GITGA'AT FIRST NATION:

Community Energy & Emissions Plan 2025

Energy Supply and Management for Hartley Bay, British Columbia

Prepared for:
Gitk'a'ata and Gitga'at Leadership Council and Administration

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Clean Energy Lead

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ACKNOWLEDGEMENTS

The Clean Energy Department and Band Administration would like to acknowledge the years of service of Hermann Meuter as Climate Action Coordinator and thank him. Among other achievements Hermann was the heat pump coordinator managing installations, contractors, suppliers, shipping and storage, repairs, and funding applications. Hermann spearheaded the refrigerator and freezer replacement project and he also did some great drone videos for the Clean Energy Projects.

Note that there are interchanged spellings of Gitga'at and Gitk'a'at. We are transitioning to the latter spelling which phonetically is more accurate. These names refer to all members, collectively, as in the tribe. To refer to the people, but not the tribe, an 'a' is added to the end. For example, I am Gitk'a'ata, I belong to the Gitk'a'at First Nation.

The contributions of the following are also acknowledged and greatly appreciated:

- All Gitk'a'ata
- Gitga'at Chief and Council and the Leadership Council – Sm'ooygit Wahmodmx, Sm'ooygit Wii Hai Wass, Sm'ooygit Snaxeet, Chief Councillor Bruce Reece, Councillors Chantal Meggison, Simone Reece, Marven Robinson and Cameron Hill
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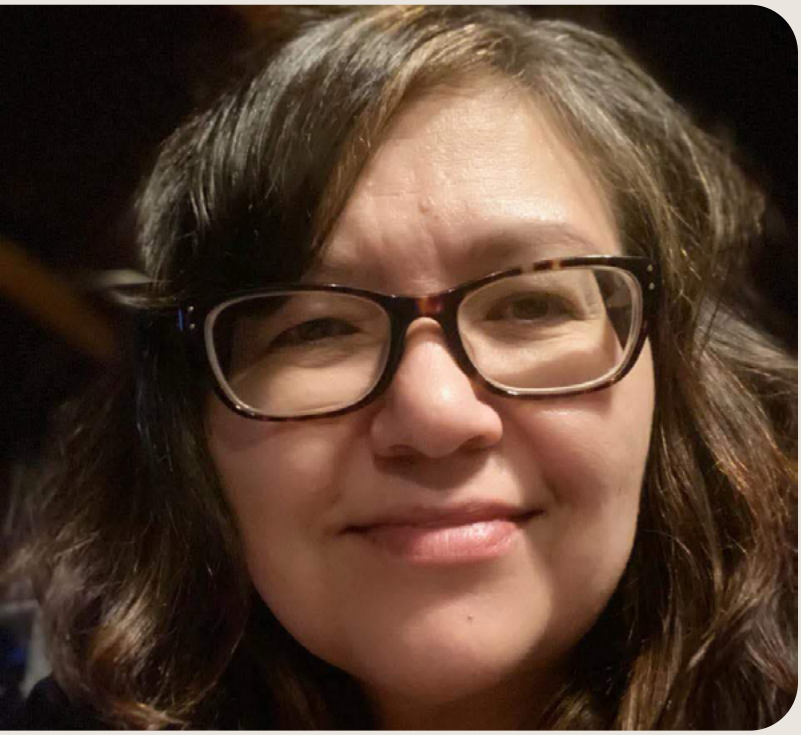
MESSAGE FROM ADMINISTRATION



Gitga'at has been trying to get off of diesel for electricity for Hartley Bay for decades. Finally, we are at the place where our dreams will come true. Our Gitga'at Power hydroelectric project is on track to generate clean, renewable energy in the next couple of years for 100 years or more. We have done a tremendous amount of Demand Side Management (DSM) work including installing heat pumps in every home and band building to reduce energy consumption and make homes more comfortable and healthier. Despite our occasional troubles with BC Hydro, they will help us realize our energy potential. Energy sovereignty is in sight.

All this work has been supported by so many people – "it takes a village" is so true. Leadership, Councils, elders, staff and consultants have all pulled together to put us on a good path. Our future is bright.

Thank you to all.

Teresa Robinson
Band Manager

GITGA'AT
First Nation

GLOSSARY AND TERMS

Canadian Dam Association (CDA):
An organization of professionals interested in dams and reservoirs, providing expertise in their construction.

Community Electricity Purchase Agreement (CEPA):
An agreement between a community (Hartley Bay) and a utility provider (BC Hydro) in which the utility provider agrees to purchase power from community-owned power generation sources.

Community Energy Diesel Reduction (CEDR):
Provincial program providing funding for clean-energy initiatives to eligible remote communities that are off-grid that rely on diesel fuel for electricity generation.

Community Energy and Emissions Plan:
A strategic document which outlines how a community plans to achieve its goal related to local energy security and emissions.

Demand Side Management (DSM):
A group of actions designed to manage a site's energy consumption by reducing the consumption of energy; therefore, the required supply. DSM may be accomplished through pricing, behavioural changes and equipment modifications like installing heat pumps.

Electricity Demand:
Measured in *watts (W)*, *kilowatts (kW)*, or *Megawatts (MW)*, represents the instantaneous rate at which electricity is being consumed.

Electricity Consumption:
Measured in *watt-hours (Wh)*, *kilowatt-hours (kWh)*, or *megawatt-hours (MWh)*, represents the amount of electricity that has been consumed over a certain time period. For example, a 60 W bulb that is on for 1 hour uses 60 Wh [60 W x 1 h = 6 Wh].

Greenhouse Gas (GHG):
A gas (or gasses) that contribute to the greenhouse effect, trapping heat in Earth's atmosphere.

Gitga'at First Nation (GFN):
The First Nation based out of the area of Hartley Bay.

Gitga'at Development Corporation (GDC):
An organization which create projects and businesses that deliver clear economic benefits, including meaningful employment to the community of Hartley Bay.

Gitga'at Oceans and Lands Department (GOLD):
The organization responsible for planning, coordinating, and managing activities related to the protection, stewardship, and sustainable use of the Nation's natural resources including lands and oceans.

Indigenous and Northern Affairs Canada (INAC):
A now dissolved department of the Government of Canada which was (in-part) responsible for policies relating to Indigenous peoples and those living in areas of northern Canada.

Gitga'at Power Project (GPP):
An ongoing project which will create a small-scale hydroelectric power generating station in the Gabion Watershed to provide clean energy to Hartley Bay.

Load Forecasting:
A prediction of future electrical loads. Load is the amount of energy the community needs for its operation. Load forecasting is used by power companies to anticipate the amount of power needed to meet demand and adjust their equipment to meet it.

Non-Integrated Area (NIA):
An area that is not connected to the broader BC provincial power grid.

Water Security Project (WSP):
An ongoing project which will create a reservoir on the Upper Gabion Lake to provide a more resilient water supply for the community of Hartley Bay.

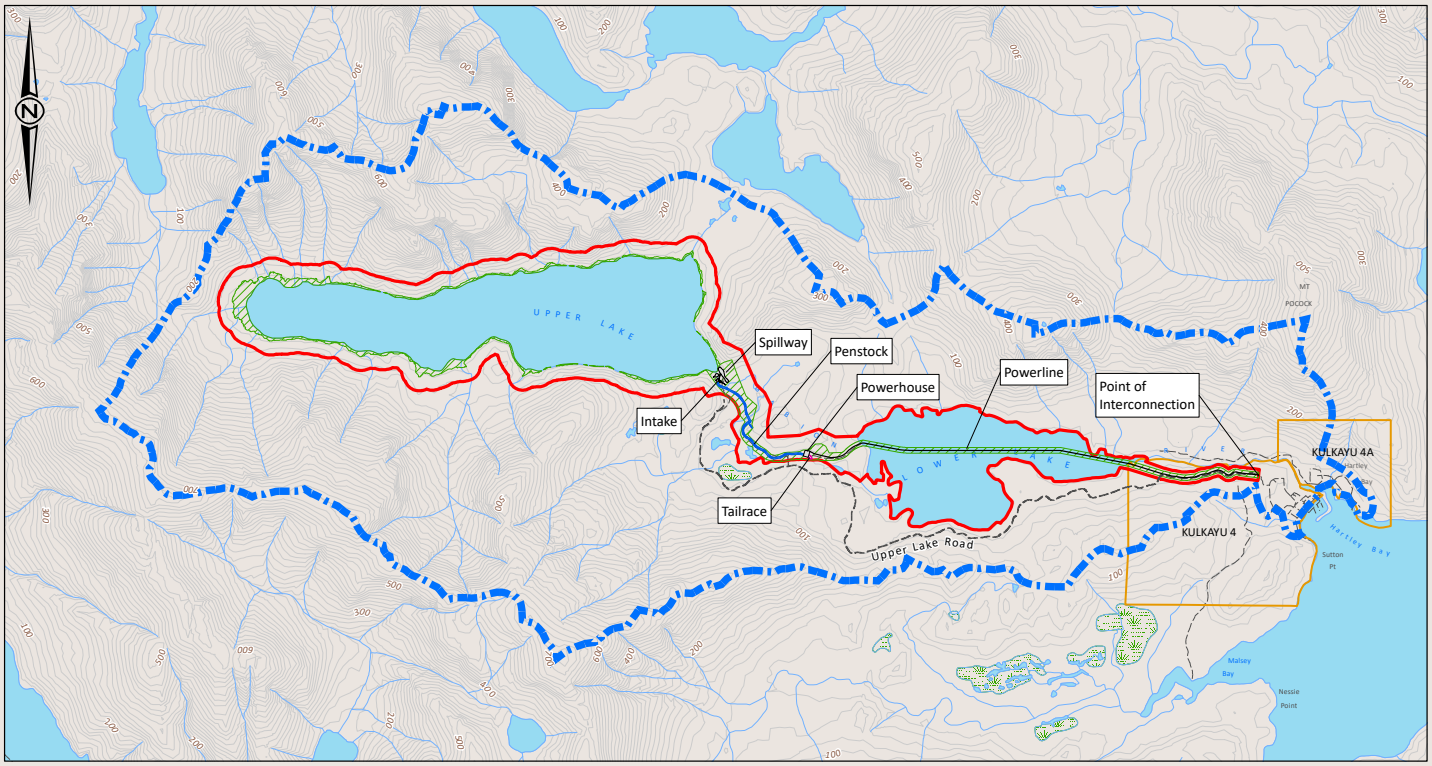
1. EXECUTIVE SUMMARY

Human-driven activities continue to alter the earth's climate, posing threats to peoples all over the world. This includes the Gitga'at'a, who have long recognized the need for bold and rapid action to mitigate and adapt to climate change. Thanks to this recognition, a great deal of work has already been accomplished by the Gitga'at First Nation (GFN) over the past several decades to improve the energy security and sustainability of the village of Hartley Bay. This plan highlights many of these achievements and lays out a roadmap to further the Nation's energy and emissions goals.

This plan also outlines the following goals:

- Support the Gitga'at First Nation to achieve their "Back to Green" vision with respect to energy generation in order to make Hartley Bay the greenest First Nations village in Canada
- Support the advancement of the Gitga'at Power Project to provide a reliable and clean source of electricity for Hartley Bay
- Continue to examine energy efficiency retrofit opportunities to support the availability of abundant, clean, and affordable energy
- Continue to involve the community in the planning process and provide routine updates as major project milestones are achieved
- Increase energy sovereignty by reducing the need for outside support to maintain and operate Hartley Bay's energy supply

Reaching these goals will take further efforts from Band officials, collaboration with senior levels of government, utility providers, and energy experts, and proactive participation by all community members. This document provides an action plan that addresses the roles of each of these groups. Decision-making guidelines, as determined through continued community engagement, are provided, as well as information on how the community is expected to grow and prosper over the coming decades.



Gitga'at Power Project
Watershed Overview Map

2. INTRODUCTION

2.1 CEEP DESCRIPTION AND PURPOSE

This Community Energy and Emissions Plan (CEEP) is a strategic document that addresses all aspects of the community's energy profile. It captures the current state of electricity demand, supply, and efforts to improve both. It outlines the community's strategy to reduce its greenhouse gas (GHG) emissions and improve energy efficiency. It identifies opportunities to switch to cleaner energy sources, reduce energy waste, and adopt sustainable practices.

Hartley Bay has prepared CEEPs three times in the past and is now updating its CEEP for 2025 and beyond. By updating its CEEP, Hartley Bay is also continuing to take proactive steps to address climate change and ensure a sustainable future for its community and the planet.

2.2 SCOPE

This CEEP covers the geographic area of the ancestral home of the Gitga'at First Nation – Kulkayu (Txalguix) – which is in the immediate area of the village given the colonial name Hartley Bay.

This CEEP is intended to articulate the electricity needs of Hartley Bay and the potential for alternative supply and energy efficiency.

The CEEP includes:

- A description of the historical electricity and fuel uses and issues in Hartley Bay.
- An estimation of the community's near-term electricity needs.
- An estimation of the community's long-term electricity needs.
- A detailed look at the Gitga'at Power Project hydroelectric opportunity.
- Nation and community support for the next steps in implementing clean energy solutions
- An initial examination of the potential for energy efficiency and conservation, as well as fuel switching potential.

The focus of this CEEP is on electricity, although other forms of energy are considered in the context of fuel-switching potential. Figures for transportation fuels are included as available.

2.3 METHODOLOGY

This CEEP was developed through a review of past work completed on energy consumption trends, GHG emissions, and the clean energy option chosen for Hartley Bay by Leadership and supported by Administration. Other information provided is derived directly from discussions with the community and its leaders. Whether included directly or indirectly, much of the information in this document was developed by other sources such as Elders, Band staff, BC Hydro, and consultants.

Community engagement is key to success in exploring, developing and operating clean energy projects. Not only is community support needed to install a clean energy solution, leadership, over the long haul, is necessary to continue to support plans. A summary of engagement to date is also provided in this plan.

2.4 BENEFITS OF COMMUNITY ENERGY AND EMISSIONS PLAN

A comprehensive CEEP can serve as a critical resource to inform the community of future energy projects, the work that has been completed on these projects already, and can serve as a resource to external stakeholders who will be involved in helping to deliver major energy projects. In addition, the CEEP serves as a way to ensure that the community's energy plans align with previously established goals.

2.5 CONNECTION TO PREVIOUS WORK

Since the development of the Hartley Bay CEEP 2019, there have been multiple changes to the status of major energy-related projects in the community. Notably, costing comparisons for long-term operating and maintenance costs have been completed for several potential energy projects. Additionally, critical infrastructure has been established or is in the process of being established for other non-energy related major works around the community. This includes an Upper Lake access road (completed 2024) and a weir on the upper Gabion Lake (planned 2025-2027). These two pieces of infrastructure significantly reduce the additional required investment for a hydroelectric project, which has been in planning stages since 2003.

This CEEP also builds on newly available information such as the Hartley Bay Community Electricity Load Forecast (2023), a Design Basis and Design Summary Report (2024) for the Water Security Project (WSP) and Gitga'at Power Project (GPP) Gitga'at First Nation Heat Pump Analysis (2024), and the Hartley Bay Security Projects – Water and Energy Project Charter (2024).

3. COMMUNITY CONTEXT

3.1 WHO WE ARE

Hartley Bay (Txalgiuw) is a First Nations community situated on the central coast of British Columbia. It is the home community of the Gitga'at (Gitk'a'at) First Nation (GFN), who have inhabited the region for millennia. The community is located at the mouth of Douglas Channel, approximately 630 kilometers north of Vancouver, 145 kilometers south of Prince Rupert, and 80 kilometers south-west of Kitimat. No roads connect Hartley Bay to the rest of the province and the community is accessible only by air or boat. As of 2024, the community had a population of approximately 150 fulltime residents and many more professionals and contractors. A number of members of the GFN also reside in larger urban areas, principally Prince Rupert.

Economic activities in Hartley Bay are many and varied and the community enjoys, essentially, full employment. Major drivers include community-focused services (village administration, public works, safety, social and health services, housing, and education) as well as tourism (adventure, heritage, cultural and nature-based), forestry, salmon enhancement and the Gitga'at Ocean's and Land's Department (GOLD) leading ecological research and territorial stewardship. In addition, the Gitk'a'ata continue to hunt and harvest wildlife, fish and traditional marine and plant resources from their territory; particularly important resources include salmon, halibut, clams, cockles, seaweed, berries and cedar.

The coastal temperate forests around Hartley Bay are comprised primarily of cedar and hemlock. Unique and sensitive ecosystems exist in the floodplains, estuaries, tidal marshes, spray zones, limestone and karst geologies, freshwater wetlands, kelp and eel grass beds and rock bluffs. Further inland, the Coast Mountains reach 3000 m with alpine ecosystems at the higher elevations.

Hartley Bay itself is located in a coastal climatic zone (CZ5)[1] and experiences mild year-round temperatures and heavy precipitation (one of BC's wettest areas with 4550 mm/year, which is about four times that received in Vancouver). High winds and fog, particularly in winter, often cause transportation delays to and from the community. The average temperatures are -2.2°C in January and 15.5°C in July.

3.2 COMMUNITY ENERGY HISTORY

Hartley Bay is considered a Non-Integrated Area (NIA) community, meaning that the community is not connected to the integrated provincial power grid. BC Hydro is the electricity service provider in Hartley Bay and is responsible for maintaining the diesel generation system (DGS), which has been the primary source of electricity generated in the community for decades. BC Hydro also maintains the transmission equipment required to distribute electricity throughout the community. The cost of supplying this electricity is relatively high - BC Hydro pays roughly 3 times what they receive in payments. The expensive nature of this system, its reliance on outside resources (i.e.: fuel and maintenance technicians), and its GHG emissions have been points of concern for years; therefore, Hartley Bay has long sought to transition to a better energy source.

In 2019, a Working Group established to assist Hartley Bay in transitioning to clean energy, recommended the creation of a Community Energy and Emissions Plan (CEEP 2019) for Hartley Bay. The CEEP 2019 summarized findings from engineering contractors who thoroughly examined all clean energy options in the vicinity of Hartley Bay. The top 3 ranking renewable options for Hartley Bay were solar photovoltaic, on-shore wind turbine – both in combination with battery storage, and small-scale hydroelectric. The CEEP 2019 recommended continued feasibility studies to select the best option.

A comparison of the total costs over forty years for the wind and solar solutions and a former Gabion hydroelectric project was conducted. This analysis indicated that the Gabion hydroelectric project is the least expensive option over the total project life, and provides the most secure source of energy. Council approved the development of the Gabion hydroelectric project and re-named the effort the Gitga'at Power Project. Efforts to secure funding for the project are underway, with over $20 million committed to developing infrastructure that will support Hartley Bay's transition to clean and secure energy.

Log onto gitgaatpower.com for information and updates on the Gitga'at Power Project.

[1] *https://www.betterhomesbc.ca/faqs/climate-zone/*

3.3 COMMUNITY ENERGY VISION AND GOALS

GFN has established a "Back to Green" vision to become the:

"Greenest First Nation Village in Canada."

Under that vision, the Nation aims to "relegate our diesel generating station to a back-up 'security' system," while producing "abundant" energy from alternative methods. Expansion of renewable energy generation as the main source of electricity for Hartley Bay is also aligned with:

- Federal Emissions Targets
- Provincial Emissions Targets
- BC Hydro Emissions Targets
- First Nations Strategy and Emissions Plan
- BC First Nations Climate Strategy and Action Plan

It is important to the Gitga'at First Nation to find renewable alternatives to the diesel generators that have historically provided electricity to Hartley Bay. Other initiatives, like home retrofits and energy efficient new-builds will support the availability of abundant, clean, and affordable energy, enabling growth and prosperity.

The first GFN Community Energy Plan (2003) laid out overarching principles for future energy supplies. These principles drive more specific goals that will be used to evaluate the suitability of future energy projects.

Figure 1 – A spirit bear on the hunt for salmon in Gitk'a'at Terriorty

PRINCIPLE	ENERGY PROJECT GOALS
Minimize environmental impacts of energy	Minimize impacts on fish, particularly those associated with the fish hatchery in the lower reaches of the Gabion River Minimization of the emissions of greenhouse gases and therefore a positive contribution toward a worldwide effort to prevent further changes in climate Minimize local air emissions that could have an impact on community members' health
Minimize the cost of energy	Minimize operation and maintenance costs
Maximize local employment creation	Deliver support for economic development interests of the community such as further facility development, housing development; potential large cold storage area, specialty-cutting mill, and/or drying kilns to prepare wood for cultural uses, construction or market Create good paying jobs (both part time, project specific and long-term)
Maximize renewable energy content and self-reliance	Provide a reliable supply of electricity and heating and sufficient redundancy to ensure that equipment failures do not result in long-term energy outages`
Maximize local ownership and management of the energy system, entrepreneurial opportunities	Through local ownership of the clean generating infrastructure, increase expenditures kept within the community to the greatest extent possible – construction accommodation services being a significant opportunity, potential tourism increases

4. COMMUNITY ENERGY USAGE

In Hartley Bay, energy is used to power homes, fuel vehicles, and run critical community services, like potable water and wastewater treatment. Ground transportation methods in the core community are uniquely distributed due to the existence of a boardwalk network in place of roads. Transportation methods most commonly include foot, bicycle, mobility scooters, quad ATVs, and electric utility vehicles with a small additional portion of emergency vehicles, motorcycles, and some small vans, trucks and cars. Diesel and gasoline are also used to power marine vessels.

Electricity represents the single largest source of energy consumption, and the vast majority of electricity usage (94%) comes from buildings. There are approximately 70 residential homes and multiple large commercial or community buildings in Hartley Bay. In the years since the previous CEEP, new homes have been built, many have been renovated, and new homes are being constructed. A number of new community buildings have also been constructed, including the daycare, firehalls, Coast Guard station, and Emergency Response and Research Facility (MERRF) (construction completion due 2025). This section presents analysis of the existing electrical supply, demand from all of these structures and the projected demands from future expansion.

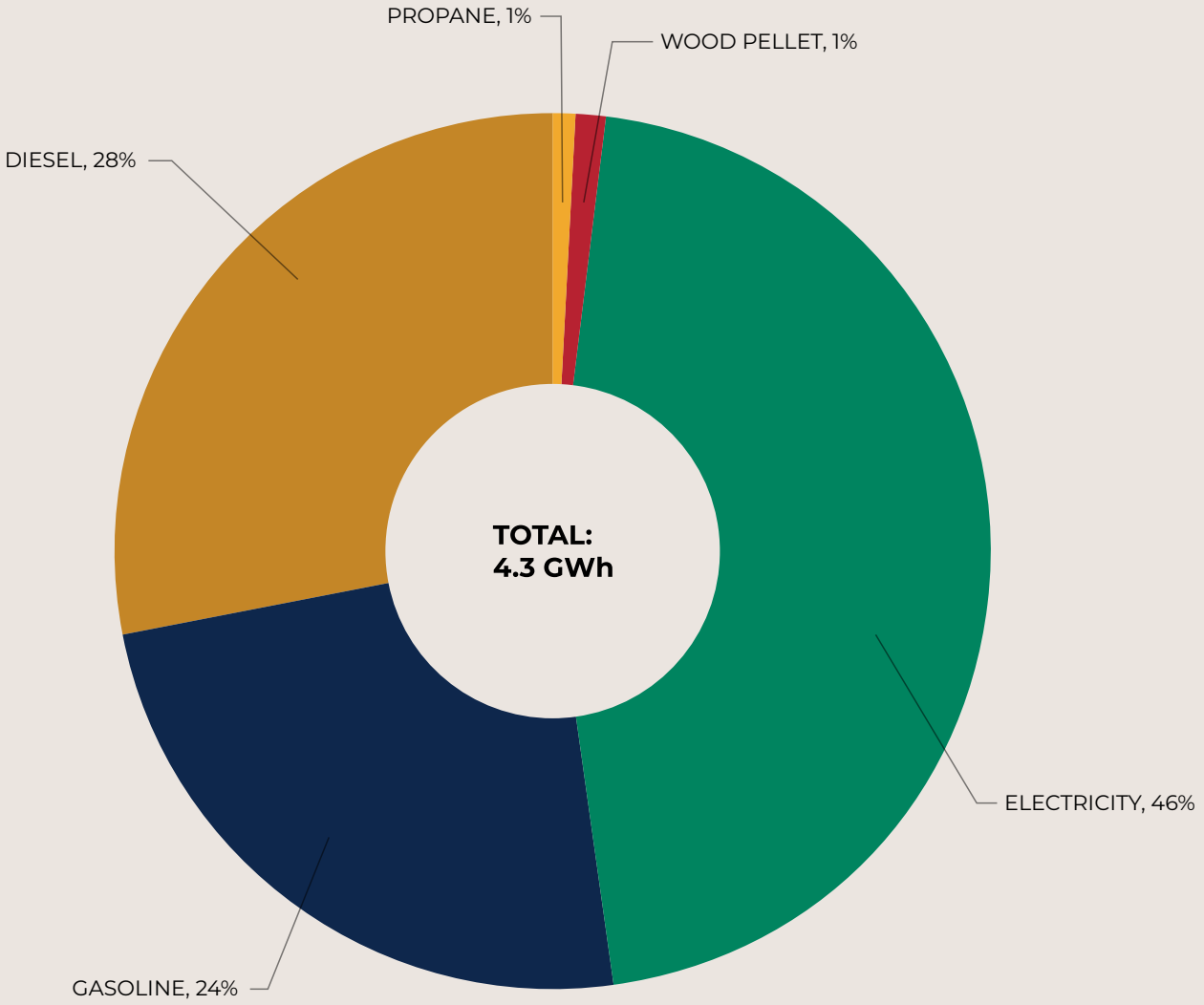


Figure 2 - Energy Consumption by fuel type, 2022

Figure 3 - Hartley Bay's Waaps Wahmodmx Feast Hall and Elder's Room

4.1 SOURCES OF ELECTRICITY

The primary source of electricity power in Hartley Bay is the BC Hydro diesel generation station (DGS). There are three generators within the DGS supplying electricity to Hartley Bay, providing 1,010 kW of power to the community. The generators are stored in a plant building, which is outfitted with heat pumps that provide backup heating. Diesel fuel is stored near the DGS in two large tanks and piped to the DGS.

There are also back-up generators dispersed throughout the community that serve emergent loads as needed, for example the health clinic. A small number of solar PV panels are present as well.

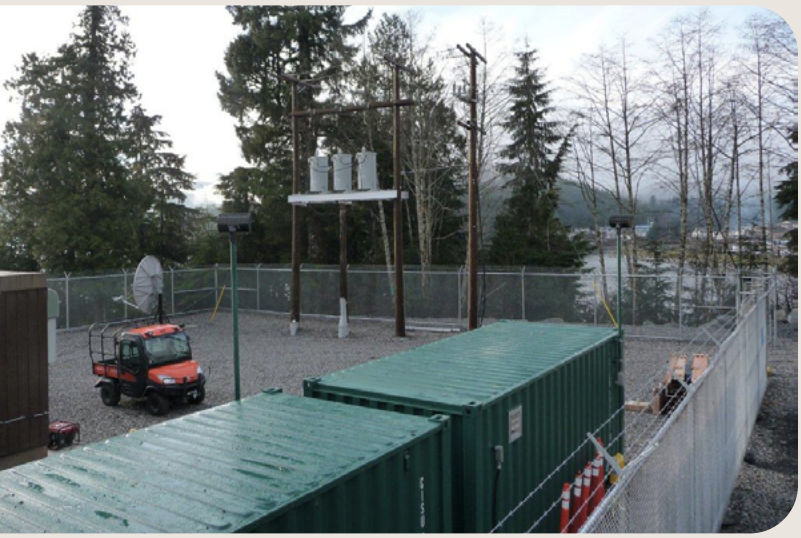


Figure 4 - The Diesel Generating Station (DGS)

4.2 CURRENT LOAD PROFILE

The 2023 Hartley Bay Electricity Load Forecast evaluated electrical consumption trends in the community[2]. The evaluation relied on account level data and aggregate consumption and demand data provided by BC Hydro for the year 2022. Some figures collected for the Electricity Load Forecast were also re-collected for the year 2024 via discussion with BC Hydro.

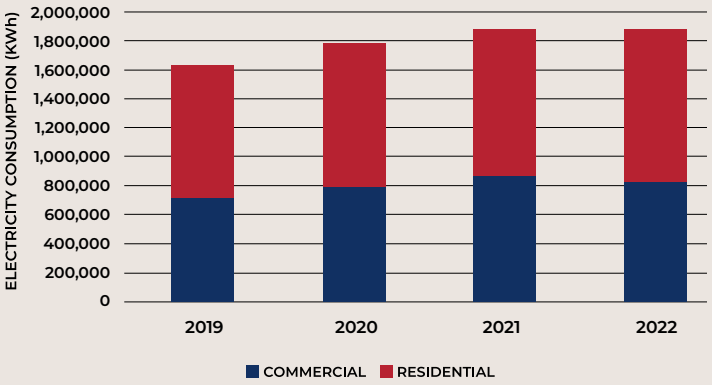


Figure 5 - Annual Energy Consumption by Building Sector

The annual electricity consumption in 2022 totalled 1.9 GWh, an increase of 22% from the 2019 figure of 1.55 GWh. The 2024 consumption showed a further increase to 2.116 GWh. The gradual increase is attributed to construction usage and changes in heating sources from oil-based heat to electrical-based heat pumps in several homes and institutional buildings (which are considered 'commercial' for purposes of this report). An increase in the number of full-time occupants of residential buildings also contributed to the increase.

Although commercial consumption was more intense on a per-customer basis, residential consumption accounted for roughly 56% of all consumption. This constitutes a slight increase from previous years. Industrial electrical consumption is minimal in Hartley Bay, and there is presently no electrical consumption from the community's fishing industry.

[2] Completed by Innes Hood Consulting with the support of many Gitga'at staff, for BC Hydro.

Among residential consumers, space heat comprised the biggest share (42%) of electrical consumption, followed by appliances (25%), domestic hot water (21%) and lights (12%).

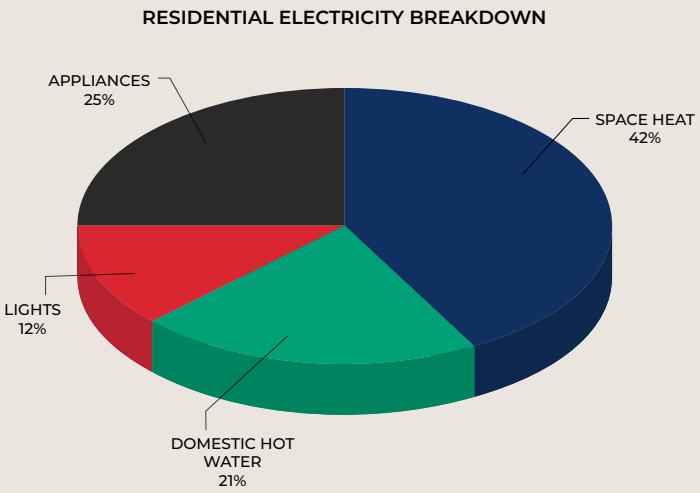


Figure 6 - Residential Electricity Breakdown

Peak demand for the community was 580 kW in 2022 and 627 kW in 2024. Peak demand in both years corresponded with a local cold weather event. In general, cold weather events increase consumption in Hartley Bay. This is explained by increased demand for space heating in colder weather. Conversely, the warmer and brighter summer months correspond with substantially reduced consumption. The lowest summer demand in 2024 was 90 kW, which occurred in mid-July. Heat pumps have added to electricity consumption slightly, in summer, because of they can offer a cooling effect. This adds to the comfort of homes.

Nighttime loads are generally 30-40% lower than daytime loads, and cold weather exacerbates fluctuations in demand throughout the day. Daily peaks tend to occur in late afternoon or early evening hours, when cooking, socializing, household chores, space heating and lighting demand increases.

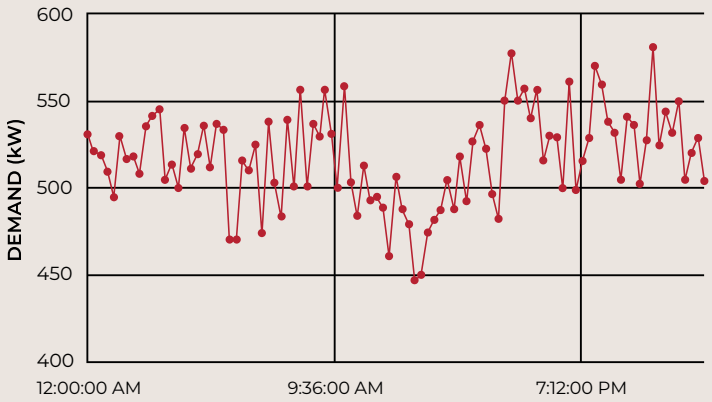


Figure 8 – 15-minute interval demand on peak day, 2022

Peaks aside, most 15-minute intervals in 2022 saw electrical demands of 300 kW or fewer, on average.

COMMUNITY LOAD & CONSUMPTION - HARTLEY BAY - CALENDAR 2024		
Measured at output of diesel generating station		
Cold Load > Max Load, kW (15 min snapshot)	N/A	
Maximum Load, kW (15 min snapshot)	627	Jan.13, 16:30
Minimum Load, kW (15 min snapshot)	90	
Annual Consumption, kWh	2,116,424	

BC HYDRO DIESEL GENERATING STATION				
#	Make	Model	Rating, kW	Min allowable loading on a continuous basis, kW (40% of max prime rating of engine frame)
G1	Caterpillar	C15	455	182
G2	Caterpillar	C15	455	182
G3	Caterpillar	C9	200	110

Figure 7 - Hartley Bay Community Loads, 2024

4.3 FUTURE LOAD FORECAST

The Electrical Load Forecast also included a survey of staff and contractors on planned development activities in the community. These include short-term projects (e.g. renovations to the pumping system at the wastewater treatment plant) and long-term opportunities (e.g. new sewage lagoon and marina expansion). The Capital Planning Manager provided feedback on the timing, size and likelihood of the development activities (see, Appendix C). Based on this information, low, baseline, and high growth scenarios were created and evaluated. Items with a high likelihood to proceed were included in the baseline and low growth scenarios, while the high growth scenario assumes that all identified potential development projects are constructed. BC Hydro intends to do another load forecast in the near term to ensure they 'right-size' their DGS generator capacity.

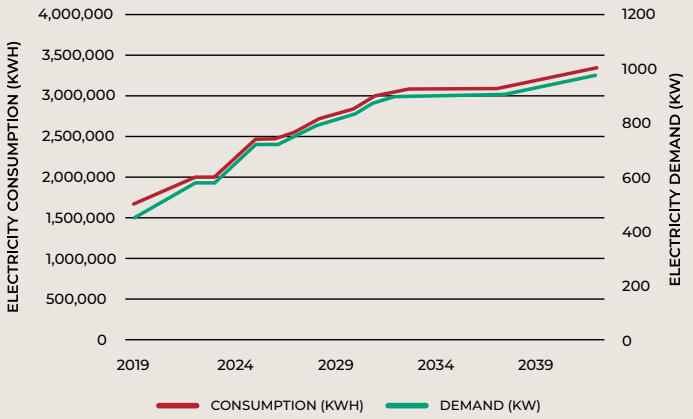


Figure 9 - Baseline Electrical Consumption and Demand Forecast to 2042

Under the baseline scenario, electrical consumption is forecast to increase from 1.9GWh in 2022 to 3.3 GWh in 2042. Peak demand is forecast to increase from 0.6 MW to 0.98 MW, nearly equal to the individual capacities of the DGS (1,010 kW) and the planned hydroelectric project (978 kW). In order to meet this expanded demand, the equipment configuration of the DGS may require reconsideration. This reconfiguration will be carried out by BC Hydro and is not included in this plan.

Once complete, the hydro project will carry most of the load, most of the time. BC Hydro will continue to maintain the existing DGS, but it will only be required in cases of very high loads in the years beyond 2040, and as a backup system. The presence of a secondary system in Hartley Bay will constitute a major improvement in the community's energy security. The impacts of climate change, which include a reduction in peak winter demand and an increase in summer demand for space heating/cooling, are incorporated into this forecast.

[3] In Hartley Bay, warming temperatures may increase summer consumption, but reduce winter consumption, where peak loads typically occur.

In addition to assumptions on new construction, the low and high growth scenarios were also developed with more conservative or aggressive assumptions regarding population growth, demand-side management scenarios, and climate change impacts. A comparison of the annual electrical consumption under the various scenarios is shown below.

PARAMETER	LOW GROWTH	BASELINE	HIGH GROWTH
Population Growth	210 residents by 2042	245 residents by 2042	470 residents by 2042
DSM Implementation	Intense	Moderate	Low
Energy Efficiency Step Code Implementation	Level 3 by 2030	Level 4 by 2035	Level 3 by 2040
EV Charging	None	None	None
Climate Change Impact on Consumption	Moderate Decrease[3]	Minimal Decrease	No Decrease

Table 1 - Electrical Consumption Growth Scenarios

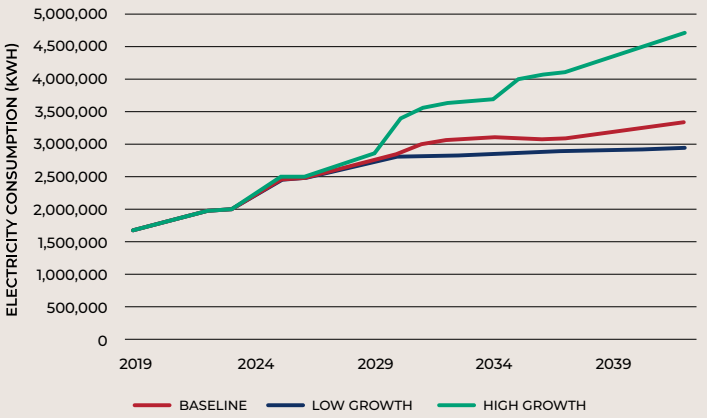


Figure 10 - Hartley Bay Electrical Consumption Scenarios to 2042

4.4 GHG EMISSIONS

The DGS is responsible for most of the emissions within Hartley Bay. Because of this, emissions in the community are most closely tied to sources of electricity usage. This will likely remain true until emissions resulting from electricity generation are meaningfully reduced. The Gitga'at Power Project hydroelectricity can drastically reduce these outputs.

The fleet of fishing vessels, non-electric ground transportation vehicles, and some carbon-based heating appliances are responsible for the remainder of emissions in the community. The ease of de-carbonization for these sources varies significantly. For instance, the potential for adoption of electric fishing vessels is limited in the near-term by high capital costs and a lack of charging infrastructure at the marina. Switching to bio-diesel for fishing vessels could reduce carbon by over 70%. Electric golf carts however, already make up half of the golf carts in the community, a percentage that will likely continue to grow.

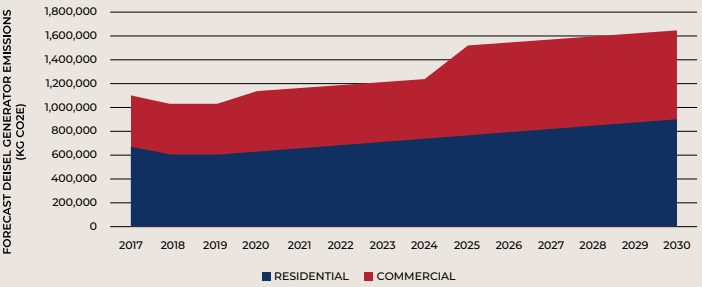


Figure 11 - Historical and future predicted emissions from buildings without clean energy

4.5 NEED FOR ENERGY ACTION

There is a need for immediate action; load projections threaten to exceed the capacity of the existing DGS in less than 20 years and there is conflict between the current course and GFN's vision of being the Greenest First Nation in Canada. Emissions and consumption can be reduced through demand side management and renewable energy generation.

Figure 12- View of the Marina and bay from the Band Office

5. DEMAND SIDE MANAGEMENT

Demand Side Management (DSM) refers to reducing the amount of energy that consumers demand. This is accomplished through energy efficiency upgrades and customer behaviour education.

5.1 ANALYSIS OF HEAT PUMP INSTALLATIONS

Hartley Bay has already implemented many energy efficiency upgrades successfully. Since 2020, nearly all homes and businesses have been retrofitted with heat pumps. Included in this program were baseboard heating homes, oil heated homes as well as the school and gymnasium. Heat pumps have been generally very well received in the community. In addition to improving energy efficiency, residents have reported being more comfortable in their homes with heat pumps in place. This is a key success of the 2019 CEEP.

Figure 13 - Heat Pump Installation, Units, and Interior Components

Heat pump installation achieved lower overall costs and healthier homes

5.2 RESIDENTIAL ASSESSMENT

Opportunities for further progress remain. The Community Electricity Load Forecast noted that exterior cladding had recently been replaced on a number of older homes, though insulated sheathing was not installed at the same time. A more detailed assessment of residential demand side management opportunities will be integrated with ongoing maintenance activities by the Band. Strong remaining opportunities for additional residential retrofits have the potential to reduce existing peak demand by an estimated 70kW. Some opportunities for residential retrofits included:

- Energy Star water heaters
- Water conserving fittings and fixtures
- Energy Star appliances including refrigerators, freezers, washers and dryers (note, GFN has already replaced most freezers and refrigerators in the community)
- Energy efficient lighting
- Bathroom and kitchen fan replacement
- Installation of exterior sheathing installation as part of cladding upgrades
- Upgrade insulation in exposed floor conditions on underside of homes built on piles.
- Addressing surface water under and around homes to reduce humidity and improve comfort (may also address issues with heat pumps becoming stuck in defrosting cycles)

Since the time of the Community Electricity Load Forecast, GFN has replaced many older freezers and refrigerators. Opportunistic upgrades to insulate floors and walls during future planned upgrades is a very cost-effective approach.

5.3 COMMERCIAL/INSTITUTIONAL ASSESSMENT

Institutional buildings include the school, community center, Waaps Wahmodmx Feast Hall and Elder's room, gymnasium, health clinic, band administration building, two firehalls, an RCMP detachment, daycare, and others. Institutional buildings are generally heated with heat pumps or minimally with fuel oil, and use electricity for lighting, ventilation, plug loads, and auxiliary mechanical equipment. There are few commercial business services in Hartley Bay. The vast majority of provisions (food, house wares, building materials) are transported by barge, small boat or on the passenger ferry service.

In past DSM work for the commercial sector, 20 variable thermostats and twelve load controllers were deployed in commercial buildings. These thermostats can be automatically adjusted in cases of peak loading to reduce demand. They are also equipped with manual overrides to ensure occupant comfort.

- Interior and exterior lighting retrofits and lighting re-design
- Occupancy sensors and daylight sensors
- Building automated control system schedule and programming review
- Air sealing of building enclosures
- Insulation repairs

Additional opportunities include behavioral demand side management efforts, insulated wall sheathing, domestic hot water efficiency in the gymnasium and health clinic, and heat pump water heaters.

For buildings that switched from electric furnaces to heat pumps, installation of heat pumps resulted in energy savings of 25%

Figure 14 - Heat pumps installed outside of Waaps Wahmodmx

Between 2019 and 2022, electricity use in the commercial sector increased by 15%, driven largely by the school and community gymnasium switching from fuel oil to electricity for space heat. Commercial buildings have generally been retrofitted with heat pumps to allow for transition away from low efficiency baseboard heating or fossil fuel emitting oil-fired boilers. Limited additional increase in the commercial sector demand is expected.

LOCATION	ORIGINAL HEATING FUEL	HEAD PUMP ELECTRICITY SAVINGS 2019 - 2022
Clinic	Electric	28%
Training Centre	Electric	24%
School	Fuel Oil	-76%
Water Treatment	Electric	30%
Band Office	Electric	17%
Culture Centre	Fuel Oil	-47%
Gymnasium	Fuel Oil	-134%
Average Savings in Electrically heated Commercial Buildings		25%
Overall Savings in Commercial Buildings		-15%

5.4 FUTURE DSM ACTIONS

Gitga'at First Nation commissioned a study in 2009 to determine energy saving actions for the commercial and institutional sectors[4]. This report indicated energy efficiency initiatives should focus on the largest electricity consumers, namely the health clinic, school, water treatment plant, cultural centre, gymnasium, band office and band storage. While these facilities represent only one third of the total commercial and institutional sites, they represent over 85% of this sector's loads.

While the heat pump conversion initiative has been successful, some further opportunities were noted. These include finding a solution to the heat pump defrost cycle that is causing extra energy consumption in the colder months, and providing occupant education about appropriate thermostat settings for the season, and how to make these adjustments. Additional coaching for occupants on the operation of heat pumps is being considered to advance these opportunities.

GFN is also working to ensure there are qualified maintenance staff in the community to maintain the heat pumps. Currently, when service of units is required, a contractor from elsewhere is required to come to the community to resolve issues resulting in significant costs to the Band. GFN is working to reduce ongoing maintenance costs and issues by building local capacity for service.

There is also an opportunity to optimize the boiler, heat pumps, and ventilation systems at the school. Control system upgrades to synchronize the operation of the two systems should be examined to address these issues.

At the community level, a detailed DSM implementation plan is recommended to address the likely growth of demand to levels near the capacity of the community's existing and planned power supplies. Further site investigation of peak events is also recommended to understand opportunities to keep the peaks within the system capacity.

	ACTION	TIMELINE
1	Consider additional coaching for residents on heat pump operation.	Less than 2 years
2	Integrate a more detailed assessment of DSM opportunities into ongoing maintenance activities.	2-5 years
3	Upgrade control systems to synchronize the operation of heat pumps, boilers, and ventilation systems at school.	2-5 years
4	Establish a detailed DSM implementation plan.	2-5 years
5	Continue to build local capacity to reduce ongoing maintenance costs.	Ongoing
6	Carry out more detailed analysis on local emissions sources.	2-5 years

While these actions will positively impact the community's energy consumption, the need for additional generating capacity in Hartley Bay remains clear. Future loads are projected to near the capacity of the existing DGS. The community has been planning for this increase in load, and efforts have been underway for over 30 years to add new, renewable capacity to the community's supply. With the recent installation of a road to the upper Gabion Lake and the scheduled construction of a weir for the Water Security Project, the Gitga'at Power Project is closer to reality than ever before.

[4] This work was completed by Pulse Energy

5.5 ANALYSIS OF RENEWABLE ENERGY OPTIONS

High level analysis of renewable energy generation options was completed with the 2019 CEEP, which recommended further analysis of wind-solar-battery, and micro-hydro projects.

An independent engineer's cost analysis (including total capital cost, expected lifespan, revenue, Net Present Value (NPV), Payback Period, and Levelized Cost of Energy (LCOE)) over a 40-year period revealed that the Gabion River Watershed hydroelectric project was the best-value option. More specifically, that hydroelectric project had both lower annual costs as well as longer equipment lifespans meaning that, in spite of high upfront costs, the micro-hydro project was financially favorable for all periods beyond 24 years. This analysis, further detailed in Appendix E, was supported by BC Hydro.

Technical concerns about the viability of the wind-solar-battery option also remained. The availability of small-scale wind turbines and their operations and maintenance (O&M) costs remain uncertain – there are no suppliers at this point. Solar was (and is) possible but represents a limited time of day and seasonal resource at Hartley Bay's latitude. Many more years of study would have been required to identify a suitable wind-solar-battery system. Accordingly, at the Gitga'at Power Project, with its focus on small scale hydroelectricity was chosen as is supported by Leadership Council and Administration.

5.6 WATER SECURITY PROJECT

In 2022 GFN launched the "Mitigation of Risks to the Water Supply of Hartley Bay" or Water Security Project (WSP) in response to elevated risk of drought in the community brought by warming summers. In the course of this project, GFN applied for and received funding to construct a road to upper Gabion Lake and a weir on the lake. The reservoir created by the weir is intended to improve the resilience to drought for the community of Hartley Bay, even if periods of dry weather increase[5]. Notably, total annual precipitation in Hartley Bay is forecast to increase, suggesting that the weir/dam in the Gabion watershed should provide a secure source of water for community usage and power for the foreseeable future.

The weir/dam serving the WSP will store up to 5.6 million cubic meters of water in the Upper Lake and make 5.9 million cubic meters of water available for fish habitat security and community usage. Hartley Bay should never experience drought with the expanded source of potable water for health, firefighting, sewage processing, and Coho/Chump production from the Hatchery located on the river.

Although this project was launched independently from energy considerations, the road (which was completed in 2024) and the weir/dam (which is slated for completion in 2027) represent critical items for the implementation of a hydroelectric project in the same area. With items addressed by the WSP, costs of the GPP in the Gabion watershed have been significantly reduced, further improving the suitability of the project.

Figure 15 - New road to Upper Gabion Lake

[5] Data taken from climatedata.ca – using SSP2-4.5 scenario, CMIP6 model

6. GITGA'AT POWER PROJECT PLANNING AND IMPLEMENTATION

Gitga'at First Nation has initiated the Gitga'at Power Project (GPP) to implement a resilient hydroelectric power solution for the community of Hartley Bay. This project is supported by the:

- Need for renewable power,
- Reduction in cost of a hydroelectric project stemming from the implementation of the WSP, and
- Work done to compare the merits of various renewable energy sources,

A project charter, covering both the WSP and GPP, has set forth several goals for the project, which are built upon the community's energy goals established in previous CEEPs and listed in Section 3.3 above. The goals which are specific to the GPP include:

1. Energy Security

The GPP will provide the community of Hartley Bay with up to 95% of its electricity requirements. The hydroelectric system will provide an independent clean energy generation system capable of carrying the load for the community for the foreseeable future, relegating the diesel generating station (DGS) to a back-up system.

Consultation with BC Hydro is also intended to help BC Hydro appropriately size their backup systems and reduce their O&M and capital burden when loads are not carried by the DGS.

Reducing greenhouse gas emissions from burning diesel in BC's remote communities will help the Province and all of Canada meet legislated climate targets and international commitments under the United Nations Declaration on the Rights of Indigenous People (UNDRIP).

2. GFN Sovereignty and Security

Energy Sovereignty and UNDRIP Implementation focus on appropriate recognition, compensation, and decision-making frameworks with all Indigenous Nations, recognizing that the Gitk'a'ata are legacy stewards of the lands and waters including the natural resources in their territory. To achieve energy sovereignty, new relationships between Nations, Canada, the Province, and its Crown corporations and regulatory bodies that center on transparency, accountability, and honor, that entrench Indigenous community knowledge, values, and ways of knowing are required.

Establishing a second generating system is key to the wellbeing of Hartley Bay. The additional redundancy in the electrical system will reduce the risk of potentially disastrous power outages that could threaten the safety and comfort of residents through medical incapacity, risk of food spoilage, loss of heating or cooling systems, and loss of other basic amenities. Electricity failures could put all infrastructure assets is jeopardy.

The GPP system will also reduce the community's reliance on fossil fuels sourced from outside the community. Maintenance and operation of the GPP system will be relatively straight forward, further reducing the community's outside reliance.

3. Economic Growth

The project will also include a Community Electricity Purchase Agreement with BC Hydro, which will provide a source of revenue for the community to offset operating costs and maintenance, while keeping money within the Nation. In the future if major commercial projects become attractive, additional clean energy sources may be required.

4. Environmental Stewardship

The GPP will protect GFN territory for members by reducing local emissions and the threat of fuel or oil spills in or near the community.

We will use an Environmental Social Governance Indigenous (ESGI) framework - expanded to incorporate indigenous world values and principles related to environmental stewardship - as the foundation for decision-making on energy and transmission projects.

5. Truth and Reconciliation

Through each of these goals, and their empowerment of GFN, the project will support all levels of government in achieving their aims in reconciliation.

The province's commitments to climate change mitigation, greater clean and renewable energy generation, and reconciliation with First Nations is outlined in the Clean Energy Act and DRIPA.

Much work remains.

6.1 GPP DESIGN BASIS REPORT

In 2024, GFN initiated a design basis report[6] which describes in detail project siting and basic design considerations for the Gitga'at Power Project. The report takes into consideration the geotechnical conditions, annual water discharge and projected changes to it, flood risks, and operating costs. A generating station with a nameplate capacity of 978 kW is suggested, sufficient to meet all or nearly all of Hartley Bay's annual electrical demand until at least 2040. The design basis report constitutes a major step in implementation of the GPP and the design will be further refined in future steps of the project.

HIGH-LEVEL O&M BUDGET FOR THE GPP	IF CONTRACTED	IF IN-HOUSE?
Total	$526,378	$322,295

6.2 FUTURE DEVELOPMENT

The chart below provides an overview of the proposed project timeline as outlined in the Hartley Bay Security Projects – Water and Energy Project Charter (2024). Submission of a Clean Energy Development Plan was accomplished on October 8, 2024 and constitutes a major step forward in the project. Construction on the weir requires several additional permits and successful applications before it can proceed, including approval of the Development Plan, License of Occupancy, Occupant License to Cut, Conditional Water License, a GALOOO, authorizations, and various Dam Safety plans, etc. etc..

The project is slated to be operational at the end of 2027. Avoiding provincial permitting delays will be critical in keeping to this deadline.

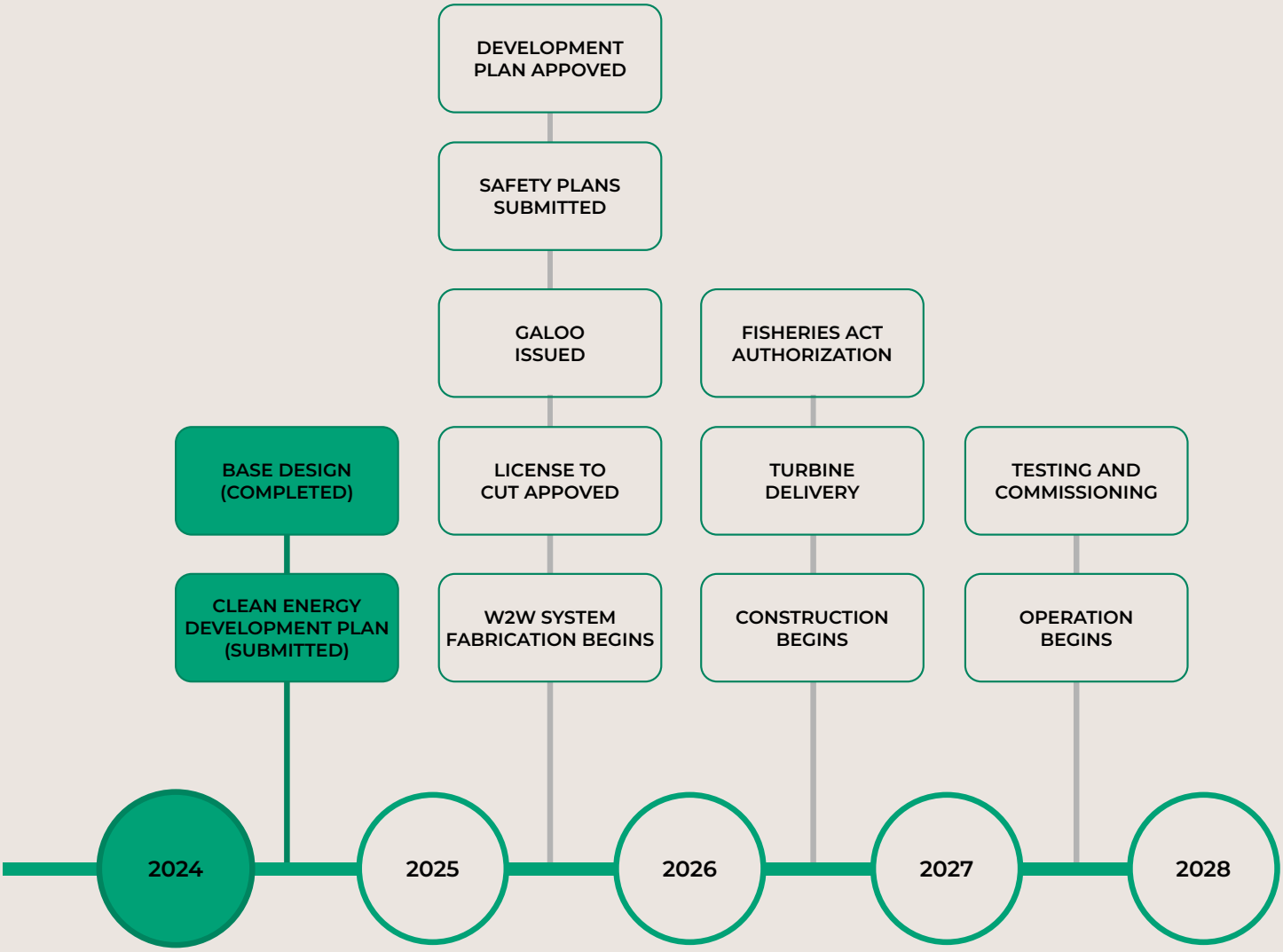


Figure 17 - Projected timeline of major milestones for the GPP

6.3 RISK ASSESSMENT

The Ministry of Environment assessed and classified the consequences of dam failure at Upper Gabion Lake as "Significant" (as defined in Schedule 1 of the BC Dam Safety Regulation (BC Reg 40/2016)). This is due to estimated financial and ecological damage that could occur in the event of a Dam break. This classification will inform critical design criteria of the dam in accordance with CDA guidelines (CDA, 2013).

There are other formal restrictions pertaining to the resilience of other project components (such as the powerhouse); however, adherence to applicable standards may not, on its own, provide suitable resilience. As the GPP is intended to supplant the existing DGS as the primary source of electricity in Hartley Bay, the standard of construction will be carefully considered to ensure that a reliable source of electricity is achieved.

It must also be noted that, while hydroelectricity is a highly reliable source of electricity, extended periods of drought may threaten a hydroelectric project's generating potential. Average precipitation amounts in Hartley Bay are not forecast to decline. In fact, they are anticipated to increase due to the effects of climate change. However, long term forecasts will be periodically revisited to ensure this remains the case.

6.4 FUNDING

The GPP remains an expensive project to construct. As at January 2025, pre tarrif wars, all assets will be valued at $54 million, with $16 million of that being attributable to the Water Security Project. To date, the New Relationship Trust has granted the GPP $4 million dollars via its Community Energy Diesel Reduction (CEDR) program for both development and construction of the trail-roads in the reach. These funds are divided equally between construction and development. In addition, the Government of Canada is providing $16 million to build the Upper Lake Road and the Weir while GFN has committed over $2,137,000 of its own project development funding to the GPP.

While these contributions represent a sizable portion of the necessary financing, significant additional funding is required to complete the project. GFN is actively pursuing means to secure that funding and financing.

To manage ongoing expenses, GFN will negotiate a Community Energy Purchase Agreement (CEPA) with BC Hydro. This agreement will allow BC Hydro to purchase clean energy from the GPP, to energize Hartley Bay. GFN intends to ensure that revenue from this agreement will be sufficient to operate and maintain the hydroelectric facility and eventually return a profit to GFN.

7. COMMUNITY ENGAGEMENT AND IMPACTS

7.1 ENGAGEMENT TO DATE

Community engagement pertaining to community energy has been ongoing since the beginning of community energy planning initiatives. Starting in 2000, several in-person workshops were conducted that focused on addressing the cost of energy, community growth objectives, employment opportunities, local energy autonomy, self-reliance, and environmental issues. These workshops resulted in a number of guidelines, explored above, for assessing the community's energy supply which have continued to drive the clean energy work performed by community members.

The objectives that came out of the consultations in the early 2000's have not materially changed. The vision for Hartley Bay, to become the **'Greenest First Nations Village'** in Canada, has not materially changed either and continues to guide decisions on the community's energy supply.

Also, through the Economic Development Strategy community consultations over the years, clean energy was continually confirmed as a key objective. These consultations were generally done in the context of the Gabion River Hydroelectric Project (which is now out, and changed to GPP), but continue to provide valuable direction for the new GPP.

As a follow-up to the 2019 CEEP, which committed to sharing evaluations of the various renewable energy options this CEEP presents the findings of the preliminary costing study, evaluating those options. Based on the findings of independent contractors, the GPP has emerged as a strong option that meets the needs of Hartley Bay.

Engagement resulting from the 2019 CEEP also included meetings with Chief and Council, the Leadership Council and the Gitga'at Development Corporation to share the financing structure and commitments with members. These meetings generally illustrated, as planned, how profits are projected to grow over time as loans required to construct are paid down. The corporate structure and how it benefits members and its accountability regime was also explained. This generally yielded a positive reaction from the Gitk'a'ata in Prince Rupert and Hartley Bay.

7.2 FUTURE ENGAGEMENT DURING CONSTRUCTION AND OPERATIONS

With the GPP continuing to progress, engagement work is not complete. Community members will continue to be informed of major updates to the project. Specifically:

- Members will be included in any celebrations to break ground of any major project, and to celebrate project completion.
- Members will be given periodic updates on any major project construction and operations when the project is up and running.
- Members are provided with yearly audits of GFN Financial statements within 90 days of completion of audit.
- Opportunities for members for jobs and training, contracts and procurement will be shared with community members.
- Any studies that show impacts to rights and environment will be shared with community members.
- Through our community newsletter and public presentations, such as the Annual General Meeting, we will continue to update members periodically on information received and any major actions undertaken.

8. CONCLUSION

The Gitga'at Development Corporation, along with its subsidiaries, is focusing on several key projects and infrastructure improvements in Hartley Bay and for GFN. These initiatives aim to boost economic development and enhance the overall quality of life for the Gitk'a'a't community in Hartley Bay. Achieving the "Greenest First Nation Village in Canada" vision will deliver on overarching goals that promote a sustainable economy that fosters employment in good quality jobs, while maintaining the integrity of the environment and the community's well-being. By reducing the community's emissions with the availability of a community-owned, reliable, renewable energy the GPP paves the way for Hartley Bay to be energy secure and resilient.

APPENDIX A – EXTENDED COMMUNITY ENERGY HISTORY

As early as 1978, the Hartley Bay Band Council had sought to find a local clean energy solution to decrease the reliance on diesel fuel for electricity in Hartley Bay. At that time, Indigenous and Northern Affairs Canada (INAC) deemed the $1 million cost estimate for a small hydro project too steep and did not pursue the project.

Nevertheless, community interest in transitioning from diesel-generated electricity continued. In the early 2000s, community consultations and workshops identified minimized greenhouse gas emissions as one of many goals and values of the Gitga'at people regarding electricity sources and uses. The Pembina Institute was commissioned to create a Community Energy Plan (CEP 2003) to blueprint a long-term energy supply solution with an emphasis on clean electricity generation. As a result of that CEP the Gitga'at Development Corporation (GDC) began the arduous task of examining hydroelectricity options. They eventually selected a particular configuration within the Gabion watershed, based on engineering recommendations. The Gabion River, which flows through the community is Hartley Bay's home watershed and lifeblood.

Unfortunately, by 2018, after 15 years of planning and efforts, project costs had escalated to such a high cost that Council decided to abandon the project and search for other renewable energy production opportunities for GFN in Hartley Bay. The Clean Energy Leader, David Benton with the assistance of the Climate Action Coordinator, Hermann Meuter, hired in March of 2019, was tasked to find the other viable solutions to help Hartley Bay finally reduce its carbon footprint. A Working Group consisting of government and industry professionals was established to make recommendations to leadership.

HATCH Engineering was contracted in 2019 to thoroughly examine all clean energy options in the vicinity of Hartley Bay. Eight possible clean energy technologies were identified and ranked according to the readiness of technology, capital costs, operation and maintenance costs, environmental impacts, local economic development, complexity/risks and local feasibility. Many of the proposed solutions had not reached sufficient technological maturity - constituting a major risk for a geographically isolated community.

HATCH ultimately suggested a wind-solar-battery solution, but concerns remained. The availability of small-scale turbines and their operations and maintenance (O&M) costs were uncertain. Solar was (and is) possible but represents a limited and seasonal resource at Hartley Bay's latitude. Many more years have study would have been required. The BC Government, on the Working Group, asked GFN to continue seeking a clean energy solution for Hartley Bay.

The Hartley Bay CEEP 2019, supported by Pinna Sustainability, summarized findings on loads and renewable generation options, adding consideration of biomass combined heat and power, ocean tidal, and ocean wave, but narrowed the top choices down to small scale hydro-electric, wind, and solar.

APPENDIX B – VISION

"BACK TO GREEN"

A Vision for Environmental Sustainability and a Prosperous Future

The raw, unspoiled display of Mother Earth surrounding our postcard-perfect community grants us opportunity, poses responsibilities and demands we act to sustain her.

Great opportunities abound for the Gitga'at First Nation in new and traditional economies but only if we take responsibility for a healthy environment sustained by our excellent infrastructure.

Opportunity. Responsibility. Sustainability. The Three Pillars of Green energize and direct our youth and bring comfort to our Elders.

In a community wide program called 'Back to Green', members have honoured the old ways and are again reliant on what the creator has given them. The success of 'Back to Green' is attributed to youth leadership, elder wisdom, and the guidance of our leaders.

By 2025 our community is celebrating our significant achievements on our journey to becoming the Greenest First Nations Village in Canada. After years of hard work, we relegate our diesel generating station to a back-up 'security' system. We are no longer reliant on it to produce the abundant energy we require to thrive in our remote and prosperous community. Recognizing that our citizens are our energy champions, we have driven down the net cost of electricity to households to promote growth and achieve prosperity. This includes the retrofit of houses to achieve maximum energy efficiency and the building of new 'net-zero' homes.

Our relationship with our ecological and energy stakeholders – the Government of Canada, the BC Government, BC Hydro and Coastal First Nations and others has lead us to this moment. In the spirit of reconciliation and their climate commitments, they have facilitated and financed our transition away from carbon and toward energy efficiency and economic prosperity.

The Gitga'at have always been technologically advanced, harnessing the earth's energy and abundance to our advantage. But we have always been stewards too. We know that our ecological balance means our survival. Today we have gone Back to Green and developed an array of systems to generate, capture, store and distribute clean energy to meet our needs no matter what conditions prevail. Our renewable energy technologies are scalable, varied, and sufficient to meet our residential, commercial, infrastructure and industrial requirements. We are no longer reliant on one form of energy production. Recognizing the changing nature of environmental forces, we have prepared for climate change. Our resilience continues to be rooted in our ability to adapt.

The total demand for electricity continues to rise as we add new houses and buildings and industries. However, by utilizing sophisticated management technologies, peak demand never exceeds capacity. Our energy efficiency is unsurpassed for any remote First Nations village not connected to an integrated grid. All Band buildings and operations, including water treatment, wastewater, and solid waste, are powered by clean energy. Emissions from our solid and wastewater production are reduced to meet the highest standards. All new developments are energy efficiency focused from design through construction and operations. We have decarbonized the community and no oil-heating systems exist any longer. We are on track to eliminate fossil fuels for transportation - most vehicles are battery powered and charged at night when off-peak power is readily available.

We have invested in the skills development of our citizens to meet these realities. High quality jobs are tied to our Green Economy, not only in production and maintenance, but in research, education and leadership. We participate in all aspects of conservation.

Hartley Bay is not only clean and green, but has the lowest per capita carbon footprint and non-recyclable waste production of any First Nations Community in Canada. We seized the opportunities, we adapted responsibly, and now, we are sustainable.

Our waters are clean, our skies are clear and our Creator is honoured by our efforts.

APPENDIX C – FUTURE DEVELOPMENT ACTIVITIES

BUILDING / PROJECT	SIZE/ ENERGY DETAILS	ADDITION OR RENOVATION?	STATUS AND TIMEFRAME
Wastewater Treatment Plant	New lagoons, Pumping system (uphill), moderate power requirements at treatment facility	Addition and Renovation	Expected completion: Late 2025/early 2026
New Single-Family Homes	8 units, 120m2 each	Addition	First unit to be completed Spring 2025, 2nd by winter 2025, balance 2026-2027
Wellness Centre	Up to 520 m2	Addition	Construction not started – possibly 2026/227 completion
Gabion River Hydroelectric Project	948 kW hydro generation, 20kW parasitic load loss (estimated) when hydro generation not operating	Addition	90% likely to proceed. Weir funding in place. Commence operation in 2028
New Housing – mini homes	16 units, 95 m2 each	Addition	First 2 are completed, balance at 4-6 per year
Boiler Rooms: Back-up heating for School, Gym and Cultural Centre	3 rooms, 10 kW each	Addition	2024/2025 completion
Utility Building on the dock	5 kW load	Addition	2025 completion
Maintenance Dept. workshop and storage yard	90 m2, some 3-phase loads	Addition	2025/2026 completion
Community Storage Facility	220 m2 plus 40 m2 of conditioned space. Possible bank of 5-6 deep freezers	Addition	2025/2026 completion
Community Sawmill	600 Volt -600 Amp 3-phase	Addition	2025/2026 completion
Marina Expansion for tourism	No Shore Power requirements. Possible loads for kiosk and additional dock lighting	Addition	Long-term Opportunity (post 2030)
Gravel Pit/Rock Quarry	Self-contained: all equipment runs on diesel fuel – no electricity	Addition	Development begins Spring 2025
Accommodations for Temporary Workers	10-12 units housed in 2 structures w/large communal kitchens	Addition	Mid-term Opportunity (post 2027)
Fish Processing Facility and Ice Making Plant	1000 m2 facility. Some 3-phase loads	Addition	Long-term Opportunity (post 2030)
Ecotourism Accommodations / 20-Guest Hotel	20-unit modular building with commercial kitchen facility	Addition	Long-term Opportunity (post 2030)
Gitga'at First Nation Fish Hatchery Rebuild	195 m2 multi-building complex with office and monitoring station (gravity supply - no electric pumps)	Addition and Renovation	Long-term Opportunity (post 2030)

Community Store	200 m2 food retail with coolers and freezers	Addition	Long-term Opportunity (post 2030)
Local Cafe	80 m2 kitchen/cafe with coolers and freezers	Addition	Mid-term Opportunity (possibly 2026)
New Subdivision	40u nits at 120 m2 each – new homes in subdivision	Addition	Long-term Opportunity (post 2030)
Playground Facility	700 m2 outdoor play space with yard lights	Addition	Construction to commence Spring 2025
Barge Ramp Upgrade	Power for boat lift/ways, yard lighting and 120V for tools	Addition and Renovation	Mid-term Opportunity (possibly 2026/2027)
Fuel Tank Storage Yard	Power for pumping, controls and yard lighting	Addition	Construction to commence Spring 2025
EV Charging station for golf carts and ATVs	Quick charge stations at a free-standing kiosk	Addition	Mid-term Opportunity (possibly 2026/2027)
EV charging at homes	Continually increasing demand as residents acquire more EV ATVs – added load per home	Addition	Mid-term/Long-term Opportunity
Village Road Upgrade	Route changes & extension. Requires additional streetlights	Addition and Renovation	Construction to commence Spring 2025

APPENDIX D – LOAD PROFILE ASSUMPTIONS

Expanded Harbour
Based on available information, assume similar to a new house: 22,515 kWh annually

MERRF / Coast Guard facility
Based on available information, assume similar to a new house: 22,515 kWh annually

FIREHALL #1 AND #2

Attribute
Building size 400 m2

Energy use
Total energy use: 400 m2 x 260 ekWh/m2 = 104,000 kWh

Reference

- Township of Langley 2018 average firehall size. Assume Hartley Bay firehall is similar.
- Assume similar to ToL and benchmark study: 260 ekWh/m2
- ToL 2018 average firehall (excluding the largest one): 268 GJ electricity, 554 GJ natural gas (average size 9,500 sqft, 882 m2) = 259 ekWh/m2
- Firehall benchmarking: median energy use intensity: 265 ekWh/m2[7]

NEW HOMES – SINGLE FAMILY DWELLINGS

Attribute
Building size 237 m2 (2,552 ft2)

Energy use
Total Energy Use: 95 kWh/m2 x 237 = 22,515 kWh

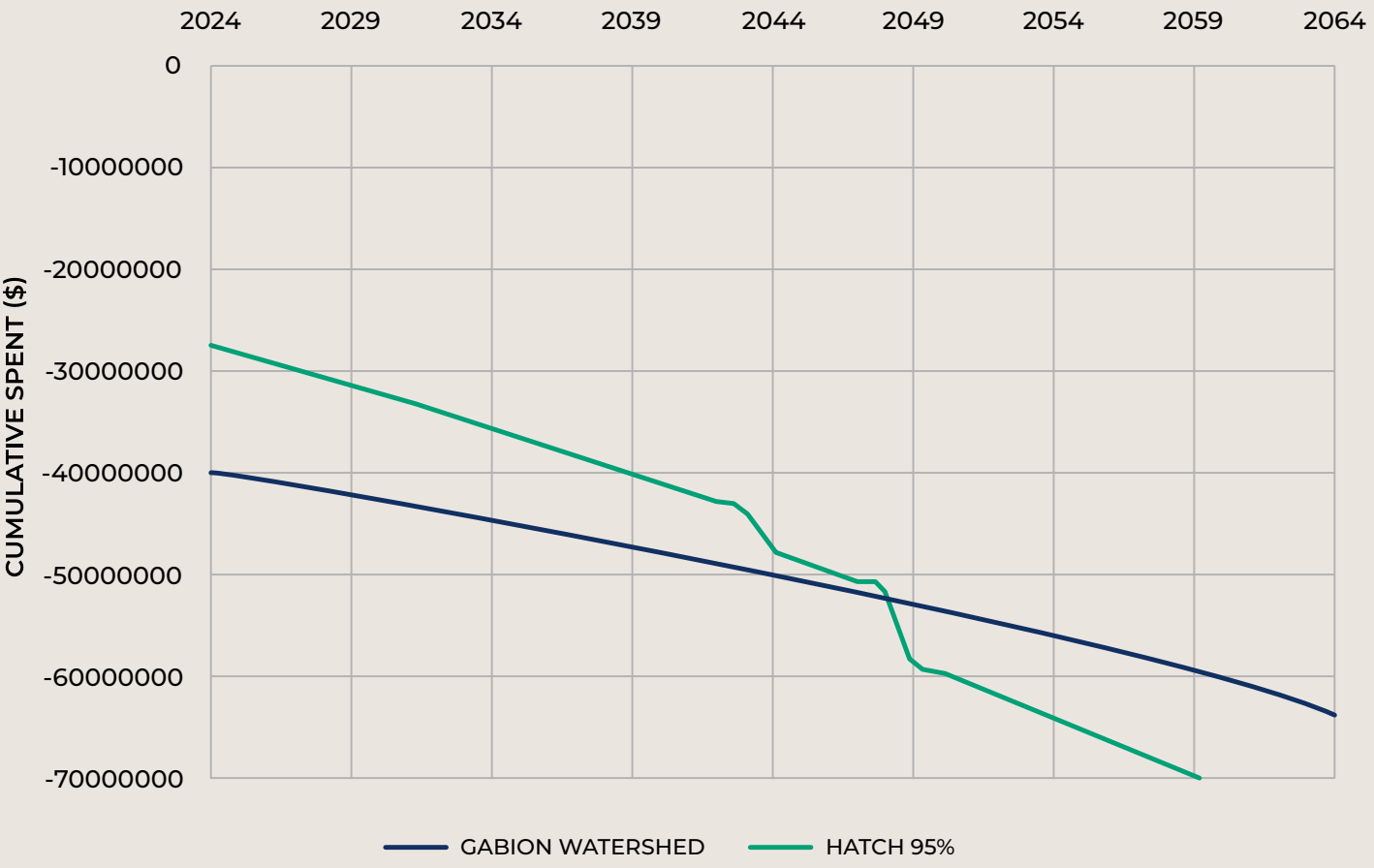
Reference

- Medium single-family dwelling (6 people per household) 237 m2,
  2 storey with basement
- Climate zone 5, based on HDD[8]
- Step 2 – 10% beyond code
- Assume that homes are 100% electric heat and hot water (no fossil fuels used)
- TEUI = 95 kWh/m2
- Compared to 2007 CPR – Northern Region Table Exhibit D4: SFD post 1976, electric heating 19,365 kWh

[7] https://www.prismengineering.com/sites/default/files/upload/AnnualPUMABenchmarkingReports-Municipal-CY2018-web.pdf

[8] Reference: Energy Step Code, Building Beyond the Standard, 2017 Metrics Research, Full Report

APPENDIX E – RENEWABLE ENERGY OPTIONS COST COMPARISON



The chart displays the cumulative cash flows for two different scenarios:

1. Gabion River hydroelectric project (blue)

2. Hatch 95% wind / solar / battery storage project (green)

The chart shows a comparative payback of 25 years (where the lines cross). This is the year in which the Gabion River project becomes financially favourable over the Hatch 95% wind / solar / battery storage project.

APPENDIX F – SCREENING CRITERIA FOR RENEWABLE ELECTRICITY OPTIONS

This appendix presents a list of requirements and considerations that were used to evaluate the suitability of renewable energy generation options within the 2019 CEEP. Wind, solar, and micro-hydroelectricity options emerged as top candidates based on their alignment with the following.

Technical Requirements

a. Technologies need to efficiently produce power. Some forms of electricity generation are quite convoluted. For example, it is possible to produce hydrogen from an initial electrical source, but then that hydrogen must be used to spin turbines (steam driven) or power fuel cells that will actually produce the electricity. In other words, it takes a lot of energy at the source to produce little energy for an end user.

b. Technologies ought to have a level of maturity (market penetration, stable science) so that we know the technology will work, reliably, over time, and that the costs are reasonable for the amount of electricity to be produced. Tidal power is not a mature technology. While it is being produced in a few places on earth, it is still in development, the costs are high, and maintenance and environmental effects are still questionable.

c. Low cost and accessible maintenance are key to successful technologies being deployed in Hartley Bay. Our people need to be able to maintain them and if major maintenance is required, it must be possible to bring in parts in a timely manner and at a 'reasonable' cost. Transporting major equipment (cranes and turbines) is costly - those high-cost items need to be minimized. Every time we have to bring in 'experts" to fix a system, we experience delay and high costs. Solar panels need to be cleaned occasionally and then they just continue to work.

d. Reliability is key. A system that is stable and will continue to work, year after year, is required. When we had a waste incinerator that always failed, the waste system broke down. The revenue we will receive for our clean energy is only paid to us when the system is producing electricity delivered into our distribution system.

e. Required infrastructure supports must be available. If a road is required, we need to be able to build and maintain it. If the internet is required, we need to be able to maintain connectivity. If bio mass is required, we need to be able to reliably bring it into the community on ship or barge. If an undersea cable is needed, it must be laid and be robust.

Economic Considerations

a. The cost of the investment must be reasonable given what it produces. Whether senior levels of government pay for the clean energy technology, or we get financing to build our system, the chosen system must be reasonable compared to other technology options, given its level of electricity production.

b. Operations and maintenance costs should be as little as possible. Some technologies require highly trained personnel to be managing the system 24/7. Some technologies require very little up keep and when they do, the costs are low.

c. If capital outlay is required from the Gitga'at First Nation, then the period of time it takes to pay it back should be as little as possible.

d. The service life of the installed technology needs to be factored in. If one system needs to be replaced in 20 years, and another needs to be replaced in 40 years, the second system is more favourable cost wise. Different technologies, and different configurations of those technologies, have a large impact on service life.

Social Considerations

Any system must be acceptable to Leadership and to community members. A hydrogen-based system might have volatility in it, or a biofuel pile might represent a fire hazard. Wind turbines next to a community can be noisy and have vibrations. Certain hydroelectric projects might pose risks to fish. Depending upon the priorities of the community, these drawbacks may or may not be acceptable. In any case there must be a base level of acceptability for a project to receive approval.

a. While Hartley Bay enjoys a high level of employment, any system that can create or support good paying jobs should be given a high ranking.

b. A system that can help reduce community energy payments, or the net costs of electricity to community members is valuable. Payments for clean energy can be re-deployed into the community to reduce energy consumption or to offset cultural or other costs of living remotely.

c. A technology situated on Gitga'at acquired or owned land represents a higher value than those that do not. It represents a source of pride, could help employees with transportation times, and will result in lower costs over time.

Environmental Considerations

a. A long stated objective of any clean energy system is that it displace diesel to the largest extent possible and thus reduce or eliminate harmful emissions.

b. Requirements for land and water must be considered. We cannot negatively impact our water intake system. Land is scarce in Hartley Bay, so a technology system must be the best land use for a given location. In some instances, building in a certain area may increase the value of that area to local residents by making improvements that would not otherwise be affordable or contemplated – such as creating berry patches along a road right-of-way.

c. Negative visual and noise impacts should be kept to a minimum. Some structures may have a visual impact but not a negative one – it may be a source of pride. Noise impacts might be acceptable during construction, but should be kept to a minimum over time. Barges delivering biofuels several times a week could be loud and disturbing. The hum from generators should not be noticeable.

Risk Considerations

a. Investments have risks if there are requirements to pay back loans or guarantees must be put in place. If a system goes down and doesn't produce revenue, then servicing debt becomes impossible and can put other financial interests in jeopardy. These should be minimized with any chosen system.

b. Regulatory certainty can speed up a project. The more regulations there are governing a project, the more costly it is to construct. DFO and BC Environment Ministry have a lot of input into what a project can and cannot do, its size, its output and how harm must be mitigated.

c. If a natural disaster could take out or impair a system, it will reduce its favourability. Situating a technology in the least at risk area is always preferable, i.e. tsunamis, forest fires, and land slides all have the potential to destroy certain projects, depending on where they are situated.

d. Climate change impacts must be considered in project selection. If rising sea levels could flood a power plant, or rainfall is expected to reduce, certain projects could be negatively impacted.

e. Technological obsolescence, or its likelihood, should be considered as well. Today one kind of battery for energy storage might be the preferred technology, but another may become available. Close watch must be kept on technology development as a project moves toward design, procurement, and construction.

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