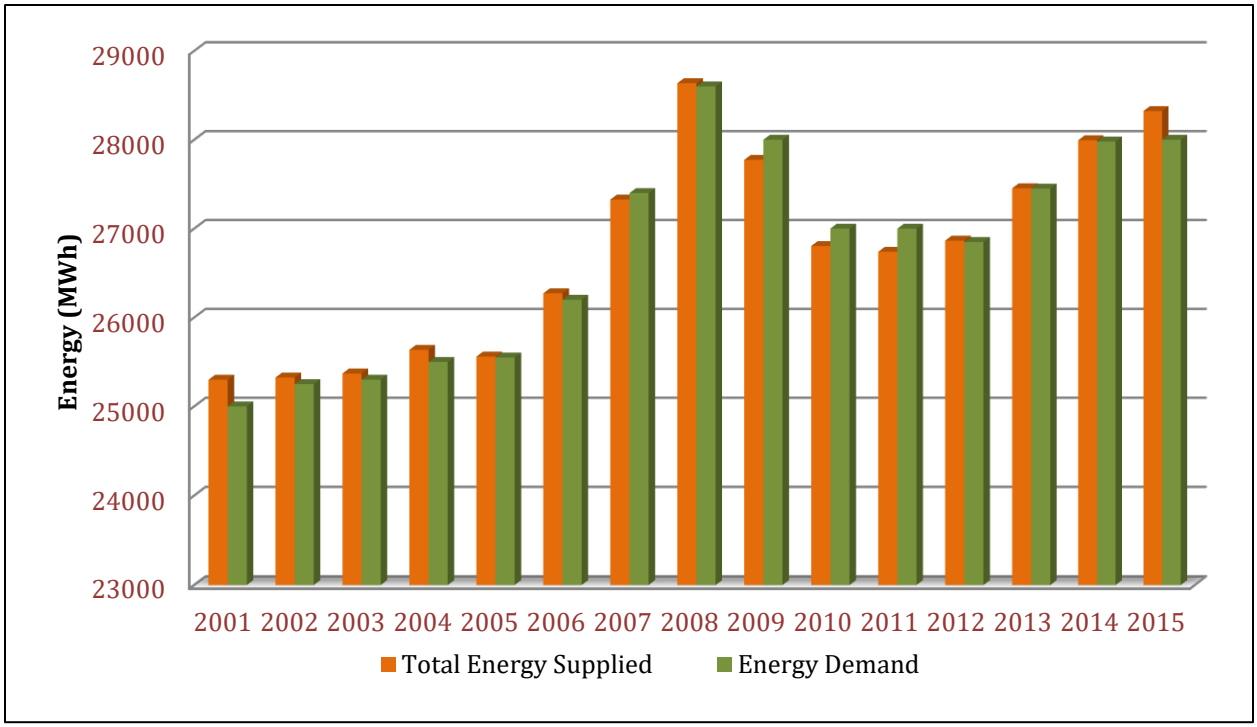
[21] Ibid.

Table 1.3: Cost of Diesel in British Columbia



Source: Adapted from Natural Resources Canada 2014-2015
Note: Very volatile – diesel prices are constantly fluctuating; major peak in 2008

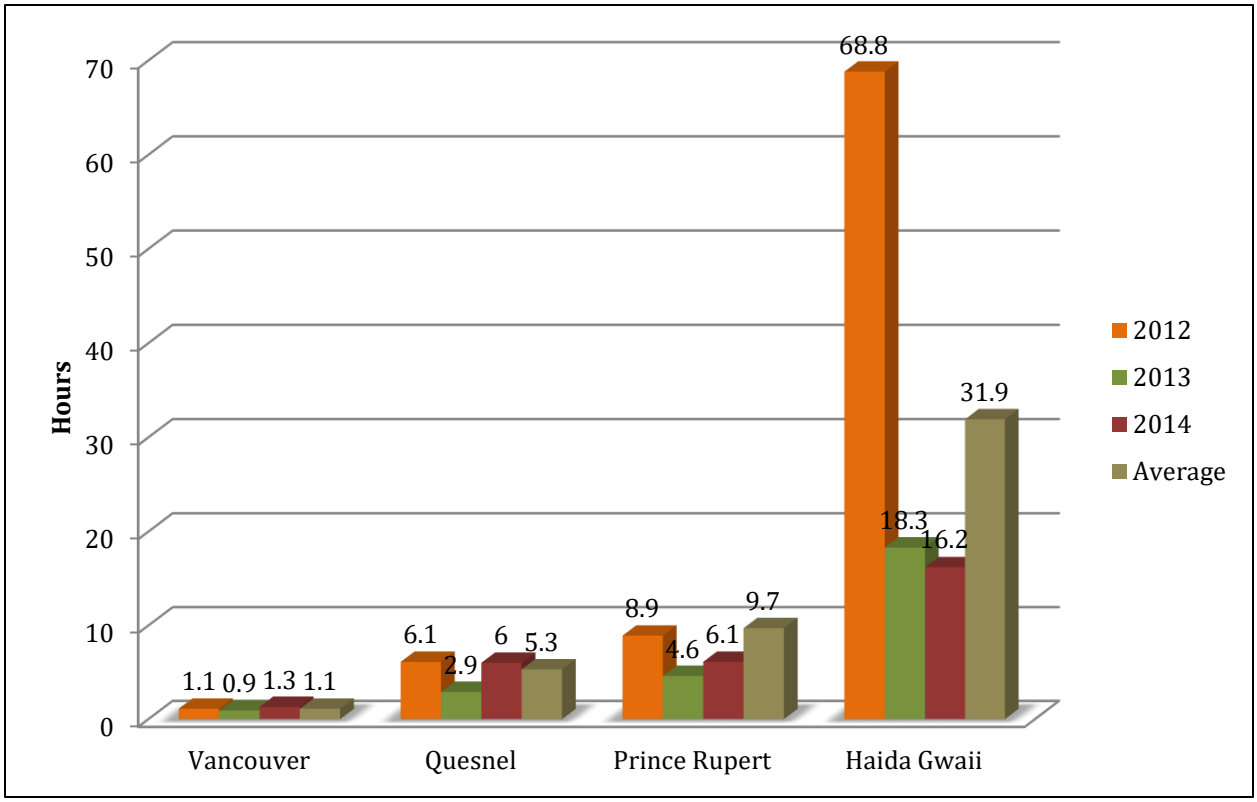
Table 1.4: Total Energy Supplied By B.C. Hydro's Diesel Generators Vs. Demand



Source: Adapted BC Hydro Haida Gwaii RFEOI – Technical Information
Note: Very volatile – different households use different amounts of energy. Energy use will always fluctuate

As we can see from ***Table 1.4***, the diesel generators that are currently powering Haida Gwaii are not capable of meeting energy demands. In 2009 B.C. Hydro had removed one diesel generator from the Masset site in order to undergo an attempt at 'cleaner' energy use[22]. Therefore we see that in the following years energy demand had surpassed energy supply capability. A newer diesel generator was then implemented in 2012[23]. However this treading supply-and-demand capacity is the cause for the major blackouts that Haida Gwaiian residents are experiencing. These blackouts are caused by peak overload caused by high-energy demand/usage periods; a demand capacity which is unsustainable and unachievable by the diesel generators[24]. Over a three-year period taken from 2012 to 2014, Haida Gwaii ranked the second highest following Valemount in B.C. regions to experience power outages. The average hours of blackouts that Haida Gwaiian's experienced over the three-year span was 32, compared to 1 hour for Vancouver[25].

Table 1.5: Household Hours of Blackouts / Haida Gwaii Vs. Renewable Energy Users



Source: Assessment from B.C. Hydro for Vancouver Sun, 2015.
Note: Highest on list is Valemount (Average: 36.3 hours) – not included in chart

[22] Hydro, *Technical Information*.

[23] Ibid.

[24] Vancouver Sun, "Power Failures Far More Common in Remote Parts of B.C." (2015). http://www.vancouversun.com/technology/Power+failures+more+common+remote+parts/11311997/story.html.

[25] Ibid.

Snapshot: Status Quo Summary

Economic Issues:
- Residents pay $0.17-0.21/KWh.
- Site consumes 7 million liters of diesel at $0.45/L, boosting yearly total to $3M.

Environmental Issues:
– North grid produces 30x and south grid produces 10x the provincial average of GHG emissions (26,000T/year).

Social Issues:
- Blackouts: 32 hours/year)
- Dependency on diesel
- Extremely noisy
- Income disparities

ALTERNATIVES

Bioenergy: Wood Waste

One potential way for Haida Gwaii to reduce its dependency on fossil fuels is through the use of wood waste, also known as biomass. In 2012, HaiCo was one of 26 proponents to submit a proposal to BC Hydro's Request for Expressions of Interest for clean electricity projects on the north grid of Haida Gwaii[26]. BC Hydro has stated it will consult with stakeholders and First Nations before any process is initiated [27] . Through its forest harvesting and manufacturing operations, HaiCo generates a tremendous amount of wood waste, which could be converted to energy through gasification or combustion. The total estimated value of raw logs shipped from Haida Gwaii during the period of 1982-2004 was $4,561,861,634[28]. This shows how much of an impact the logging sector has on the Haida Gwaiian economy. HaiCo proposes to create 10 to 12 permanent and full-time jobs and would generate $20 million net revenue over the next 20 years[29]. In Haida Gwaii, an average of 10% of the total wood volume harvested is left behind as waste wood through typical logging practices. The amount is estimated at approximately 110,000 m^3/year[30]. Recognizing the importance of the logging industry and the amount of wood harvested each year shows how bioenergy derived from wood chips would definitely be a renewable energy option for Haida Gwaii.

Table 2.1: Comparable Biomass Stations/Sources

Biomass Stations/Source	Cost/MWh
Williams Lake Station	$60-$6
Quesnel Station	$68-$95
Mackenzie Green Energy Center	$73-$95
Pine Beetle/Roadside Slash Wood	$18
Sawmill Wood waste	$13
Standing Dead Trees	$15

----------NOTE----------
Extremely high operating costs. Haida Gwaiian's currently pay approximately $0.17-$0.23kWh = $170/MWh. There would be no incentive to invest if the people would be paying the same amount or even more.

Source: ~~Strategic Analysis of Renewable Energy~~ Options for Haida Gwaii

[26] Aboriginal Business and Investment Council, "Haida First Nation." (2015). http://www.bcabic.ca/content/haida-first-nation.

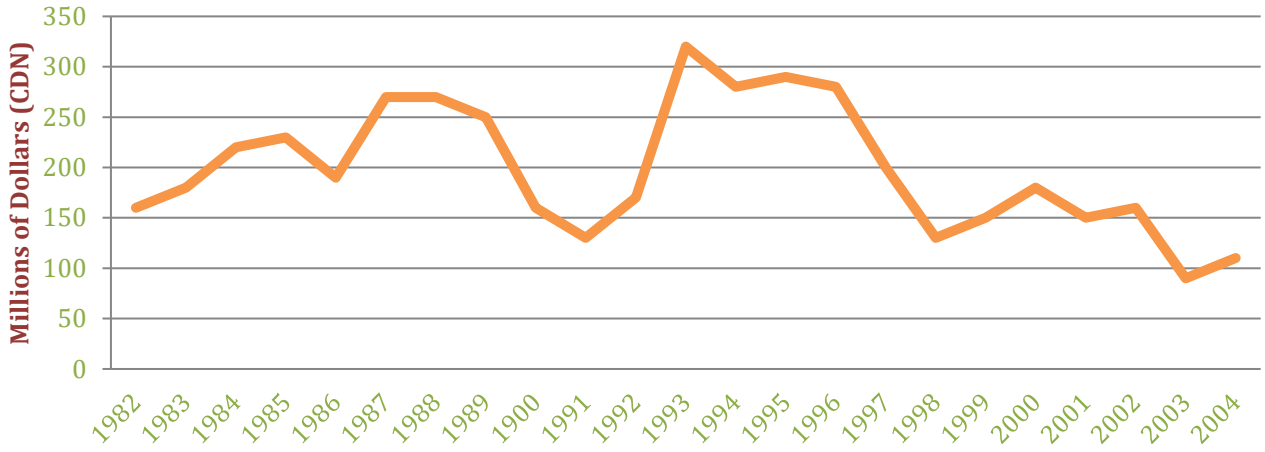
[27] Ibid.

[28] BC Ministry of Forests, "Forest Economy Trends and Economic Conditions on Haida Gwaii." (2007). http://www.spruceroots.org/Booklets/ForTrends.pdf.

[29] ABIC, *Haida First Nation*.

[30] Ministry of Forests, *Haida Gwaii*.

Table 2.2: Estimated Value of Raw Logs

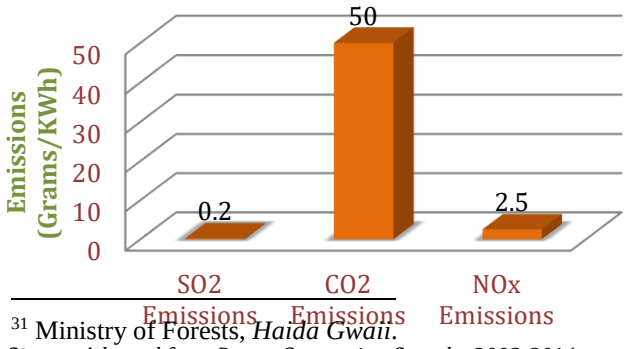


Source: Adapted from BC Ministry of Forests, Harvest Billings Database & Revenue Branch, Vancouver Log Markets
Note: Highly volatile - Greatest peak in 1993 & lowest in 2003

However, there are many drawbacks associated with the implementation of bioenergy in Haida Gwaii. Firstly, the dependency on the timber industry has been steadily declining with a reduction in the availability of harvestable land[31]. This means that if supply is not readily available or cannot be spontaneously regrown then energy cannot be produced or provided.

Furthermore, in ***Table 2.2*** we see that the value of raw logs from Haida Gwaii began to decline in 2004 and have continued since. Thus if the value for the extraction of timber – being the key derivative of biomass – is not in demand then the logging industry itself would decline. In addition, the most common issue that is central to any decision is economic costs. Essentially, the cost to generate this electricity from the wood waste residue is extremely conflicted with the cost to acquire and transport it to the plant[32]. Therefore, if timber cannot be grown near refineries then the cost to transport the feedstock would outweigh the potential benefits associated with its energy conversion[33]. According to ***Table 2.1***, bioenergy produced by woodchips derived from multiple sources would be extremely costly to start-up and operate.

Table 2.3: Bioenergy GHG Emissions



Source: Adapted from Power Generation Canada, 2003-2014

A main critique of biomass is that HaiCo does not offer the Haida residents or more importantly, the Haida Council, any sort of

[31] Ministry of Forests, *Haida Gwaii.* Haida Gwaii Management Council, "Developing A Forestry Strategy For Haida Gwaii," (2013). http://www.haidagwaiimanagementcouncil.ca/forest_strategy/documents/Forest%20Strategy%20Discussion%20Paper.pdf.

[33] Ibid.

share or incentive to have this energy generation source implemented[34]. Therefore, the key issue here is that although bioenergy would generate $20M in revenue over the next 20 years, there is no promise that funds would be streamed towards helping the people of Haida Gwaii. In other words, it does not take any other factors into account other than replacing diesel generators[35].

Although biomass is considered to be a clean renewable energy source, it still emits GHG's that the plant/tree had consumed in the period of its lifetime – meaning it re-releases stored CO_2 back into the atmosphere[36].

Grid Integration

Grid integration has by far been the most contested alternative to diesel energy generation for Haida Gwaii[37]. Integrating Haida Gwaii onto B.C. Hydro's electrical transmission grid would mean that renewable energy that is currently being enjoyed by urban areas would be made available to this region. Inherently, there is no doubt that this would eliminate the dependency on diesel-fueled generators. The potential project would bring with it clean energy to Haida Gwaii along with drastic reductions in the current GHG emissions. More importantly, the grid would have the ability to provide energy for as long as urban areas are receiving it – therefore reducing blackouts and peak over-load shutoffs[38].

However there are several criticisms regarding the support of this project. We can relate many of these issues in to the recent Northwest Transmission Line (NWTL).

Firstly, integrating Haida Gwaii onto B.C. electrical grid would mean that new substations would have to be built in the region along with transmission lines to the various communities that make up the region[39]. Not only would it cost a great deal of money but it would also have dramatic impacts on wildlife habitats and the environment due to the digging of trenches for laying pipes, operation of machinery, potential spills, and impact on scenic and ecological values[40]. As we noted earlier in the paper, forestry is the largest sector in Haida Gwaii. It provides 672 jobs and has an employment dependency rate of 28%. This shows that the implementation of transmission lines – similar to the NWTL would drastically impact the forestry industry by clear-cutting trees beyond its usable form[41].

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[34] CHN, *Energy Issue*.

[35] Ibid.

[36] NRC, "Energy Markets Fact Book." (2014-2015). http://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/energy/files/pdf/2014/14-0173EnergyMarketFacts_e.pdf.

[37] CHN, *Energy Issue*.

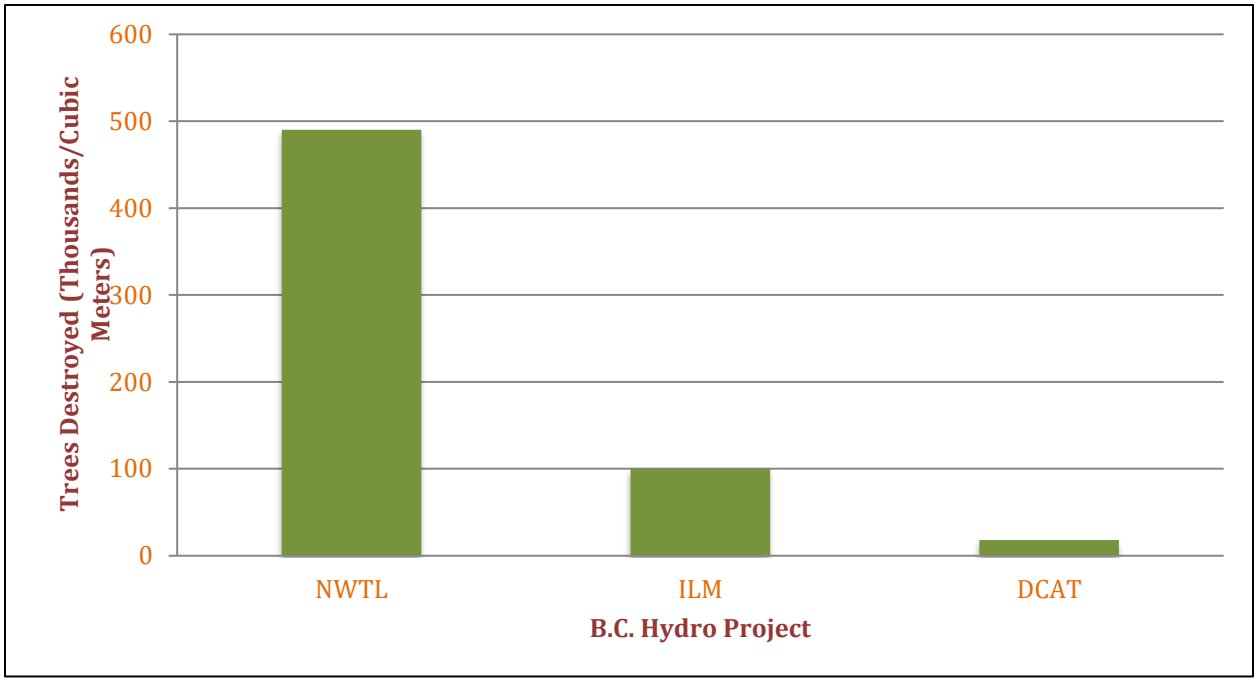
[38] Vancouver Sun, *Power Failures*.

[39] Susan Margot Boronowski, "Integration of Wave and Tidal Power Into The Haida Gwaii Electrical Grid." (2007). http://dspace.library.uvic.ca:8080/bitstream/handle/1828/1704/Susan%20Boronowski.%20M.A.Sc.%20Final%20Thesis.pdf?sequence=1

[40] Canadian Institute of Mining Metallurgy and Petroleum, "BC Hydro Gets Approval For Northwest Transmission Line." (2011). http://www.cim.org/en/Publications-and-Technical-Resources/Publications/CIM-Magazine/May%202011/news/BC-Hydro-gets-approval-for-Northwest-Transmission-Line.aspx

[41] Ibid.

Table 3.1: Clear-Cut Trees In Comparable B.C. Hydro Grid Integration Projects



Source: Mining and Energy Exploration Canada, 2015

Secondly, in terms of economic costs, all commitments and risks for the project, would fall on B.C. Hydro. This would mean increased taxes to pay for the project as well as tapping into Canada's Green Infrastructure Fund. The NWTL had tapped into the fund for $130M[42]. Therefore, with a similar project size needed in Haida Gwaii, we would see similar numbers. Furthermore, as we have seen from examinations of Haida Gwaiian income levels, there is simply not enough revenue generation in the region to have a quick payoff or even a prospect of breaking even[43]. It is also important to look at the cost of the project itself.

For example, the comparable NWTL had swayed tremendously from its initial cost estimations, making it extremely difficult to analyze revenue, employment and any other benefits of the project[44]. Putting this in terms of Haida Gwaii, the region as we analyzed, does not have sufficient income to support the taxation that would follow the project. Adding to the issue, this project will only produce 200-480 jobs[45]. Also, if costs were to exceed beyond amounts predicted – the worst-case scenario of selling materials would still not be able to break the project even[46].

[42] Northern Development, "Government of Canada Announced $130M Investment in NWTL." http://www.northerndevelopment.bc.ca/news/government-of-canada-announces-130-million-investment-in-northwest-transmission-line/.

[43] CHN, *Energy Issue*.

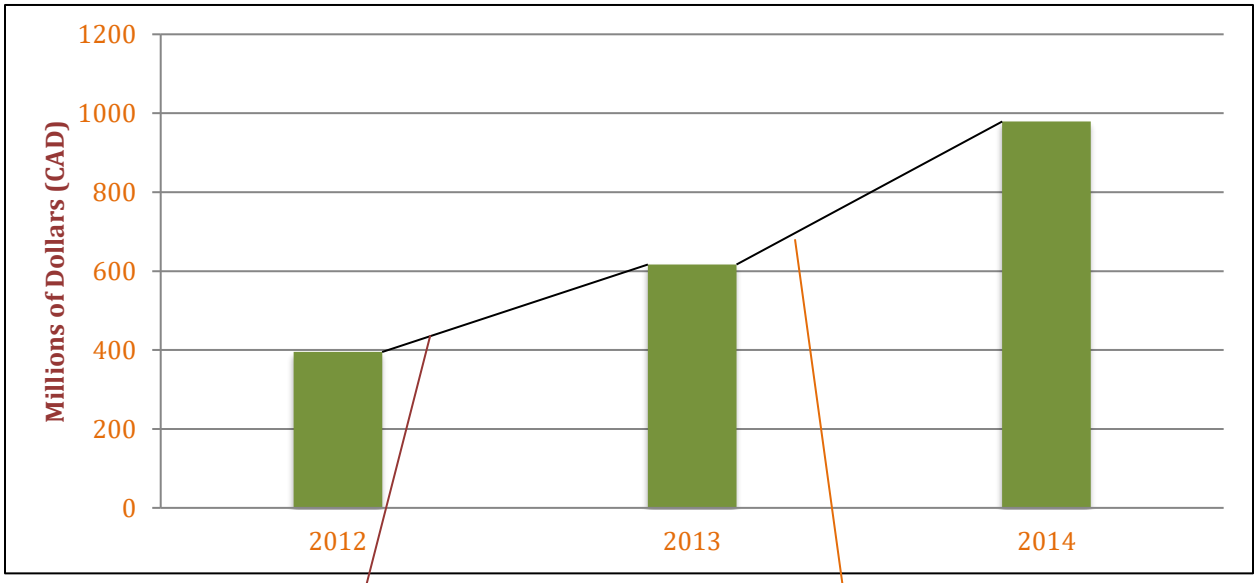
[44] MEM, "Factsheet: The Northwest Transmission Line." https://news.gov.bc.ca/factsheets/factsheet-the-northwest-transmission-line-ntl.

[45] Ibid.

[46] Chris Hild, "First Nations Renewable Energy Roadmap." (2015). Sauder School of Business.

According to the Dogwood Initiative - lobby groups wanted to have the government subsidize the construction of the power line with at least $250 million in taxpayer money in order to reduce the costs of exploitation and mining of the regions mineral and fossil fuel resources.

Table 3.2: Unpredicted Cost Increases For Northwest Transmission Line



Cost increase from $395M to $617M = 56% increase in the project cost over 1 year.

Cost increase from $617M to $979M = 59% increase in the project cost over 1 year.

Total unpredicted cost increase of 147% over a two-year period.

Source: Ministry of Energy, Mines and Natural Gas; B.C. Government 2015

Thirdly, the construction of such a project would be vigorously opposed by the Haida First Nations due to potential violations of treaties and threats to Aboriginal land. In particular, the Strategic Land Use Agreement (SLUA). This was signed between the indigenous people of Haida Gwaii and the province of British Columbia, which outline ecosystem preservation and maintenance[47]. For example, the NWTL affected nine first nations groups in terms of its carbon footprint[48]

Snapshot: Strategic Land Use Agreement

- The use of interim and permanent protection measures.
- Analysis, testing, verification and establishment of land use objectives.
- Establishment of appropriate management structures to oversee implementation of EBM in Haida Gwaii.

[47] GVC, "Haida Gwaii/Queen Charlotte Islands Land Use Planning Process." (2003). https://www.for.gov.bc.ca/tasb/slrp/lrmp/nanaimo/haidagwaii/docs/HGQCI_Background_Report.pdf

[48] Dogwood Initiative, "Citizens Guide to Effective Engagement on the Northwest Transmission Line." (2009). https://dogwoodinitiative.org/publications/reports/NTLguide.pdf/view

Solar Energy

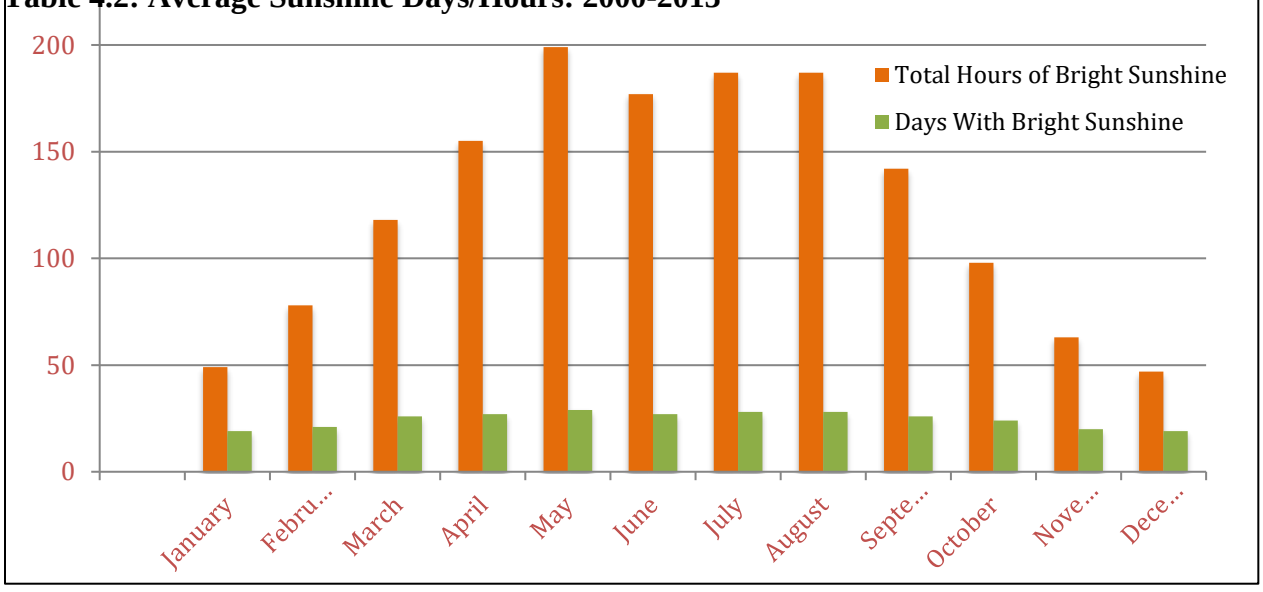
The third viable alternative to diesel generation in Haida Gwaii is solar energy. This source uses solar radiation from sunlight that is captured and stored in batteries to be used for heat, electricity, etc.[49] Areas is which solar panels have been implemented have shown variable rates of economic success. Solar energy would be a renewable energy source to consider for Haida Gwaii due to its never-ending fuel supply – being the sun. In economic terms the costs of maintenance is rather low making it somewhat attractive[50]. One of the key proponents of solar energy is that there is no plant or refinery needed making the system of energy generation silent as opposed to the loud nuisance caused by diesel generators[51].

Solar Energy Source	Cost/MWh
Solar PV Electricity	$500-$1700/MWh
Household Size Solar PV System	$20,000-$30,000
Household Size Solar Hot Water System	$5000-$10,000

Source: Strategic Analysis of Renewable Energy Options for Haida Gwaii

----------NOTE----------
Start-up costs will exceed potential benefits for the Haida Gwaii region. Dependency on low income will not be able to sustain these costs. Payoff will be over long period, if any.

Table 4.2: Average Sunshine Days/Hours: 2000-2013



Source: Ministry of Energy, Mines and Natural Gas; B.C. Government 2015

Table: 4.1: Associated Costs of Solar Energy Production

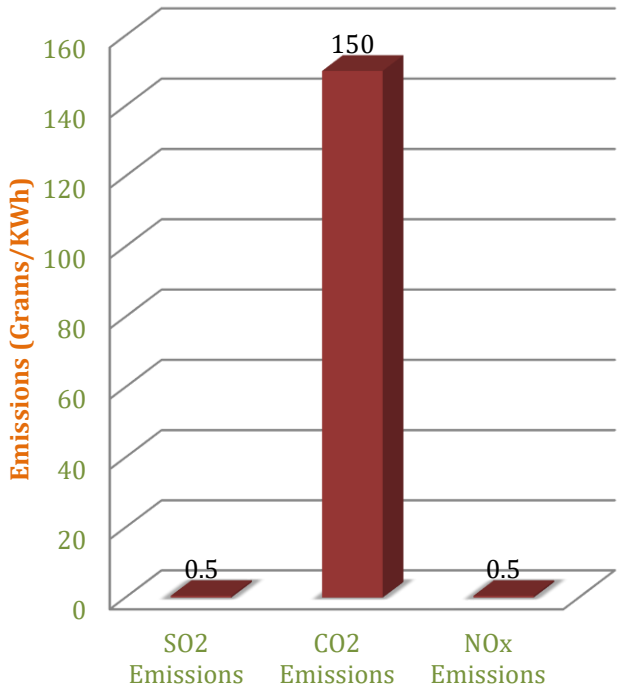
[49] NRC, *Fact book.*

[50] Ibid.

[51] Molinski, *Haida Gwaii.*

Although solar energy may be a viable alternative, it is more so in the urban setting. Such implementations would be somewhat offsetting for a region like Haida Gwaii. This is due to the significant start up investments ranging from $1 billion to $2 billion annually[52], which means that initial costs are significantly higher than the overall payback rate and revenue return. Furthermore the average daily solar radiation in Northern B.C. is among the lowest in British Columbia making the solar system extremely intermittent in low-sunlight seasons[53]. Comparable to bioenergy and grid integration, there is not enough income in Haida Gwaii to support or sufficiently maintain this energy source. This is because start-up costs are extremely high due to the relatively recent introduction of solar technology [54] . Furthermore, among its competitors, solar energy is one of the highest in GHG emissions. The costs for these household units cannot be justified by the fact that solar energy generation will only offer 240-300 jobs including both construction and operation[55].

Table 4.3: Solar Energy GHG Emissions



Source: Adapted from Power Generation Canada, 2003-2014

GRANTING AN EPA FOR NWP

In 2008, BC Hydro released a report by Garrad Hassan that provided an independent assessment of the wind energy potential and the estimated costs of wind energy generation in British Columbia. The report focused on four regions in the Province that were seen to have the best wind energy potential[56]. The findings indicate that the North Coast of British Columbia offers some of the best potential for wind energy in the province. Observation sites used in the Hassan Report included large offshore areas in the Hecate Straight [57]. The report estimated that offshore sites along the Hecate Strait would receive a mean annual wind speed between 9.0 m/s and

[52] Molinski, *Haida Gwaii*.

[53] Ministry of Energy Mining and Natural Gas, "Service Plan." (2013-2016). http://www.bcbudget.gov.bc.ca/2013/sp/pdf/ministry/emng.pdf

[54] MEMNG, *Service Plan*.

[55] Molinski, *Haida Gwaii*.

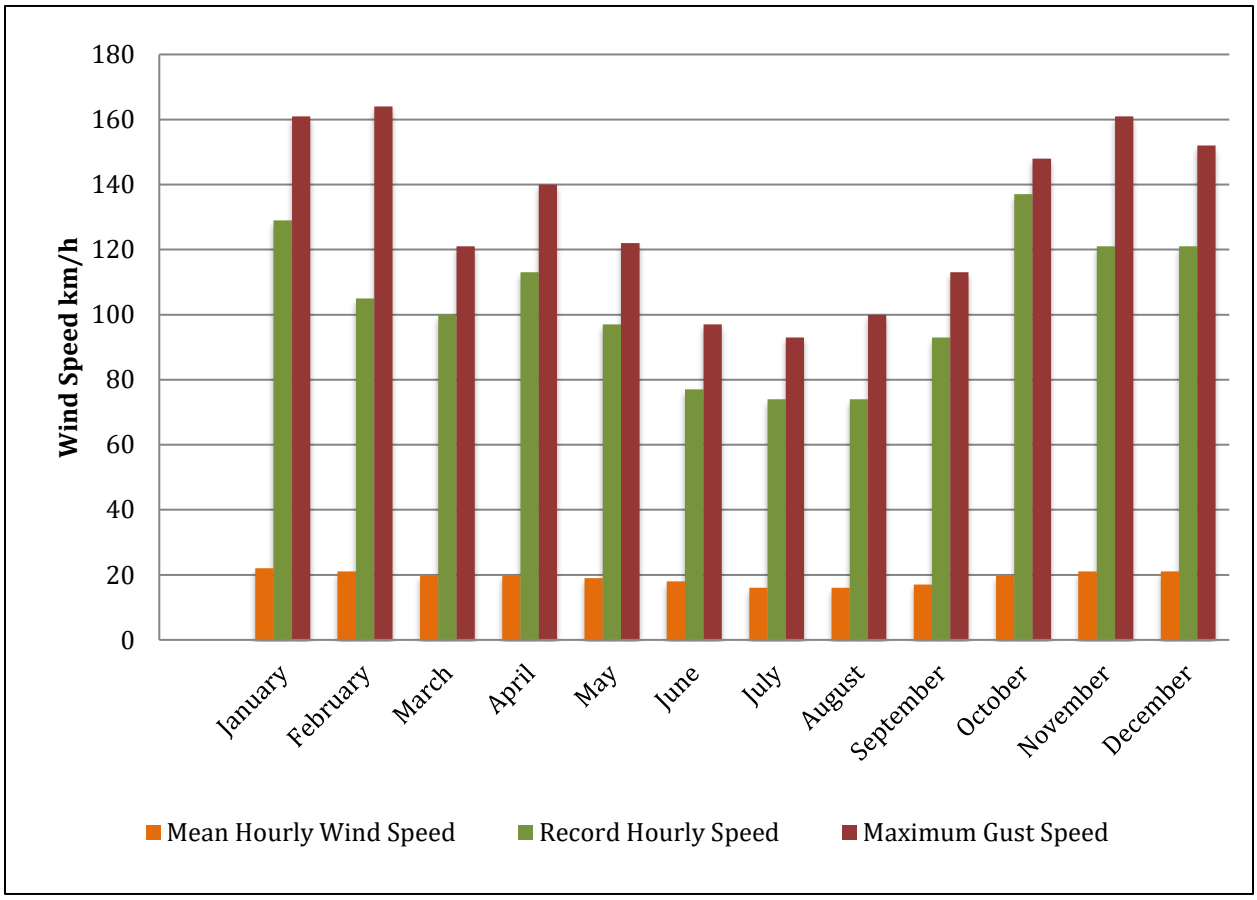
[56] Ibid.

[57] Ibid.

10.0 m/s at an estimated hub height of 70 m[58]. Offshore wind tends to be more constant and predictable, and offshore turbines are larger and more efficient, with capacity factors up to 20% higher than the same turbines on land[59].

The NaiKun Wind project (NWP) is at an advanced stage of development with environmental approvals from the Provincial and Federal Governments and agreements in place with key suppliers. Given its development status, construction can begin within two years of securing an electricity purchasing agreement with B.C. Hydro. Once implemented the NWP has the potential to rid HG of of its dependency on diesel generation for decades to come. This section will conduct a comparative cost benefit analysis of the NWP to the status quo, solar energy, bioenergy and grid integration. ***Table 5.2*** provides a summary of the NWP and its competitors.

Table 5.1: Average Monthly Wind Speeds in the Hecate Strait: 1999-2012



Source: Adapted from Power Generation Canada, 2003-2014

[58] Molinski, *Haida Gwaii*.

[59] NRC, *Fact book*.

Energy Source	Criteria			
	Startup Costs/ Energy Costs	**Local Employment**	**GHG Emission/ Env'tal Impact**	**Is there available technology?**
Diesel Generators (Status Quo)	Consumes 8 million liters of fuel at $0.45/liter – yearly costs of $3-$4M. (Only 1 site). Residents pay $0.17-$0.23/kWh.	Offers no local jobs.	Emits 730 g/kWh of CO2, 2.25 g/kWh of SO2, and 12.5 g/kWh of NOx.	Ready but no cost effective or ecofriendly method exists.
NaiKun Wind Energy Project	Startup cost $1600M. Offshore energy in US & Asia costs $0.20-0.25/kWh.	Construction employment of 2500 & operating employment of 50.	Emits 10 g/kWh of CO2, 0.2 g/kWh of SO2, and 0.2 g/kWh of NOx.	Project is in advanced stage. Technology is ready.
Solar Energy	EcoEnergy for Renewable Heat startup costs $400,000. Operating costs $500-$10,00/MWh depend on type.	Construction employment of 190 & operating employment of 0-20.	Emits 150 g/kWh of CO2, 0.5 g/kWh of SO2, and 0.5 g/kWh of NOx.	Technology is fairly new but available.
Bioenergy (Woodchips)	Mackenzie Green Biofuels startup costs $22M. Operating costs from $60/MWh-$180/MWh	Construction employment of 260 & operating employment of 26.	Emits 50 g/kWh of CO2, 0.2 g/kWh of SO2, and 2.5 g/kWh of NOx.	Technology is mature but costly.

Table 5.2: Comparison of Potential Renewable Energy Sources For Haida Gwaii

Grid Integration	NWTL startup cost was $979M + other funding.	Direct and indirect employment of 200-480.	Threat to Aboriginal land. Clear cut - machinery emissions	Technology is available – recent NWTL to Bob Quinn substation.

NaiKun Wind Project will produce many jobs that will not only boost Haida Gwaiian economy but also increase potential for investment and reduce income disparities.

The NWP is destined to create 2550 employment opportunities in Haida Gwaii alone, for the construction and operation phases combined. Essentially it has the ability to employ 53% of the entire population – consisting of 4800 [60]. This increase in the employment sector has the ability to offset the income disparities that are currently being experienced by residents of Haida Gwaii. Not only between Haida aboriginals and non-aboriginals but also between Haida Gwaiian's and Southern residents. Currently the Haida earn a median income of $13,525 whereas non-aboriginals in Haida Gwaii earn $22,431[61]. A assessment of job creation is presented in ***Table 5.3***.

Table 5.3: Energy Source Employment Creation

Energy Generator	Employment	
	Construction	Operation
NaiKun Wind Group	2500	50
Mackenzie Green BioFuels	260	26
EcoEnergy For Renewable Heat (Solar)	190	0-20
Masset Diesel Generators	23	0

Sc
H

The NWP has a large generation capacity, which can ultimately rid Haida Gwaii of all dependency on diesel generation.

The NaiKun offshore wind farm has the capacity to generate 396MW, which in turn has the ability to provide power to approximately 200,000 homes as oppose to the current diesel generation capacity of 12.54MW powering only 2979 homes. NWP will produce nearly 7-10 times as much energy as its competitors. This project also has the expansive capability of growing in the future if conditions require. With an abundance of excess electricity, NaiKun has the potential to sell unused power to other nearby regions such as Prince Rupert and Skeena[62].

Table 5.4: Energy Source Capacity and Supply Potential

Energy Generator	Capacity	Supply (Homes)
NaiKun Wind Group	396 MW	130,000-200,000
Mackenzie Green BioFuels	59 MW	30,000
EcoEnergy For Renewable Hear (Solar)	75kW	1-3
Masset Diesel Generators	12.5MW	2979

Source: Strategic Analysis of Renewable Energy Options for Haida Gwaii

[60] Sean Markey, "Economic Development on Haida Gwaii: Ounces, not Pounds." (2012). Action Canada.

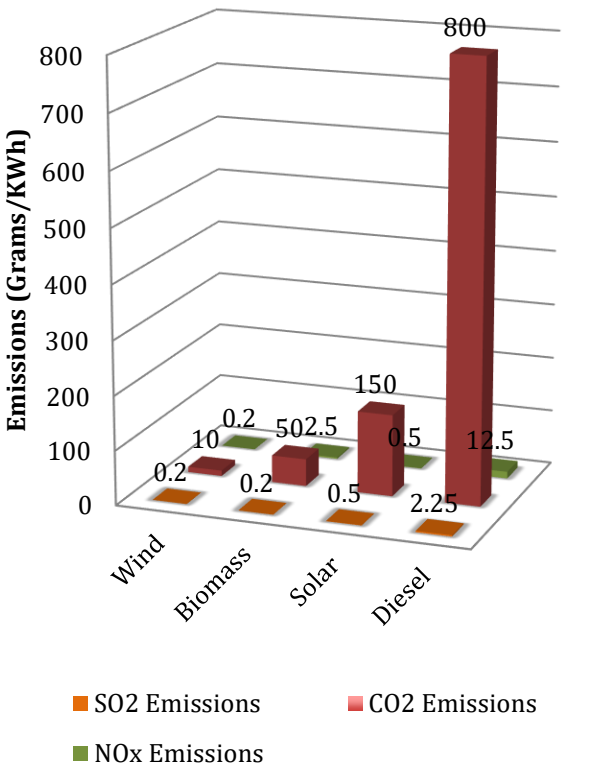
[61] Ibid.

[62] NaiKun Wind Group, "HaidaLink Backgrounder." Last modified May 10th, 2007. http://www.turtleisland.org/news/haidalink.pdf.

Wind Energy is among the cleanest renewable energy sources. NWP will produce close to no GHG's and its implementation also eliminates other GHG producers. Apart from emissions the NWP will also have no environmental impacts.

Table 5.5: Renewable Source GHG Emissions

In March 2011 NaiKun received a Federal screening decision from the Canadian Environmental Assessment Agency (CEAA). The decision concluded the harmonized environmental assessment review process and confirmed that the NWP, which could be Canada's first offshore wind energy project, can be constructed with no significant environmental, social or health effects. Along with this, the 110 3.6MW wind turbines that have been proposed by NaiKun Wind Group will have no GHG emission either. The only emissions that will be produced will be during the construction of the wind farm – caused by machinery and other equipment involved[63]. Assessments conducted by NWG, B.C. Hydro and the federal government have shown that the project will have the ability to displace 476,000 tonnes of GHG's in its entirety, of which 26,000 will be a direct result eliminating diesel generators in Haida Gwaii[64].



Source: Adapted from Power Generation Canada, 2003-2014

Wind energy is extremely cheap at the moment. The fuel source – being wind – will never run short. Especially for an offshore wind farm where wind speeds are nearly double those on land. As a result wind energy from the NWP will be very affordable for Haida Gwaiian residents.

Table 5.6: Energy Prices

Energy Generator	Price
Wind Energy	$0.03/KWh
Bioenergy	$60-$180/MWh
Solar Energy	$500-$1700/MWh
Diesel Generator	$0.17-$0.21/KWh

Source: Strategic Analysis of Renewable Energy Options f

Estimations in North America have shown that wind energy is currently selling for $0.25/MWh and $0.03/KWh. These projections prove that wind energy is a mature technology and extremely reliable. This will also cater to the levels of income disparities that are present in Haida Gwaii. The benefit here is that wind energy prices do not fluctuate as opposed to diesel fuel[65].

[63] NWG, *Haida Link*.

[64] NRC, *Fact book*.

[65] NRC, *Fact book*.

CONCERNS WITH THE NWP

There have been several concerns and criticisms presented regarding the project. The Haida First Nations and other contenders of renewable energy generation are central to the proposal of these issues. This section provides a number of issues that have been illustrated along with the response of NWG in terms of its mitigation or solution.

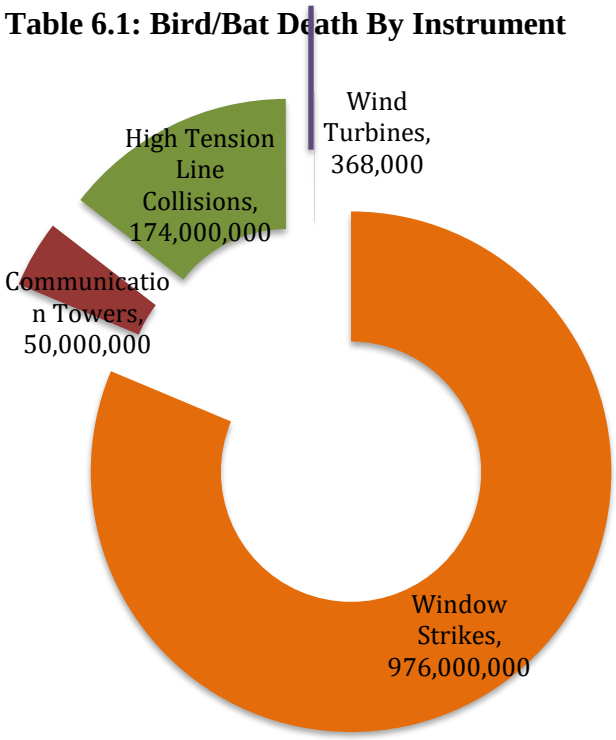
Concern # 1: *Birds and Bats*

The first and most important issue addressed by the Haida First Nations is a concern about potential harms to wildlife habitats. They claim that the wind turbines that will be constructed on the Hecate Strait will affect bird and bat habitats and migration routes[66]. In essence, they claim that these 80-meter wind turbines over the seabed will be a fatal obstacle.

Response # 1: *Long-term strategy*

NWP acknowledges that wildlife preservation is a reasonable and important concern. However, the NaiKun Wind Project would displace and rid the emissions that are currently being spilled into the atmosphere. More specifically the NWP would spare the environment from 476,000 tonnes of GHG's yearly[67]. In other words, the amount of GHG emissions that NWP will reduce will positively impact climate change and other environmental concerns – saving thousands of birds and bats species in the long run. That being said, statistics show that an estimate of 214,000-368,000 birds die from wind turbines annually in North America compared to the 6.8 million that die from a collision with a non-moving cell tower[68]. This shows that although wind turbines are associated with bird and bat deaths, they are not merely as dangerous as other obstacles. In addition NaiKun Wind Group is currently undergoing several seabird and crab migration studies in order to formulate their '101 Environmental Commitments'[69].

Table 6.1: Bird/Bat Death By Instrument



Source: Adapted from U.S. News and World Report, 2013

[66] CHN, *Energy Issue*.

[67] NaiKun Wind Group, "Managers Discussion and Analysis." (2015). http://naikun.ca/wp-content/uploads/2015/03/NKW-Q12015-MDA.pdf.

[68] Markley, *Ounces not Pounds*.

[69] NWG, *Discussion and Analysis*.

Concern # 2: *Expensive / 2008 CPC*

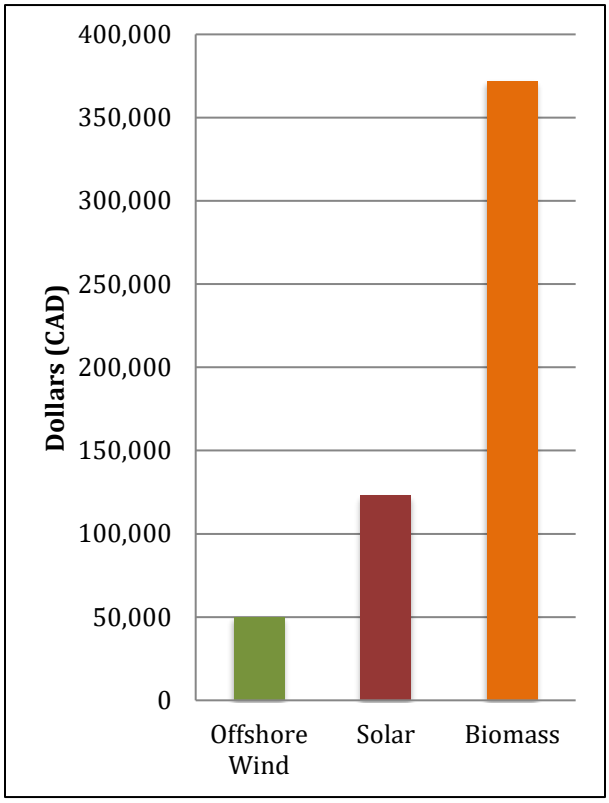
The NWP had been dropped for consideration by B.C. Hydro from the 2008 Clean Power Call and has been opposed by many residents of Haida Gwaii. B.C. Hydro claims that the NWP is far too expensive for the clean energy call and furthermore, for B.C. Hydro investment. Primarily the main concern here is the startup costs associated with the NWP, which is estimated at $1.6B[70].

Response # 2: *Long-term strategy*

However, there are many renewable energy projects that B.C. Hydro has accepted in the past which have associated themselves with similar costs. One major example is the Site C dam which has an estimated cost of $8.8B. In the 2008 Clean Power Call that was initiated by B.C. Hydro, 27 projects were chosen which include 19 run-of-river projects, six wind projects, one storage hydro project and one waste heat project. The projects represent capital spending of more than $3.8 billion[71]. Furthermore, the NWP will be able to meet future demands for decades as oppose to the potential energy generation provided by other alternatives.

Although the NWP does in fact have a steep startup cost, it is somewhat countered by the fact that the project will produce a large number of jobs, cheap and clean energy, GHG reductions and low maintenance costs. Wind farms generally have low energy costs that differ drastically from their initial start up cost. Maintenance costs for the NaiKun Wind Farm is estimated to be at approximately $50,000 annually as oppose to the high maintenance and operation costs of the proposed alternatives[72] (shown in ***Table 6.2***).

Table 6.2: Maintenance Costs of Energy Source



Source: Adapted International Renewable Energy Agency, 2012

Snapshot: Economic Prospects

NWP will contribute $400M of project expenditures to BC during construction, including $250M in the BC North Coast region.

Furthermore, $40M will be contributed annually to provincial GDP over the life of the project.

[70] NWG, *Discussion and Analysis*.

[71] B.C. Hydro, "Standard Form Electricity Purchase Agreement." https://www.bchydro.com/content/dam/hydro/medialib/internet/documents/info/pdf/info_open_eft_large_project_epa_clean.pdf.

[72] NRC, *Fact book*.

In response to the NWP being dropped in consideration of the B.C. Hydro CPC, NWP had undergone an extensive study to address changes and other alternations that have occurred in the time being since 2008. The cost per megawatt and the energy production of offshore wind have significantly improved since the 2008 Clean Power Call. Turbines are larger, less expensive, technologically advanced and more productive. Foundation design and supply is more efficient with construction rates nearly double those of 2008 and 2009. Furthermore, interest rates have dropped considerably over this same period[73]. With the reduced capital and operating costs, improved energy production from the new turbines, and with the substantial energy demand forecast in the region, the NWP is in a much better position than it was previously to meet the electricity demand in the Haida Gwaii.

Concern # 3: *Intermittency*

Another major criticism associated with wind energy has been its tendency to be quite intermittent when it comes to low-wind seasons. The issue presented by the people of Haida Gwaii is surrounding the fact that they are already experiencing mass power outages each year and if wind will do the same thing – it will basically be a 'cycle'[74].

Response # 3: *Large scale project*

The NWF will be B.C.'s first offshore wind farm which will host 110 wind turbines at a height of 80 meters each. The 110 turbines together have an energy generating capacity of 396MW[75]. This being said, the amount of energy produced at a safe functioning level without overload will be able to provide electricity to an estimated 130,000-200,000 homes[76]. Haida Gwaii itself has a population of 4800 with statistics showing no incentive to increase. Instead, Census Canada reported a continuous and steady drop in population size since the 1960's[77]. In ***Table 5.1*** we see that wind speeds reduce for 2 months in the year (June and July). However the median hourly wind speed remains relatively constant throughout the year. Although intermittency is an acknowledged issue for wind energy, this criticism is mostly streamed towards smaller scale farms, while the NWP is a relatively large-scale project[78]. Along with wind energy's partial intermittency, the NWP has the potential to meet increasing future demands in Haida Gwaii for several years to come, as opposed to the depleting resources involved in producing diesel fuel.

[73] NWG, *Discussion and Analysis*.

[74] CHN, *Energy Issue*.

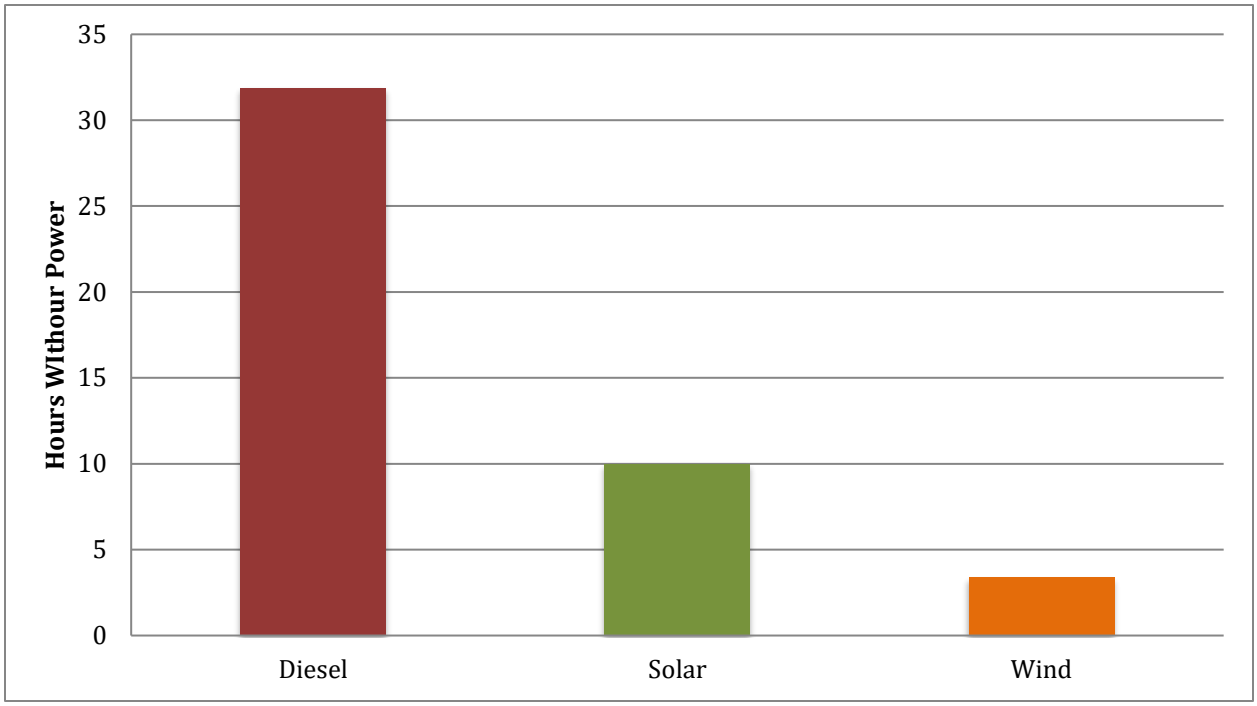
[75] NWG, *HaidaLink Backgrounder*.

[76] Ibid.

[77] BCStats, *Canadian Census*.

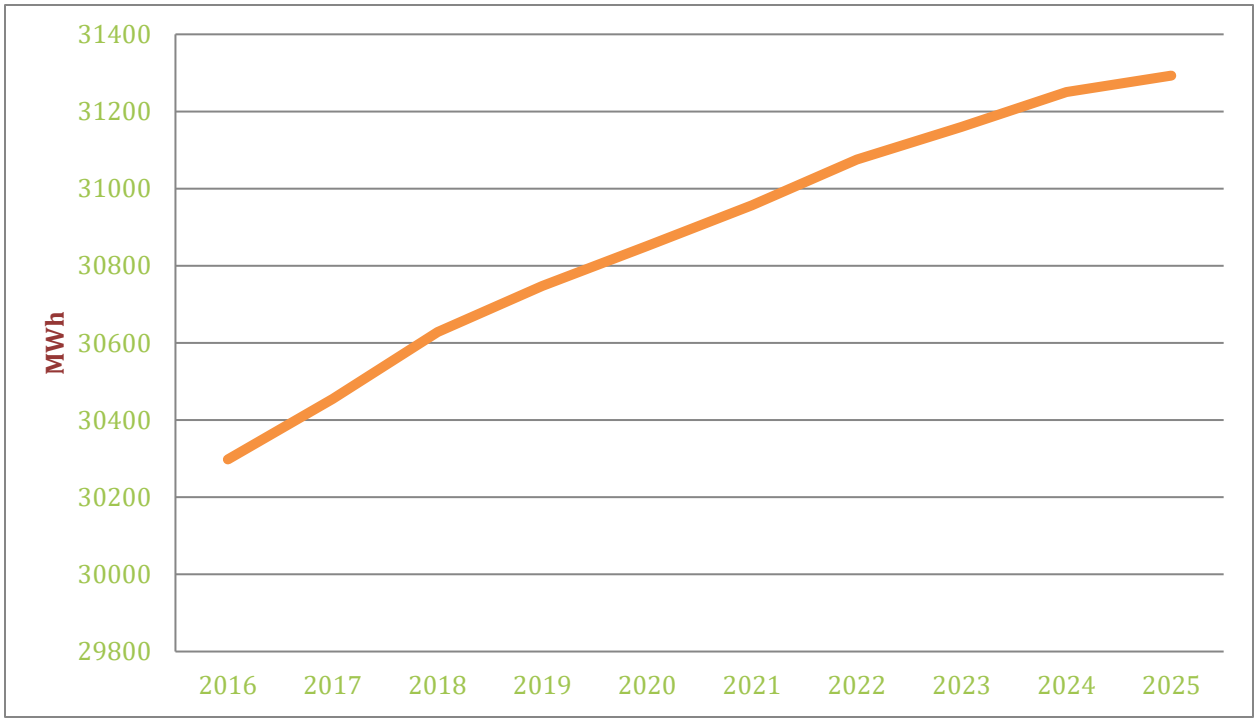
[78] QC Climate Plan, "Executive Summary." *Sustainable Solutions Group*. https://sites.google.com/a/sustainabilitysolutions.ca/village-of-queen-charlotte/.

Table 6.3: Average Annual Hours Without Power



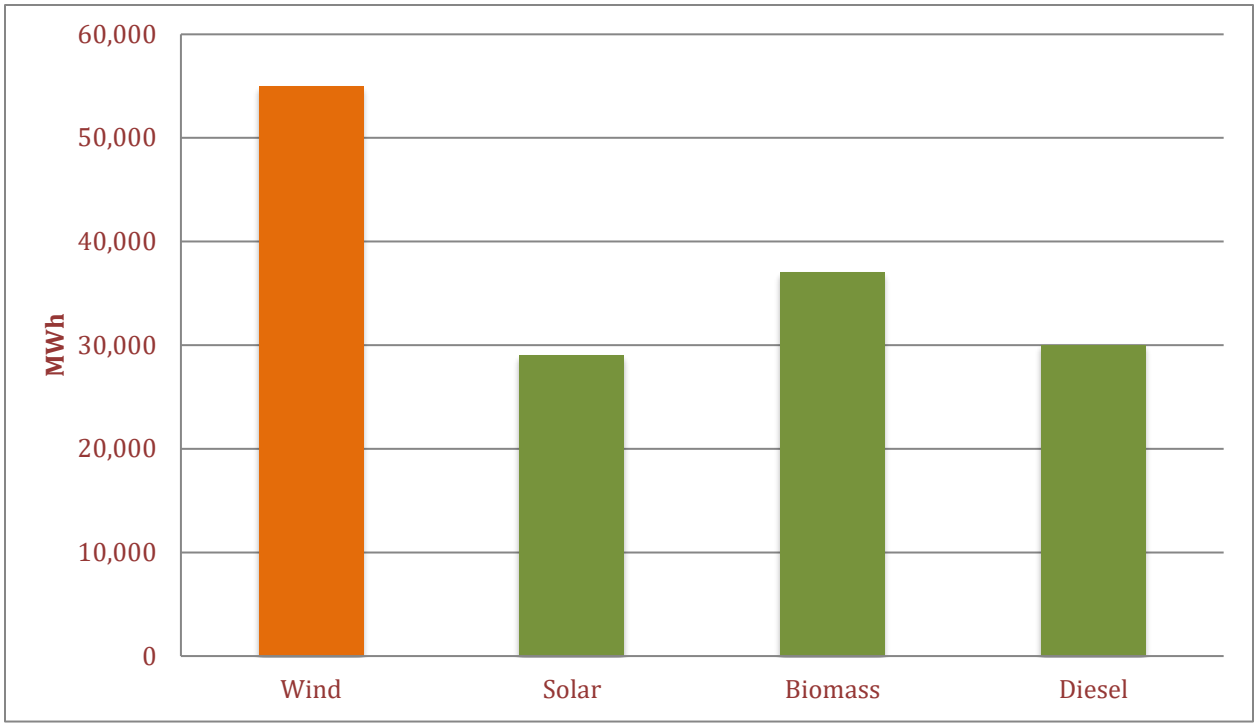
Source: Adapted from assessment by B.C. Hydro for Vancouver Sun, 2015.

Table 6.4: Future Projected Energy Demands For Haida Gwaii



Source: Adapted BC Hydro Haida Gwaii RFEOI – Technical Information

Table 6.5: Future Projected Renewable Energy Production/Supply 2017-2025



Source: Adapted BC Hydro Haida Gwaii RFEOI – Technical Information

CONCLUSIONS

Accoring to the facts, studies, and research presented in this brief it becomes clear that the NaiKun Wind Project is the most viable alternative renewable energy source for Haida Gwaii. In an assessment comparing wind energy to solar energy, biomass and grid integration, the results show that in terms of payoff, affordability, generation capacity and environmental impacts – wind trumps its competitors[79].

This project has the ability to bring more than just clean energy to Haida Gwaiian's. It will also assist in income disparities by providng employment and affordable energy prices, it will clear the environment of present GHG's that are being emitted by diesel generators, and it will solve the century-long issue of power-outages.

Currently the decision lays in the hands of the Council of the Haida Nation (CHN). The NaiKun Wind Group has undergone several consultative meetings with the Haida First Nations group regarding how the project should be planned out, with regard to fishing groups, community groups and other vital sectors. In 2007 the NWG consulted several stakeholders in Haida Gwaii in order to advance its project into the potential development stage. These

[79] NRC, *Fact book.*

stakeholders included: the Village of Port Clements, Area A

Crab Fisherman's Association, Tow Hill Road Advisory Committee, Old Masset Village Council, Village of Queen Charlotte and Village of Masset[80]. In the majority of these meetings, these First Nations groups claimed to be somewhat aware of the project and its details. Common issue arose regarding disruption to bird, fish and crab routes as well as universal distrust of large corporations exploiting small and dependent regions[81].

However the key stakeholder in this entire negotiation (on behalf of Haida Gwaii only) regarding the implementation of an offshore wind farm in the Hecate Strait is the Council of the Haida Nation[82]. The NaiKun Generating Company (GenCo) will be the one to hold the EPA with B.C. Hydro. This division will also be responsible for holding a services agreement with the Haida NaiKun Wind Operating Limited Partnership (HNLP). HNLP will be a 50/50 partnership between the Haida Nation and NaiKun and be responsible for services contacts, negotiating with suppliers, and the development of recruitment and training plans[83]. With a 50% stake in HNLP the Haida Nation will receive approximately $2,750,000 a year in revenue along with the cash spin-offs to the North Coast economy. Approximately $4-million a year will be spent in North Coast communities on operating expenses and it is calculated that another $4-million will result from indirect employment and contract income[84]. With this agreement in place, B.C. Hydro will grant NWG with an EPA[85].

The fact that Haida Gwaii's population is composed of 55% Haida First Nations goes to show that the instances of income disparities, living conditions, employment availability and traditional values among this group is a key decision maker in this renewable energy conquest. Political factors have shown to be a major stumbling block for any renewable energy source that has potential to serve as a viable alternative to diesel generators. When looking at the costs associated with bioenergy, solar energy and grid integration it is more than clear that current economic conditions in Haida Gwaii would not be able to sustain them. Whereas the NWG offers an independent company ridding the province of cost commitments, low energy prices and the ability to expand and grow as future demands persist.

One of the key benefits here is that the NaiKun Wind Project will offer the Council of the Haida Nations a share of the company. This sets NWP apart from the other proposed alternatives – in that it is more than just a fix to diesel generators. Biomass will actually take money from the people in order to produce energy. Solar will be implemented on individual housing and therefore will have no economic benefit for the Haida people. Grid Integration will require increased taxation.

[80] Gary Holman, "Haida Gwaii/Queen Charlotte Islands Land Use Plan." (2011). https://www.for.gov.bc.ca/tasb/slrp/lrmp/nanaimo/haidagwaii/docs/SEA_Base_Case.pdf.

[81] Ibid.

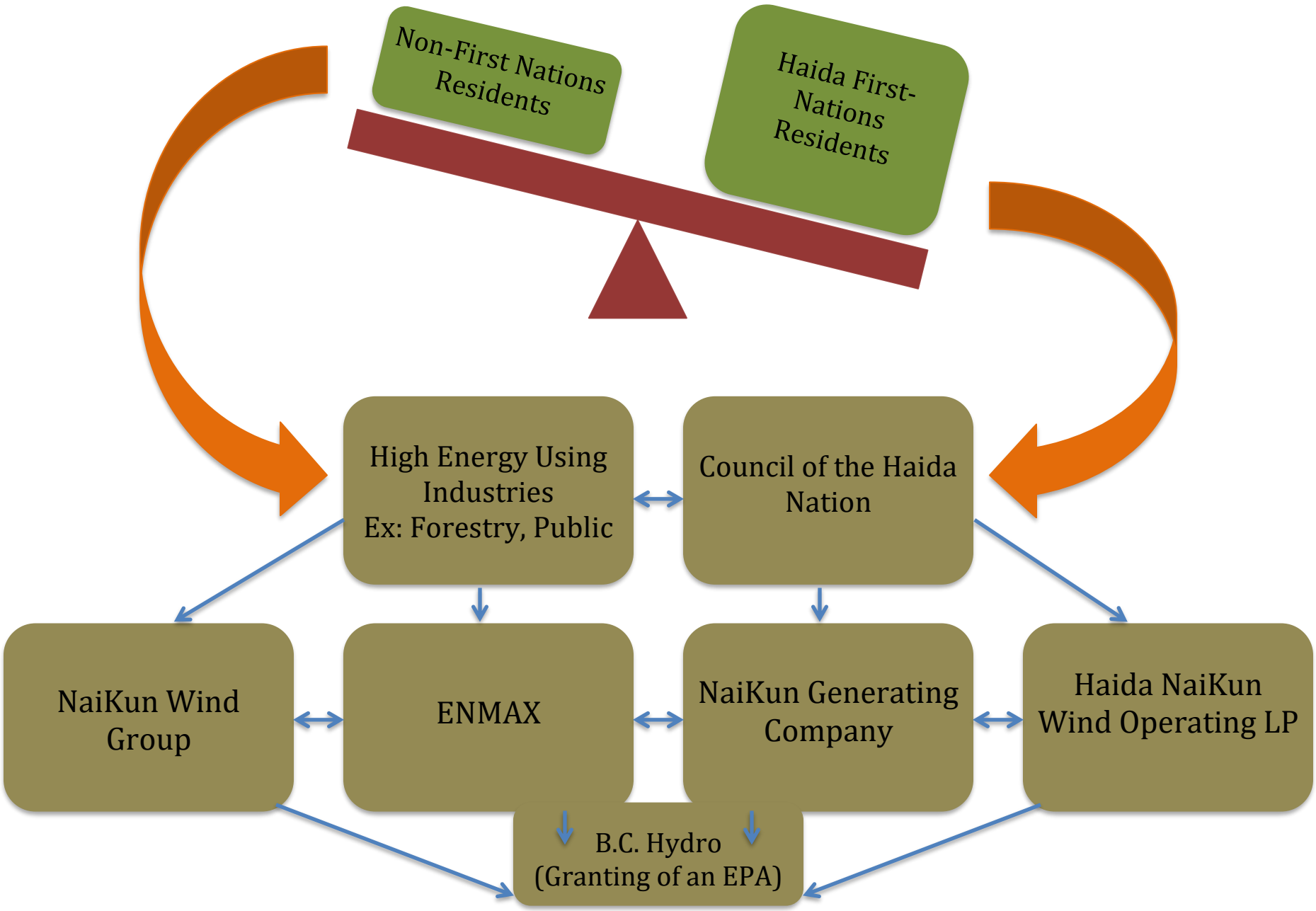
[82] CHN, *Energy Issue*.

[83] Ibid.

[84] CHN, *Energy Issue*.

[85] B.C. Hydro, *Electricity Purchasing Agreement*.

Table 7.1: Stakeholder Map



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