AGENDA

PUBLIC HEARING

Tuesday, June 13, 2023
7:00 p.m.
Council Chamber, Municipal Hall
355 West Queens Road
North Vancouver, BC
Watch at https://dnvorg.zoom.us/j/67910218298

Council Members:
Mayor Mike Little
Councillor Jordan Back
Councillor Betty Forbes
Councillor Jim Hanson
Councillor Herman Mah
Councillor Lisa Muri
Councillor Catherine Pope

NORTH VANCOUVER
DISTRICT

www.dnv.org

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District of North Vancouver
355 West Queens Road
North Vancouver, BC, Canada V7N 4N5
604-990-2311
www.dnv.org

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AGENDA

We respectfully acknowledge the original peoples of these lands and waters, specifically the səlilwətaɬ (Tsleil-Waututh), Sḵwx̱wú7mesh Úxwumixw (Squamish), and xʷməθkʷəy̓əm (Musqueam), on whose unceded ancestral lands the District of North Vancouver is located. We value the opportunity to learn, share, and serve our community on these unceded lands.

100 Forester Street
Amendments to the Zoning Bylaw

1. OPENING BY THE MAYOR

2. INTRODUCTION OF BYLAW BY CLERK

District of North Vancouver Rezoning Bylaw 1426 (Bylaw 8626)

Purpose of Bylaw:
Bylaw 8626 proposed to amend the Zoning Bylaw to create an exception to Section 403A "Uses Prohibited in All Zones", Subsection (1)(f) "the manufacture of hazardous materials" to allow the manufacturing, liquefaction and storage of hydrogen with a maximum storage capacity of 180,000 US gallons on a portion of 100 Forester Street.

3. PRESENTATION BY STAFF

Presentation: Tamsin Guppy, Development Planner

4. PRESENTATION BY APPLICANT

Presentation: Representative TBD, Hydrogen Technology and Energy Corporation (HTEC); and Doug McCutcheon, Author, Quantitative Risk Assessment

5. REPRESENTATIONS FROM THE PUBLIC

6. QUESTIONS FROM COUNCIL

7. COUNCIL RESOLUTION

8. CLOSING

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The Corporation of the District of North Vancouver

Bylaw 8626

A bylaw to amend District of North Vancouver Bylaw 3210, 1965

The Council for The Corporation of the District of North Vancouver enacts as follows:

Citation

1. This bylaw may be cited as “District of North Vancouver Rezoning Bylaw 1426 (Bylaw 8626)”.

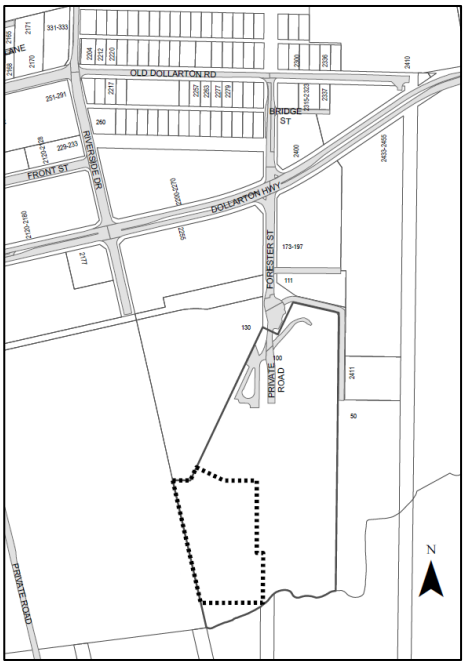
Amendments

2. District of North Vancouver Zoning Bylaw 3210, 1965 is amended as follows:

   a) Section 403A Uses Prohibited in All Zones, (1) (f) the manufacture of hazardous materials is amended as follows:

   (f) the manufacture of hazardous substances <u>except:</u>

   i) <u>for the manufacturing, liquefaction and storage of hydrogen, on that portion of the lands highlighted with the black dashed line below and located on a portion of 100 Forester Street, with a maximum on site storage capacity of 180,000 US gallons of hydrogen.</u>



READ a first time May 15th, 2023

PUBLIC HEARING held

READ a second time

READ a third time

ADOPTED

Mayor

Municipal Clerk

Certified a true copy

Municipal Clerk

AGENDA INFORMATION		Dept. Manager	GM/ Director	CAO
☑ Regular Meeting	Date: May 15, 2023			
☐ Other:	Date:			

The District of North Vancouver
REPORT TO COUNCIL

April 28, 2023
Case: 08.3060.20/014.23
File: 08.3060.20/014.23

AUTHOR: Tamsin Guppy, Planner

SUBJECT: **Text Amendment Rezoning for a Hydrogen Liquefaction Facility at 100 Forester Street (Bylaw 8626)**

RECOMMENDATION

THAT "District of North Vancouver Rezoning Bylaw 1426 (Bylaw 8626)" is given FIRST reading;

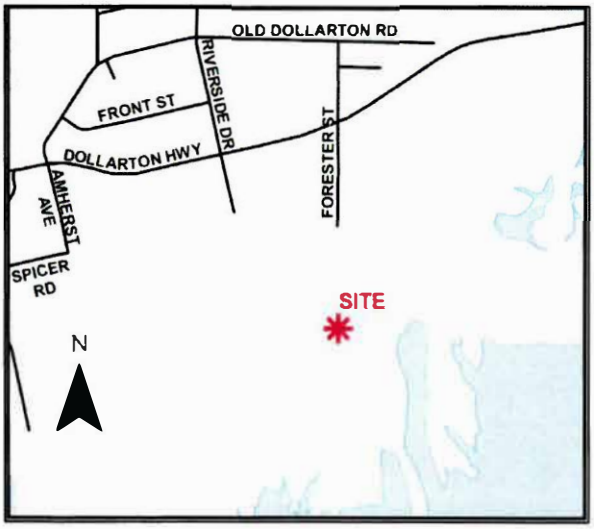
AND THAT "District of North Vancouver Rezoning Bylaw 1426 (Bylaw 8626)" is referred to a Public Hearing.

REASON FOR REPORT

Liquefaction is generally prohibited in the District of North Vancouver. HTEC would like to build a hydrogen liquefaction facility at 100 Forester Street which requires an amendment to the Zoning Bylaw.

SUMMARY

The applicant, Hydrogen Technology and Energy Corporation – HTEC have applied on behalf of the owners of the property, ERCO Worldwide, for a text amendment to the Zoning Bylaw to permit a Hydrogen Liquefaction Facility at 100 Forester Street.



In order for this to occur, a site-specific Zoning Bylaw amendment is required to allow for the manufacturing of a hazardous substance.

A Quantitative Risk Assessment (QRA) was undertaken by Doug McCutcheon, a subject matter expert. The McCutcheon assessment concludes that the risks associated with this proposed industrial use, and more particularly the

risks associated with release of liquid hydrogen from the proposed plant, meet the threshold set by the risk criteria developed by the Canadian Society for Chemical Engineering – Process Safety Management Division (e.g. 1:1,000,000 risk of death annually), subject to satisfaction of a set of conditions. The conditions will be secured in a covenant to be registered on title prior to Council consideration of adoption of the proposed zoning amendment bylaw.

Given the findings of the McCutcheon study, the proposed Zoning Bylaw amendment is supportable.

BACKGROUND

HTEC has been a leader in the production, storage, transportation and use of liquid hydrogen for over 2 decades. Information on HTEC is available on their website: www.htec.ca

In late 2022 HTEC entered into a purchase agreement with ERCO Worldwide to purchase the subject property at 100 Forester Street.

The existing ERCO plant has been producing hydrogen gas as a by-product of its operations since 1957. This hydrogen is primarily vented into the atmosphere. HTEC's proposal is to construct a hydrogen facility to capture, purify and liquefy the hydrogen so that it can be used as an alternative transportation fuel.

Hydrogen liquefaction is not a new technology, with 14 hydrogen liquefaction plants in operation across North America, including several that date back to the 1970s and 1980s.

Hydrogen fuel cell electric vehicles are a useful alternative to battery powered electric vehicles providing greater ranges and faster refuelling times. Hydrogen-powered transportation is particularly well suited to hard-to-electrify transportation modes such as heavy trucking, marine shipping, and aviation where an energy-dense fuel is required.

The use of hydrogen electric fuel cell vehicles is growing with over 56,000 cars currently in use worldwide, of which approximately 12,000 are on the road in California. Sales have been slower in BC in part due to the limited supply of hydrogen fuel and fueling stations. In 2019, HTEC partnered with 7-Eleven/ Esso stations to create locations for hydrogen fueling and in 2020, a hydrogen pump was added at the Westview 7-Eleven/ Esso.

SITE AND SURROUNDING AREA

Looking west across the Maplewood Industrial Area, subject site shown in blue, proposed hydrogen plant shown in red, approximately ½ km south of Dollarton Highway.

The subject property, outlined in blue, is located in the Maplewood industrial area. The immediate neighbours include Chemtrade chlorine plant to the south-west, established in 1957, GFL liquid waste facility to the north, and on the same legal lot, ERCO Worldwide's sodium chlorate plant also established in 1957. Further north are the multi-storey business park and light industrial developments. To the south is a tree covered berm and tidal mudflats. The subject site is located over 500 metres (1/2 km) from the closest residents.

The red dashed line highlights the portion of the site to be used for the hydrogen facility. This area is approximately 2.3-hectare (5.7 acre) of the larger 7.74 hectare (19 acre) property and is located at the south portion of the site.

Looking north-east across the subject property outlined in blue, the red dashed line shows the approximate location of the proposed hydrogen facility.

POLICY ALIGNMENT

Federal Government Direction

In 2020, the Government of Canada released its *Hydrogen Strategy for Canada*[1] and announced the development of a low carbon hydrogen economy as a strategic priority to assist Canada in meeting its climate action goal of becoming net-zero by 2050.

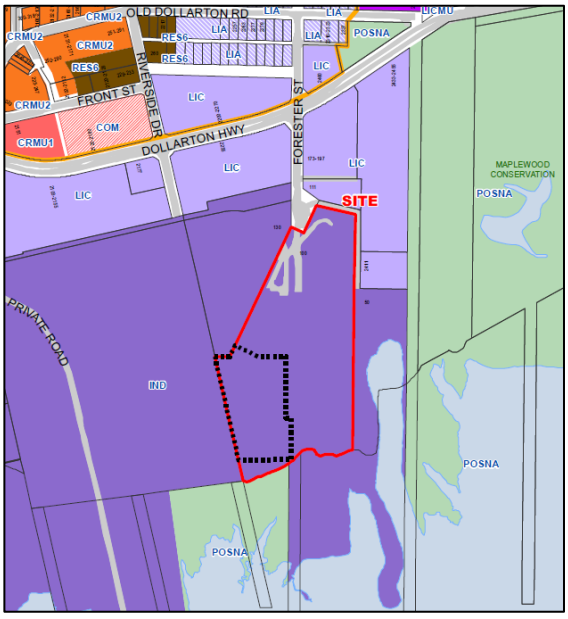
Provincial Government Direction

The *BC Hydrogen Strategy*[2] outlines the Province's actions to accelerate the development of BC's hydrogen sector to create economic opportunities, reduce carbon emissions and overcome our reliance on fossil fuels.

The BC Hydrogen Office[3] is a single point of contact for hydrogen projects and coordinates regulatory, permitting and environmental requirements. This office is already aware of this project and will be working with HTEC as their project moves forward.

DNV Land Use

The subject property is designated Industrial in the District's Official Community Plan (OCP). The proposal is consistent with the OCP designation and will not require an OCP amendment.



Left: The Official Community Plan designation for the area is Industrial.

DNV Economic Development

This project is in keeping with the Targeted OCP Action Plan's economy and employment lands goal as the project will:

- Intensify use of industrial lands;
- Generate capital investment of $140 million;
- Support job creation;
- Support the production of a low carbon energy source; and
- Establish the District as leader in the green economy.

1. https://natural-resources.canada.ca/sites/nrcan/files/environment/hydrogen/NRCan_Hydrogen-Strategy-Canada-na-en-v3.pdf
2. https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/electricity-alternative-energy/electricity/bc-hydro-review/bc_hydrogen_strategy_final.pdf
3. https://www2.gov.bc.ca/gov/content/industry/electricity-alternative-energy/renewable-energy/hydrogen-office

DNV Climate Action

This project is in keeping with District climate action policies including the OCP Priority Action to reduce greenhouse gas emissions. The emissions intensity of hydrogen production differs widely depending on the production method. Hydrogen captured at the subject site is considered *low emissions* hydrogen and thus can considerably reduce emissions by displacing the use of fossil fuels. Hydrogen is expected to play a key role in sectors that require high energy density where electrification is more challenging such as heavy-duty transportation.

The creation of a steady supply of liquid hydrogen will facilitate more vehicles fuel switching thereby reducing carbon emissions. **This facility would have the capacity to reduce green house gas (GHG) emissions by 140,000 tonnes C02e / year. This is roughly equivalent to the GHGs generated by 500 heavy duty vehicles or 30,000 light duty vehicles per year.**

Filling up a hydrogen fuel cell electric car at Westview's Hydrogen pump.

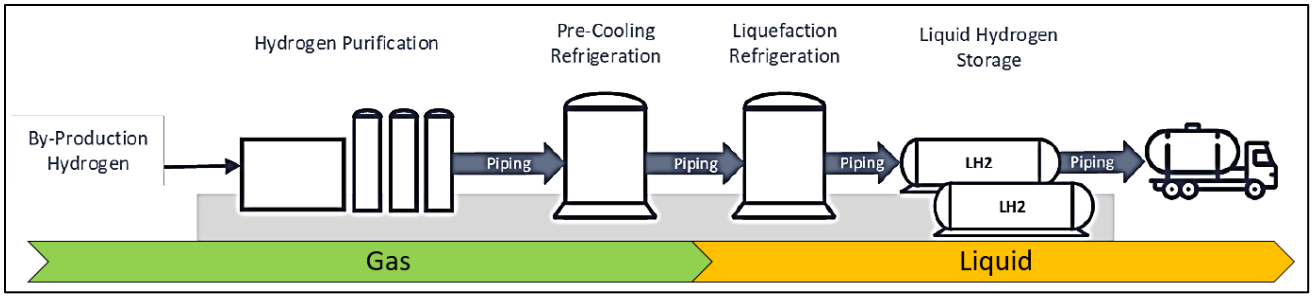
ANALYSIS

The site is zoned Employment Zone Industrial (EZ-I) which permits manufacturing and processing of materials, including the existing ERCO Worldwide facility which manufactures crystallized sodium chlorate for the pulp and paper industry.

Left: ERCO's sodium chlorate crystals are bagged for shipping.

While manufacturing is a permitted use, under the General Regulations section of the Zoning Bylaw (Section 403A (f)), the manufacture and storage of hazardous materials is prohibited, where the definition of hazardous materials includes compressed or liquefied gases. The intent of this general regulation is to ensure safety and compatibility of permitted uses in the District and allow for a site specific review of each proposal prior to a project being approved.

HTEC's proposal to liquify and store the hydrogen resulting from ERCO's manufacturing process, falls within the definition of "compressed or liquefied gases" and as such is not permitted without a site-specific review and zoning amendment.



Steps in the Processing of Hydrogen - The Zoning Bylaw's definition of hazardous materials is triggered when the hydrogen already on-site is liquefied and stored.

To address the requirement for a site-specific study on the impacts of introducing hydrogen liquefaction and storage to this site, a Quantitative Risk Assessment (QRA) has been conducted by Doug McCutcheon, an expert in this field. The McCutcheon assessment concludes that the risks associated with this proposed industrial use, and more particularly the risks associated with release of liquid hydrogen from the proposed plant, meet the threshold set by the risk criteria developed by the Canadian Society for Chemical Engineering – Process Safety Management Division (Major Industrial Accidents Council of Canada (MIACC)) (e.g. 1:1,000,000 risk of death annually).

The QRA was also peer reviewed by qualified professionals at SLR Consulting, who wrote, "the recommendations of the Consultant are reasonable, defensible and can be relied on by DNV."

Proposed Rezoning Bylaw 1426 (Bylaw 8626) limits the manufacturing and storage of hydrogen to the location and quantities discussed in the McCutcheon report.

In addition to the Quantitative Risk Assessment, HTEC is also meeting Federal and Provincial safety requirements and those established by the Canadian Society for Chemical Engineering. These include a variety of safety-oriented studies and workshops aimed at risk reduction at each stage in the planning, design, construction, commissioning and operation of this proposed facility. Highlights of this list of additional safety work include:

- Hazard and Operability Studies (HAZOP) (repeated as designs progress)
- Hazard Identification workshops (HAZID) (repeated as designs progress)
- Qualitative Risk Assessments (repeated as designs progress)
- Construction Risk and Safety Assessment;
- Emergency Response Planning
- Fire Safety Plan
- Standard Operating Procedure (SOP) development
- Pre-Start Up Safety Review (PSSR)
- Employee and Contractor Training Plan

A development covenant will be registered on title prior to Bylaw Adoption limiting hydrogen processing to the levels and locations discussed in the McCutcheon Quantitative Risk Assessment and ensuring any noted conditions are secured.

DEVELOPMENT PERMITS AND DETAILED DESIGN REQUIREMENTS

If this rezoning is supported, the applicant will move forward with detailed design and submit a Development Permit application for industrial construction. Commitment to undertaking all necessary off-site servicing upgrades will be secured prior to Bylaw Adoption.

Left – looking southeast across the site, Right- artist's rendering showing a very early schematic design in white.

CONCURRENCE

The project has been reviewed by staff from the Economic Development, Environment, Building and Permits, Legal, Engineering, Community Planning, North Shore Emergency Management, Fire Department and Climate Action teams.

PUBLIC INPUT

ERCO Worldwide and HTEC have brought this proposal to the attention of their neighbours and stakeholders including:

- Issuing a press release on this proposal on December 5th, 2022, which led to articles in the local media and in industry specific blogs and newsletters as varied as "Sustainable Biz," "Chamber of Shipping" and the "Hydrogen Fuel News," and included:
    - North Shore News Article, December 7, 2022, https://www.nsnews.com/local-news/hydrogen-north-vancouver-waterfront-6215593; and
    - Daily Hive article on December 9th, 2022, https://dailyhive.com/vancouver/htec-hydrogen-production-plant-100-forester-street-north-vancouver.
- Attending a February session of the Community Advisory Panel, a panel of industry and community representatives in Maplewood, to present the HTEC proposal.

- Forwarding information on the public information meetings to the April Community Advisory Meeting.

With the commencement of the rezoning process, HTEC worked with staff to set up both virtual and in-person Public Information Meetings. Notices for these public meetings have been widely circulated by email, postal drop, and hand delivered to properties in the notification area by a team of 8 HTEC and ERCO employees.

As the public input process is still ongoing at the time of writing this report, the results of the public process will follow in an agenda addenda report that will be provided to Council prior to consideration of Bylaw Introduction.

At this time, the virtual public meeting has been ongoing for 1 week, and the in-person public meeting has been held, resulting in 4 written comments. Comments include the following themes:

- Questions and concerns related to safety and ensuring this project meets industry standards.
- Questions about hydrogen fuel cell vehicles and how they compare to standard electric cars and interest in the hydrogen fuel cell car that was on display at the in-person meeting.
- Support for the proposal.

CONCLUSION

This project assists in implementation of the District's Official Community Plan objectives related to the economy and employment lands and climate action. The site-specific text amendment is now ready for Council's consideration.

OPTIONS

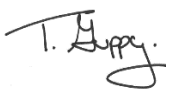
The following options are available for Council's consideration:

1. Introduce Rezoning Bylaw 1426 (Bylaw 8626) and refer to a Public Hearing (staff recommendation);

2. Refer the project back to staff for further consideration; or

3. Defeat the bylaw at First Reading.

Respectfully submitted,



Tamsin Guppy
Planner

ATTACHMENTS

1. Rezoning Bylaw 1426 (Bylaw 8626))CDNV_DISTRICT_HALL-#5985928-BYLAW 8626 - Rezoning Bylaw 1426
2. HTEC's information package CDNV_DISTRICT_HALL-#5988321-100_FORESTER_ST - HTEC Overview of Proposal

REVIEWED WITH:

❑ Community Planning	____	❑ Clerk's Office	____	External Agencies:	
❑ Development Planning	____	❑ Communications	____	❑ Library Board	____
❑ Development Engineering	____	☐ Finance	____	❑ NS Health	____
❑ Utilities	____	❑ Fire Services	____	❑ RCMP	____
❑ Engineering Operations	____	❑ ITS	____	❑ NVRC	____
❑ Parks	____	❑ Solicitor	____	❑ Museum & Arch.	____
❑ Environment	____	❑ GIS	____	❑ Other:	____
❑ Facilities	____	❑ Real Estate	____		
❑ Human Resources	____	❑ Bylaw Services	____		
❑ Review and Compliance	____	❑ Planning	____		

ATTACHMENT 1

The Corporation of the District of North Vancouver

Bylaw 8626

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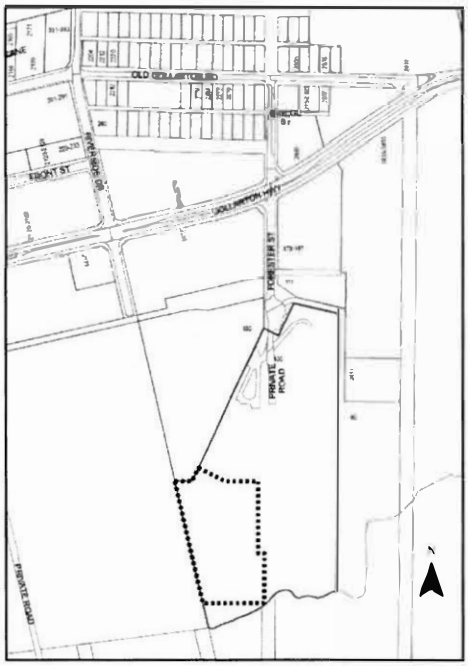


READ a first time

PUBLIC HEARING held

READ a second time

READ a third time

ADOPTED

Mayor

Municipal Clerk

Certified a true copy

Municipal Clerk

HTEC's Proposed BC Hydrogen Liquefier Project – Development Outline

December 2022

HTEC
FUELING THE DRIVE TO HYDROGEN
www.htec.ca

Project Overview & Benefits

Figure 1: 100 Forester Street, North Vancouver

HTEC has entered into an agreement with ERCO Worldwide (ERCO) to purchase its industrial land at 100 Forester Street in the District of North Vancouver and intends to expand the existing facility to include a 15-tonne per day (TPD) hydrogen liquefier. ERCO will lease back a portion of the land on a long-term basis to continue its sodium chlorate manufacturing operations, which produces low-carbon intensity hydrogen as a by-product. HTEC's hydrogen facility will capture, purify, and liquefy the by-product hydrogen to meet the growing market demand for low-carbon transportation fuels. The proposed project will be the first in Western Canada, providing low-carbon transportation fuel for zero-emission fuel cell electric vehicles. It will demonstrate how 'old' and 'new' industries can work together in B.C. to transform energy production and usage in the Province cost-effectively. In addition, the project supports, the:

- District of North Vancouver's Official Community Plan
- Reduction of GHG emissions up to 141 kilotonnes CO_2e per year, helping BC reach its CleanBC GHG emission reduction targets
- Development of the Province's hydrogen industry in accordance with the *BC Hydrogen Strategy*

On November 25, 2022, HTEC entered into definitive agreements with ERCO to purchase the 100 Forester Street land. ERCO will sell the by-product hydrogen produced from the sodium chlorate process to HTEC. HTEC is currently undergoing a **90-day due diligence period for the closing of the land sale.** ERCO's facility is ideally suited for a hydrogen liquefier, as it:

- Produces by-product hydrogen, which is primarily vented to the atmosphere today
- Is zoned for industrial use
- Has ~20 MW of transmission capacity to support the liquefier power demand
- Is situated in a municipality that officially recognizes the climate emergency
- Is near HTEC's Metro Vancouver hydrogen fueling station network

Preliminary analysis indicates socio-economic benefits of the proposed project will be substantial:

- Create more than 50 jobs in BC, directly related to the build and operation of the liquefaction plant, as well as through growth in supporting businesses
- Generate tax revenue for the District of North Vancouver with operating revenues of over $40 million per year

- Supply hydrogen fuel to more than 30,000 fuel cell electric vehicles enabling further deployment of zero-emission vehicles on Canadian roads
- Allow ERCO's current manufacturing operations to continue, retaining the employment of 40 personnel

Furthermore, the liquid hydrogen produced from the proposed facility will fuel HTEC's growing network of stations across BC and provide fuel to third parties in the transportation industry. The development of this facility poses a highly strategic opportunity to expand the hydrogen industry in BC, and decarbonize the transportation industry by capturing and utilizing a stream of by-product hydrogen that already exists today from the ERCO facility.

Liquid Hydrogen

Due to its greater volumetric density, liquid hydrogen provides advantages across the transportation, storage and fueling stages of the value chain when compared to gaseous hydrogen. For example, liquid hydrogen trailers have greater storage capacities when compared to compressed gas tube trailers and carry between 4 to 10 times the mass of hydrogen than that of a gaseous tube trailer. This allows for fewer trucks and trips to supply a network of hydrogen fueling stations, lowering transportation costs across a station network. In some applications, liquid hydrogen is also used for onboard storage, allowing vehicles and equipment to store more fuel in a given volume.

Conversion of gaseous hydrogen to liquid form requires cooling to cryogenic temperatures through a liquefaction process. Although hydrogen exists as a gas under normal temperatures and pressure, it must be cooled to -253 degrees Celsius to exist as a liquid under atmospheric pressure. Cooling hydrogen to this temperature is achieved through a refrigeration cycle utilizing compressors, expanders, and heat exchangers.

Liquid hydrogen has been produced and used commercially for decades. In addition to numerous industrial uses, liquid hydrogen has historically been used as a fuel in the aerospace industry. While this project will be the first in Western Canada, hydrogen liquefaction plants exist across North America. Numerous liquid hydrogen production facilities were built across the United States through the 1980s and are still operating today. As of 2020, liquefaction capacity across Canada and the United States was approximately 51 TPD and 241 TPD, respectively[1].

Figure 2: Liquid Hydrogen Production Capacities as of 2020

Table 1 shows a list of hydrogen liquefaction plants that are in operation across the US and Canada[2]. Hydrogen liquefaction is not a novel process. With the rise of investments in hydrogen production, many hydrogen liquefaction facilities have been announced in recent years. Most notably in Canada, Air Products has announced a 30 TPD liquefaction facility near Edmonton, Alberta, which it plans to have in operation by 2024.

Country	Location	Operated by	Capacity (TPD)	Commissioned	Still in operation
Canada	Sarnia	Air Products	30	1982	Yes
Canada	Becancour	Air Liquide	12	1988	Yes
Canada	Magog, Quebec	Messer Canada	12	1988	Yes
USA	Ontario, CA	Linde	20	1962	Yes
USA	New Orleans	Air Products	34	1977	Yes
USA	New Orleans	Air Products	34	1978	Yes
USA	Niagra Falls, NY	Linde	18	1981	Yes
USA	Sacramento	Air Products	6	1986	Yes
USA	Niagra Falls, NY	Linde	18	1989	Yes
USA	Pace	Air Products	30	1994	Yes
USA	McIntosh	Linde	24	1995	Yes
USA	East Chicago	Linde	30	1997	Yes
USA	Las Vegas	Air Liquide	30	2022	Yes
USA	La Porte, TX	Linde	27	2021	Yes

Table 1: Operating Hydrogen Plants in North America

[1] L. Decker. Latest Global Trend in Liquid Hydrogen Production
[2] J. Stang and P. Neska. Development of large-scale hydrogen liquefaction processes from 1898 to 2009.

Plant Overview

HTEC's proposed liquefaction plant will be co-located on the ERCO property adjacent to the sodium chlorate plant. The HTEC team has already initiated a System Impact Study (SIS) with BC Hydro. They have confirmed that the regional transmission system has sufficient capacity to support a 20 MW load at this site. The site exists in Employment Zone Industrial (EZ-I) zoning and neighbours the Chemtrade chlor-alkali plant and other industrial facilities, as shown on the following page.

ERCO produces sodium chlorate in its facility for use in the pulp and paper industry through the electrolysis of brine. Gaseous hydrogen is produced as a by-product and is primarily vented to the atmosphere today. Figure 3 below shows the overall block flow diagrams for the proposed liquefaction facility. The facility would treat the by-product hydrogen, remove water vapour, nitrogen and oxygen impurities, and bring the hydrogen gas to fuel cell specification. The treated hydrogen gas would then be cooled through a series of heat exchangers. It is important to note that ERCO is the manufacturer of the hydrogen gas and has been producing hydrogen on site since 1957. ERCO installed hydrogen compressors to supply a portion of the fuel to the neighbouring Chemtrade facility for heat generation. HTEC's facility will take the by-product stream that would otherwise be emitted, and will clean, dry and liquefy the hydrogen so that it can be moved offsite to hydrogen fueling stations.

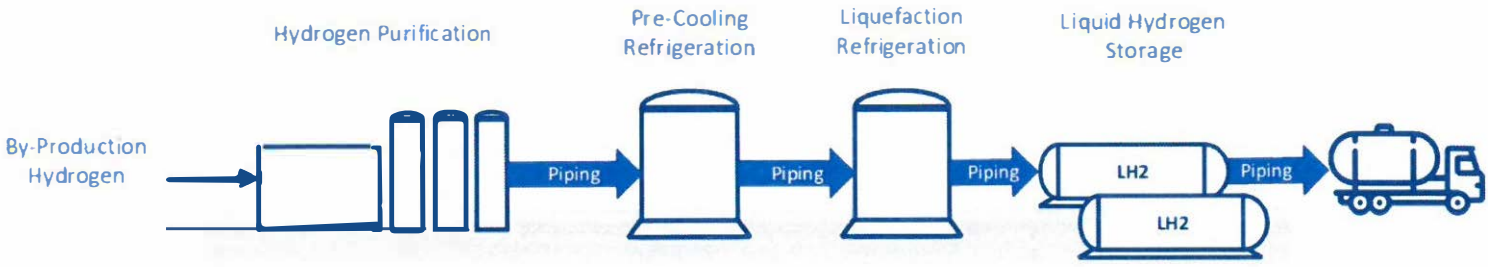
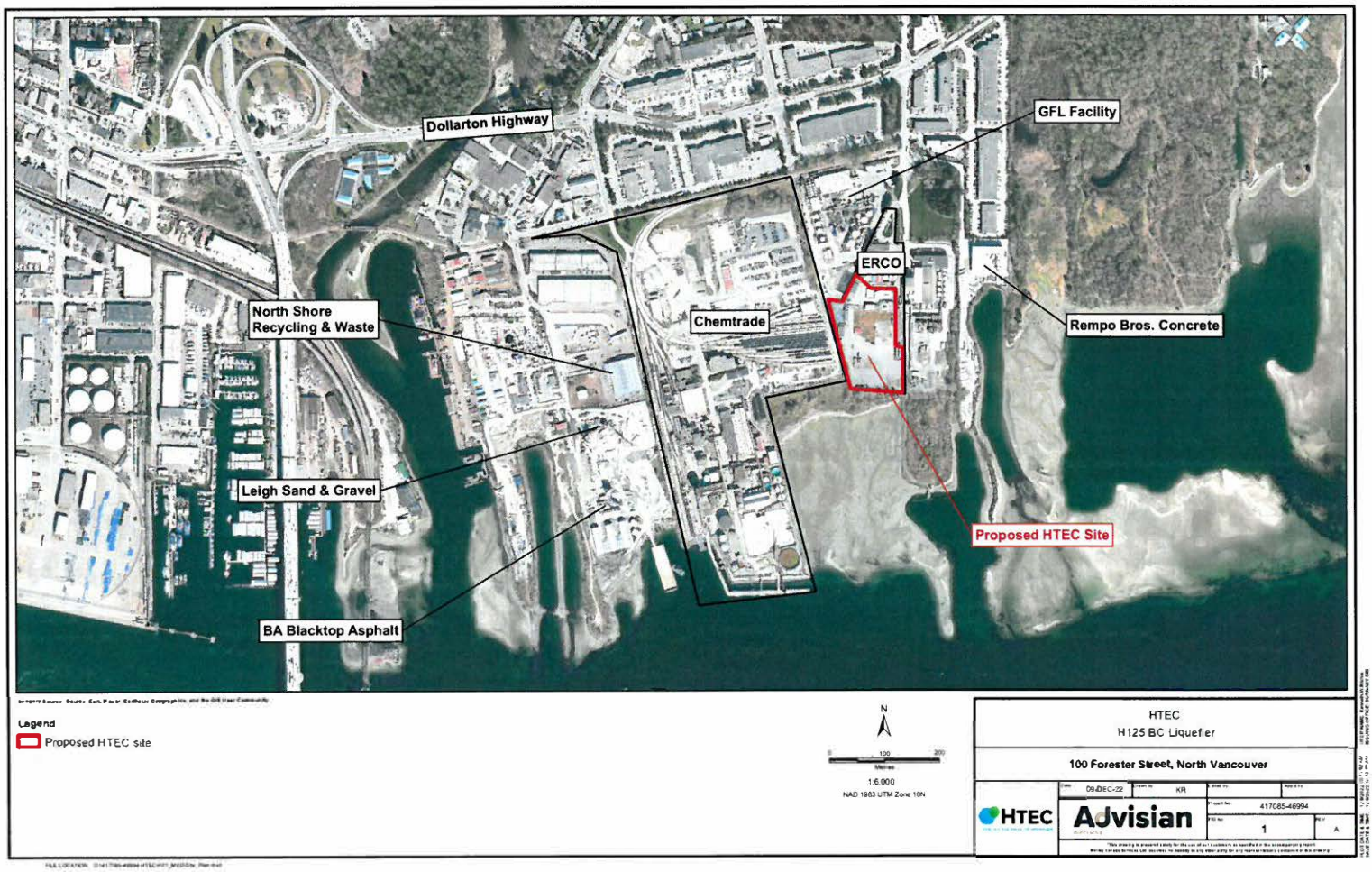


Figure 3: Liquefaction Process Overview


Dollarton Highway
GFL Facility
ERCO
North Shore
Recycling & Waste
Chemtrade
Rempo Bros. Concrete
Leigh Sand & Gravel
Proposed HTEC Site
BA Blacktop Asphalt
Legend
Proposed HTEC site
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H125 BC Liquefier
100 Forester Street, North Vancouver
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The site layout has been designed to minimize impact on the operation of ERCO's facilities. Figure 4 below shows the original ERCO site and HTEC's proposed layout.

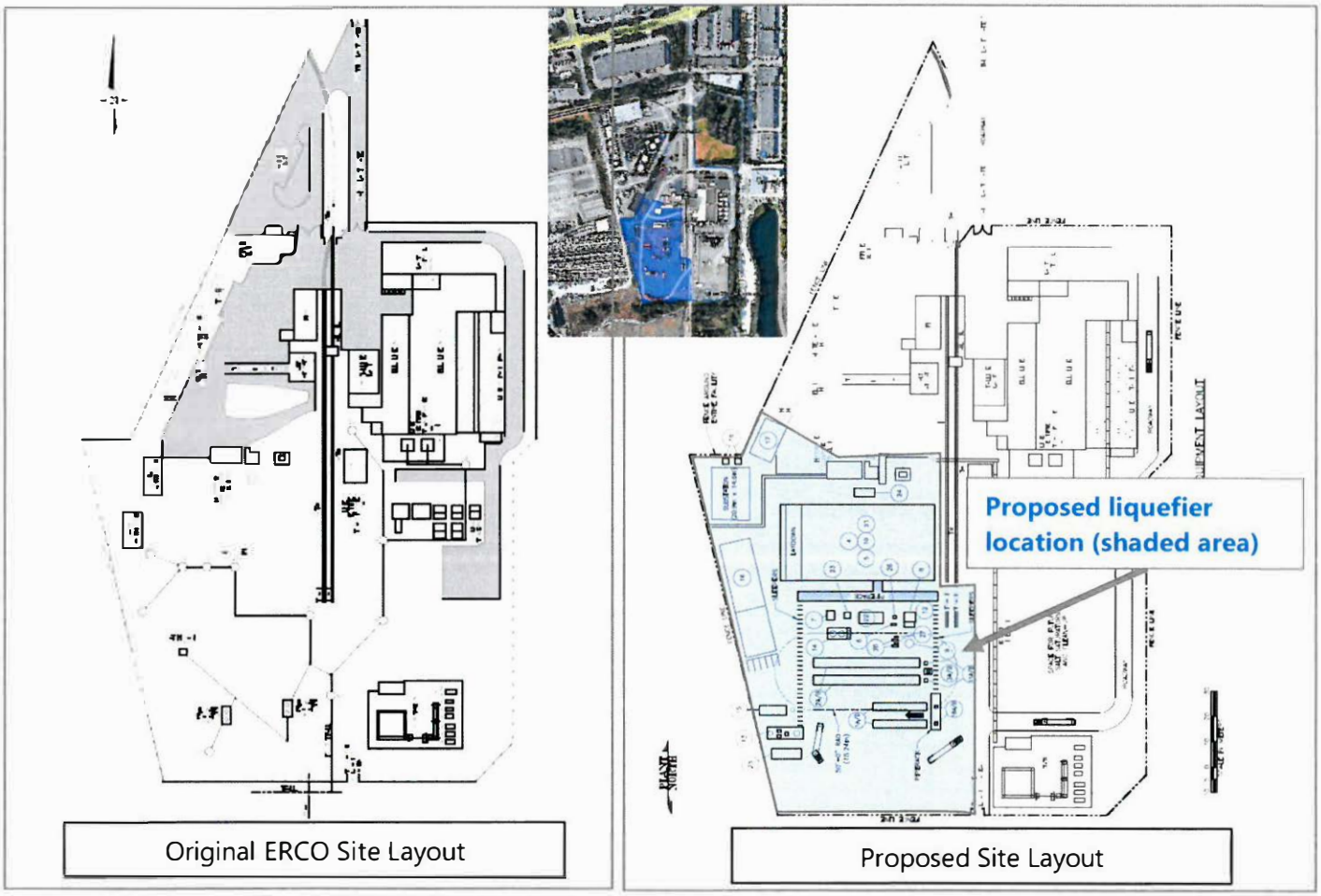


Figure 4: Original and proposed layout of the ERCO and HTEC facilities

Appended with this memo is the preliminary site layout of HTEC's proposed development. The facility will include two double-walled liquid hydrogen tanks (item 2A/B in the attached ERCO-HTEC site layout) with a storage capacity of 90,000 gallons per tank. The liquid hydrogen is stored at -253 degrees Celsius and approximately 1.5 bar. This storage capacity represents about 48,000 kg of liquid hydrogen. On an equivalent energy basis, this would equate to approximately 192,000 litres of gasoline or, *roughly the fuel capacity of one retail gasoline station.*

Safety

HTEC is committed to the highest standards of safety for our employees, contractors, clients, and the public. Safety is paramount to everyone at HTEC, and the company operates on a "Safety First" mentality. HTEC has an integrated program to ensure facilities are designed, built, and operated to manage risks associated with health, safety, and environmental incidents. HTEC's Health, Safety & Environmental (HSE) processes, which include risk management strategies, are comprehensive. HTEC employees treat hydrogen with the utmost respect. We are very proud of our safety record delivering close to 100,000 kg of hydrogen safely over the last ten years.

HTEC also designed its own Life-Saving Rules (LSR), which are an extension of its HSE program. As a progressive industry-leading company, HTEC is one of the first companies in the hydrogen space to develop these 7 Life Saving Rules. In alignment with Energy Safety Canada and practices followed by established oil companies, these rules help guide effective work planning and hazard identification while empowering our workers to pause when faced with high-risk activities and intervene when required.

As outlined in the sections above, liquid hydrogen facilities have been safely operated across Canada and the US since the early 1960s, some in close proximity to urban development. For example, Air Liquide's facilities in Niagara Falls, NY, and East Chicago, IL, are both located near urban communities. As demonstrated in the figure below, Air Liquide's Niagara Falls plant is located approximately 500 m from the nearest residential development.

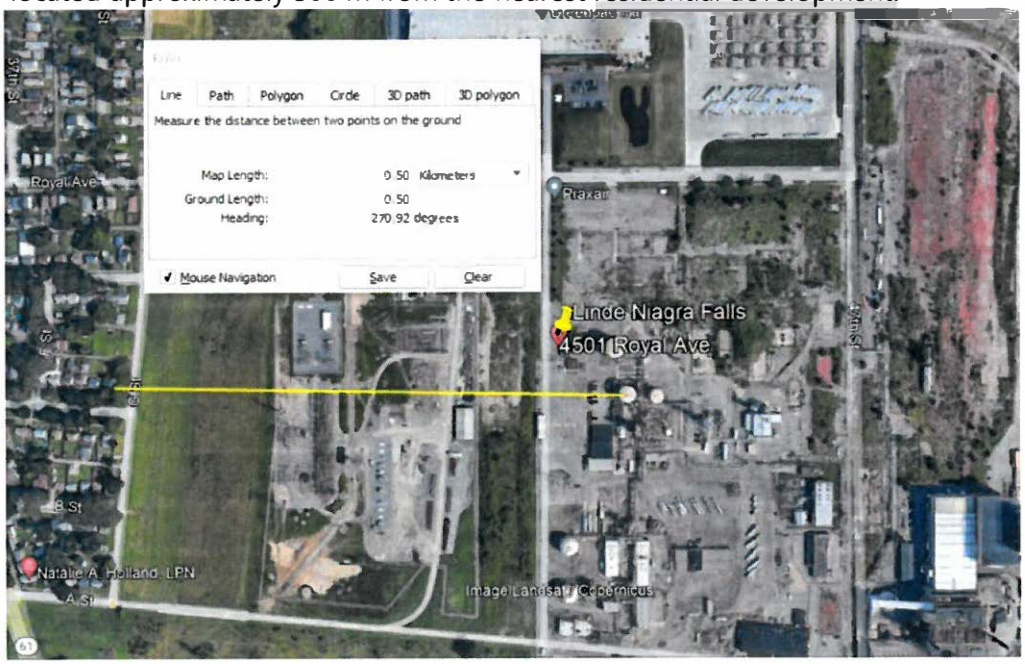


Figure 5: Air Liquide Niagara Falls, NY

HTEC's proposed facility is being engineered according to the most recent and relevant codes and standards. Appendix D outlines the relevant design codes and standards which have been identified as part of the preliminary front end engineering that has been completed for the facility to date.

HTEC has designed and built several public hydrogen fueling stations in dense urban settings in cooperation with and under permit by the provincial safety regulators, Technical Safety British Columbia (TSBC). TSBC is charged with enforcing the BC Safety Standards Act to ensure public safety and compliance under the Canadian Hydrogen Installation Code (CHIC).

Liquid tank trailers engineering and manufactured by Chart Industries will transport liquid hydrogen from the proposed facility to HTEC's fueling stations and customers. The liquid tank trailers will be certified for transportation on roadways under the federal and provincial Transportation of Dangerous Goods regulations. HTEC would ensure the safety of the public through compliance under these regulations.

HTEC has contracted a third-party consultant, Doug McCutcheon, to conduct an independent risk assessment for this project (see Risk section below). **The independent risk assessment concluded that risk contours would not extend beyond the current industrial zoning and would not impact the Maplewood district.**

Impacts to the District of North Vancouver

Plant Operations

HTEC is working towards operationalizing the plant and providing liquid hydrogen to the transportation industry by September 2025. Changes to traffic through the site during normal operations will be minimal, with an increase of 26 additional truck movements per week above ERCO's existing average of 82 truck movements per week. The site would be operated 24/7, with approximately 4 HTEC employees on-site during regular weekday hours and maintenance staff on a recurring basis. Parking on the site would be shared with ERCO and utilize the existing parking lot.

Aside from water treatment chemicals and iron oxide which is utilized as a catalyst in the liquefaction process, HTEC's proposed facility introduces no new substances to the site. Liquid nitrogen, used as a coolant in the liquefaction heat exchangers, is already being delivered to the ERCO site for use in the sodium chlorate process.

The facility is being designed to manage noise control following Occupational Safety and Health Administration (OHSA) and International Organization for Standardization (ISO) standards. Therefore, HTEC does not anticipate any noise impacts outside of this facility's proposed site.

Preliminary engineering has been conducted through collaboration with a third-party engineering firm. Current building schematics and equipment specifications indicate that the tallest structure would be approximately 20 meters tall, no taller than the existing ERCO buildings. Therefore, HTEC does not anticipate any visual impacts to the District outside the proposed site.

Plant Construction

Construction of the facility is anticipated to take place over approximately 20 months. Equipment is expected to be transported to the site via truck trailer and will occur once the necessary civil and foundation work has been completed.

Risk

HTEC contracted a third-party consultant, Doug McCutcheon, to conduct an independent risk assessment. The executive summary of the assessment is included in Appendix C, while the complete study forms part of the full PPA submission. The risk assessment concluded that risk contours would not extend beyond the current industrial zoning and would not impact the Maplewood district. The report states, "The risk of a major release of liquid Hydrogen creating an explosion and fire having an impact outside the company property line is within the risk criteria as developed through the Canadian Society for Chemical Engineering – Process Safety Management division (Major Industrial Accidents Council of Canada) *(CSChE-PSM (MIACC))* work." Additionally, HTEC has reviewed the published Maplewood Chemical Hazard Develop Permit Area study and the current zoning applicable to the ERCO site and surrounding area.

Permitting and Zoning

The ERCO site has a Certificate of Compliance (CoC) in place, issued in 2001 following the remediation of metals contamination in soils, groundwater, and sediment. In 2019, a Phase I and a limited Phase II Environmental Site Assessment were conducted of the site. These studies found that no new CSR Schedule 2 Uses had been conducted on the site since 2001, and that similar contaminant levels were encountered as were present following the 2001 remediation. Appendix B contains a memo developed by third-party consultant Active Earth, which justifies the validity of the existing CoC.

The proposed project will be located at 100 Forester Street, which is in an EZ-I Industrial Zone. The project is well-aligned with the stated intent of the Industrial Zone to accommodate port-oriented uses, general manufacturing, and other industrial activities on lands adjacent to the Port and the rail corridor. However, zoning regulation 403A creates a potential challenge to the project as it prohibits the manufacture of hazardous substances in all Zones (Bylaw 5661); the definition of hazardous substances includes 'gases: compressed, deeply refrigerated, liquefied, or dissolved under pressure. Therefore, **this zoning regulation is considered a significant risk to the project. HTEC cannot proceed with the closing of the land sale if certainty around the bylaw and permitting process is not obtained.**

Benefits of the Project

The proposed project will provide significant environmental and economic benefits to the region through the production and distribution of clean hydrogen. Capturing ERCO's low-carbon intensity by-product hydrogen to enable end-use fuel switching in the transportation sector will significantly help reduce greenhouse gas (GHG) emissions. The hydrogen produced from this project could fuel up to 30,000 fuel cell electric vehicles or 500 Class 8 heavy-duty trucks. Taking this number of heavy-duty diesel trucks off the road would result in emissions reductions of up to **141 kilotonnes of CO_2e per year.** This project represents an important step to address the climate emergency that the District has officially recognized.

- First H2 liquefaction plant in BC, enabling decarbonization of transportation
- >140,000 tonnes CO2 emissions reduction potential per year
- Positions DNV and HTEC as leaders in the renewable energy transition
- Protects and creates local jobs
- Strong project economics and tax revenues
- Co-location w/ by-product H2 = lowest cost & fastest path
- HTEC has established channel to market w/ fueling station network

The project is expected to generate substantial positive economic impacts for the local economy. The total capital investment directly related to the land purchase and construction of the liquefaction facility is estimated at **$300 million CAD**. The project is anticipated to generate revenues of over **$40 million CAD per year** in hydrogen sales. It is estimated that the project will create over **50 jobs** in BC directly related to the build and operation of the plant and through growth in supporting businesses. HTEC is currently developing further details around the project's economic impacts and job benefits.

The proposed project is well aligned with **the District of North Vancouver's Official Community Plan**, particularly priority Action 8: Reduce greenhouse gas emissions from buildings, transportation, and waste to address the climate emergency. In addition, HTEC is interested to expand beyond low-carbon fuel supply in the District into growing the network of hydrogen fueling stations that will support the deployment of fuel cell electric vehicles locally.

Alignment with BC Hydrogen Strategy

The project will bolster BC's established Hydrogen Hub in Metro Vancouver. The proposed project is in the heart of Canada's world-leading hydrogen and fuel cell sector, and the increased availability of cost-effective, low-carbon intensity hydrogen will help support pilot projects in innovative new applications such as hydrogen rail pilot projects or those proposed in the BCH2 Ports Project and will support the expanded deployment of commercially mature hydrogen applications.

The project also supports the *British Columbia Hydrogen Strategy*[3], aiding the Province in reaching its objectives of reducing GHG emissions 40% below 2007 levels by 2030 and the CleanBC target of net zero by 2050. The *BC Hydrogen Study* estimates that hydrogen has the potential to reduce annual emissions by 11% of the Province's 2018 emissions by 2050. According to the Study, the projected hydrogen demand in BC could reach up to 1.4 Mt/yr in 2050. The BC Hydrogen Strategy outlines several actions and recommendations to scale up production in the Province, including **"support the development of hydrogen liquefaction, distribution and transmission infrastructure"**.

> Unlocking hydrogen's potential requires acting with urgency and working together to implement the B.C. Hydrogen Strategy. Accelerating the adoption of renewable and low-carbon hydrogen through policy, partnerships, innovation and infrastructure will help us achieve our CleanBC commitments and build a sustainable economy.
>
> B.C. Hydrogen Strategy

The Province has put their direct support behind the proposed project by entering into a Part 3 Agreement under the Greenhouse Gas Reduction (Renewable and Low Carbon Fuel Requirements) Act with HTEC that will issue 75,000 build capacity credits for the project. These credits offer a secure and important contribution to de-risk project financing. Credits will be issued on a milestone basis. The Province's LCFR program is also an important policy lever to support cost-effective fuel sales at hydrogen fueling stations in BC, which is important to create demand for the fuel produced at this facility.

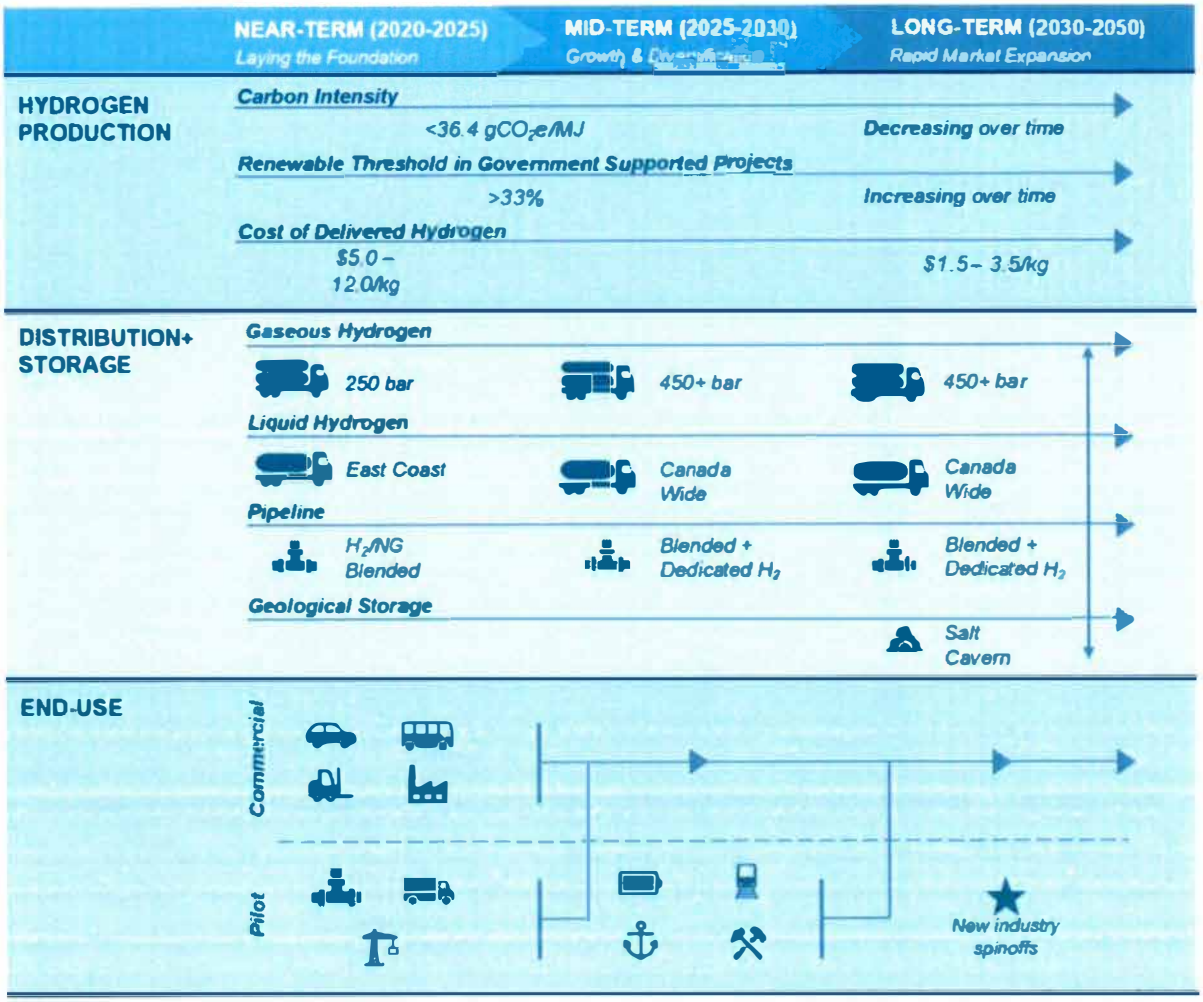
Alignment with Federal Government's Hydrogen Strategy

In 2020, the Government of Canada released its *Hydrogen Strategy for Canada*[4] and announced that the **development of a low-carbon hydrogen economy is a strategic priority for the country**. Canada is well-positioned to be a leading producer, user, and exporter of green hydrogen.

The strategy estimates that across Canada, up to 30% of energy could be delivered in the form of hydrogen by 2050. This translates to a domestic market for hydrogen of 20 million tonnes annually by 2050, contributing up to 190 Mt-CO_2e in emissions reduction potential – equivalent to 25% of Canada's total 2018 emissions. For context, the proposed facility would produce approximately 5,000 tonnes of hydrogen annually. While small relative to the forecasted demand, this facility represents an important first step to establishing at-scale, commercial infrastructure on the West Coast.

[3] https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/electricity-alternative-energy/electricity/bc-hydro-review/bc_hydrogen_strategy_final.pdf
[4] https://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/environment/hydrogen/NRCan_Hydrogen-Strategy-Canada-na-en-v3.pdf

The Hydrogen Strategy for Canada places a significant focus on developing an at-scale hydrogen production and distribution value chain, and specifically calls out the need to develop strategic liquefaction assets Canada-wide in the 2025-2030 timeframe. This project will be the first liquefier on the West Coast. Hydrogen adoption in Canada is expected to be focused on energy-intensive applications where it offers advantages over alternative low-carbon options, such as heavy-duty transportation and industrial heat generation. These markets align with HTEC's offtake plans for the facility.



In addition to their published strategy, the federal government has shown support for developing the hydrogen economy through regulations and policies such as the Clean Fuel Standard and establishment of Zero-emission Vehicle (ZEV) sales targets. It has also made funding available through incentives such as the Clean Fuels Fund, Strategic Innovation Fund, and the Hydrogen Investment Tax Credit announced during the 2022 fall economic statement. The government intends for the new investment tax credit to be available across a range of clean hydrogen pathways. The proposed tax credit will be refundable, and available for eligible investments made as of the day of Budget 2023. The lowest carbon intensity tier that meets all eligibility requirements is proposed to receive an investment tax credit of at least 40 per cent.

The Government of Canada has demonstrated strong support for HTEC's hydrogen infrastructure development plans directly through HTEC's engagement with government officials, and via strategic grant funding support for production facilities and fueling stations.

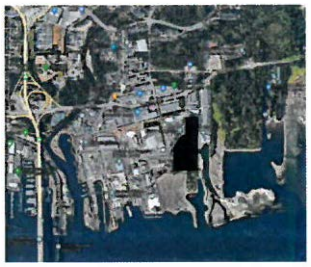
This project represents an opportunity for the District of North Vancouver, Government of British Columbia, and Government of Canada to jointly support construction of a low-carbon fuel facility that will result in decarbonization of our energy system while strengthening Canada's recognized innovation leadership in the hydrogen sector.

Appendix A:

Site Layout

HTEC HYDROGEN LIQUEFACTION PLANT

PPA review



1 A0.0 PROJECT INFORMATION

2 A0.0 LOCATION MAP

3 A0.0 PROJECT CONTACTS

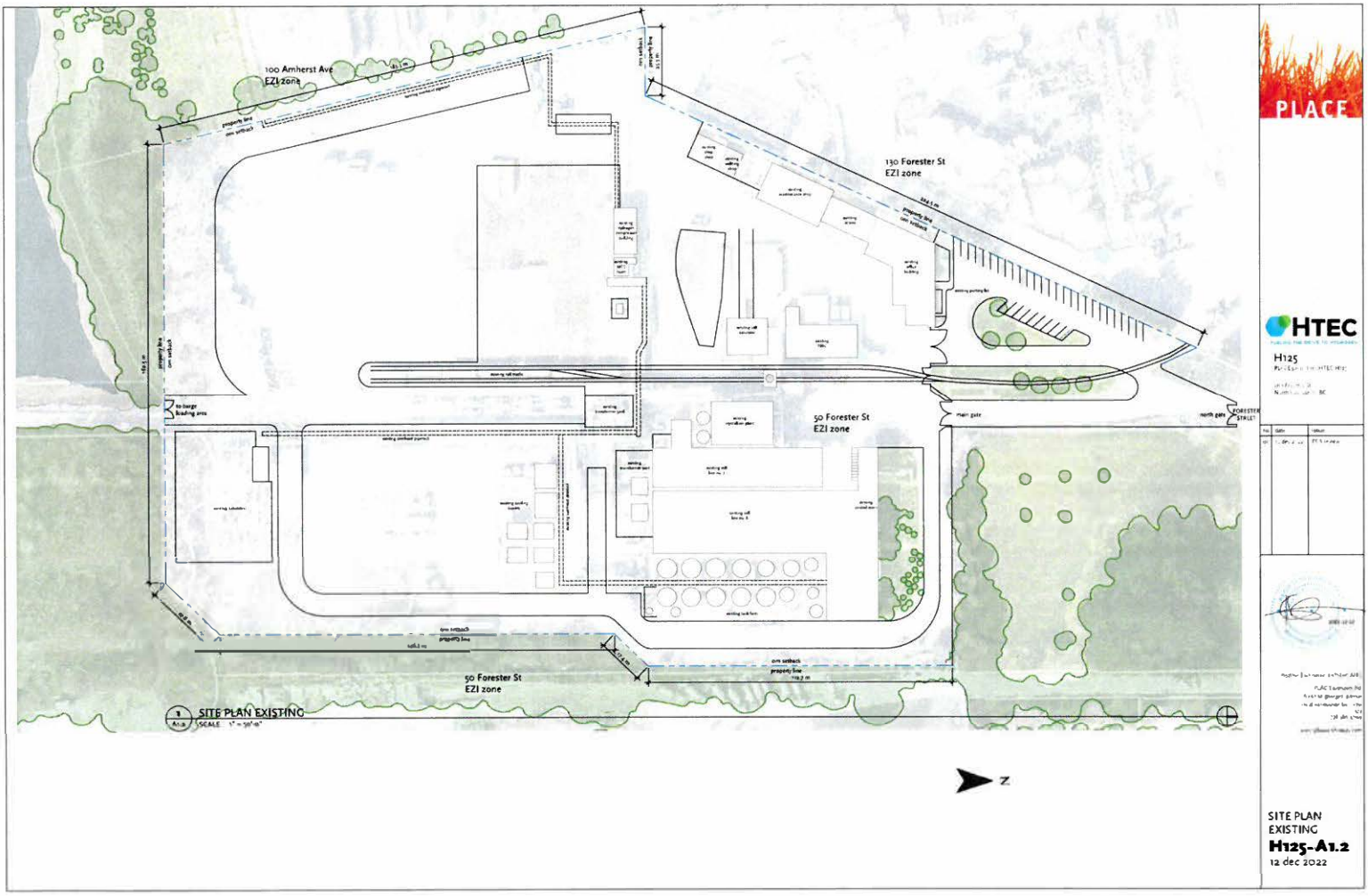
4 A0.0 DRAWING INDEX

PLACE

HTEC

H125

PROJECT INFORMATION
H125-A0.0
12 dec 2022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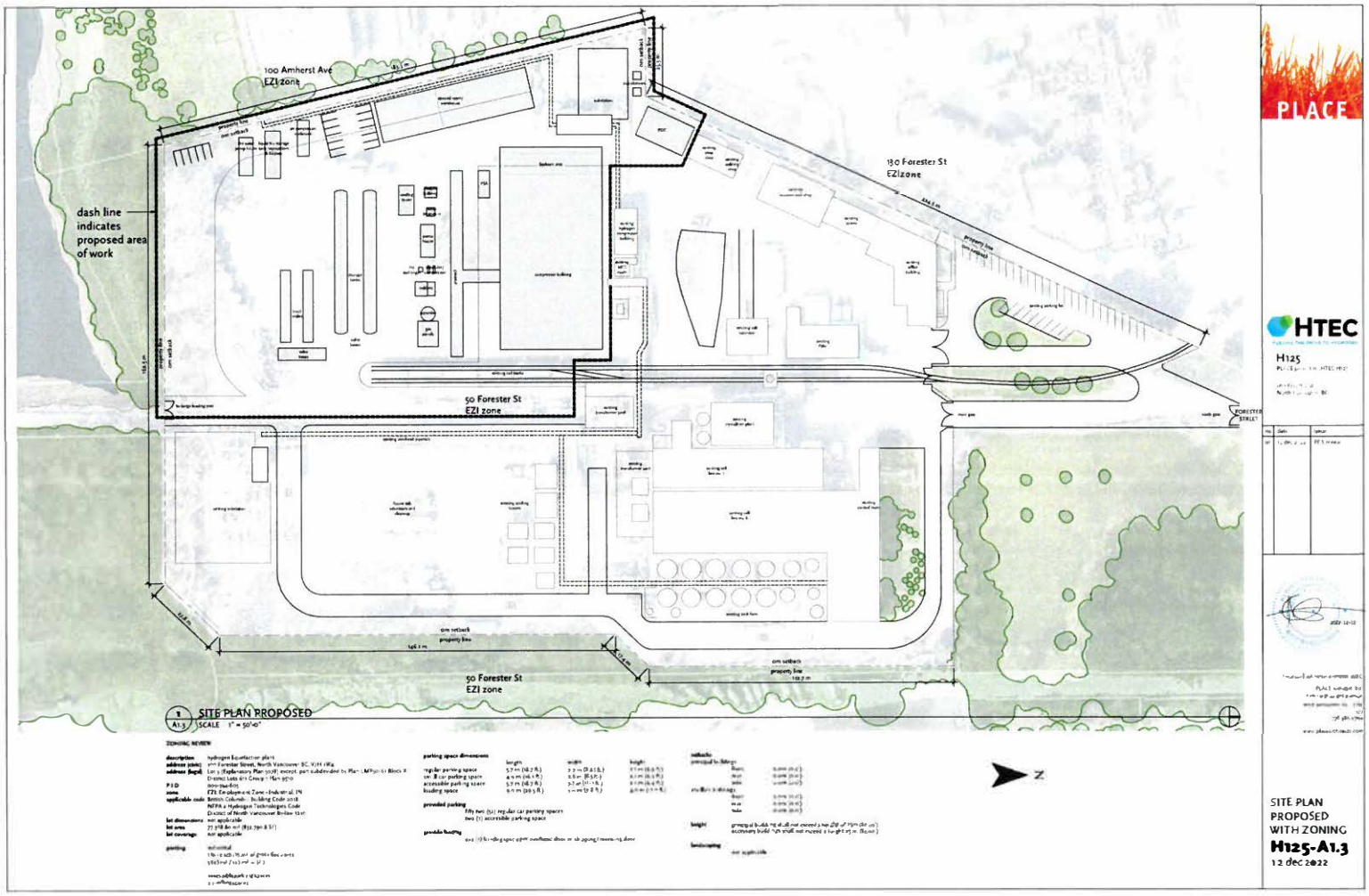
EZI zone
130 Forester St
EZI zone
50 Forester St
EZI zone
50 Forester St
EZI zone
to barge loading area
main gate
north gate
FORESTER STREET
SITE PLAN EXISTING
SCALE
N
PLACE
HTEC
H125
SITE PLAN
EXISTING
H125-A1.2
12 dec 2022


100 Amherst Ave
EZI zone
180 Forester St
EZI zone
dash line
indicates
proposed area
of work
50 Forester St
EZI zone
50 Forester St
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om setback
property line
om setback
property line
SITE PLAN PROPOSED
SCALE 1" = 50'-0"
PLACE
HTEC
H125
SITE PLAN
PROPOSED
WITH ZONING
H125-A1.3
12 dec 2022

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Public Hearings

OFFICIAL COMMUNITY PLAN AND ZONING BYLAW AMENDMENTS

When: Tuesday, June 13, 2023 at 7pm.

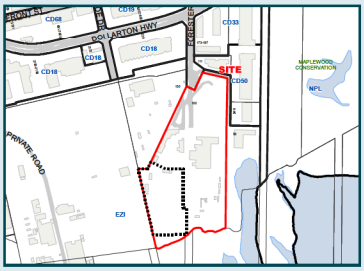
Where: Council Chamber, 355 W. Queens Rd, North Vancouver, BC

How: The Public Hearing will be held in a hybrid format with a combination of in-person and electronic participation by some of all members of council, staff and the public. The public are invited to attend at the Council Chamber where they will be able to see and hear the entire proceedings. Those wishing to view or to participate in the meeting electronically may do so at https://dnvorg.zoom.us/j/67910218298 or by phone by dialling 1-778-907-2071 and entering Meeting ID: 679 1021 8298

Two public hearings will occur consecutively in the following order:

100 Forester Street

What? A Public Hearing for Bylaw 8626, an amendment to the Zoning Bylaw to create an exception to Section 403A "Uses Prohibited in All Zones", Subsection (1)(f) "the manufacture of hazardous materials" to allow the manufacturing, liquefaction and storage of hydrogen with a maximum storage capacity of 180,000 US gallons on the portion of 100 Forester Street outlined with the black dashed line on the map, below.



Questions?
Tamsin Guppy, Development Planner
604-990-2391 or guppyt@dnv.org

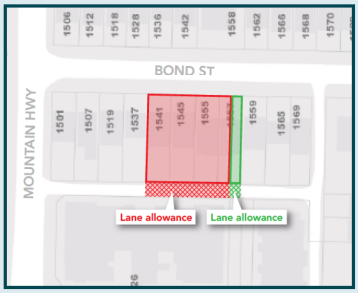
1541-1557 Bond Street and a portion of lane allowance

What? A Public Hearing for Bylaws 8623 and 8622, proposed amendments to the Official Community Plan (OCP) and Zoning Bylaw to permit the creation of a six-storey, 65-unit residential rental housing development and a contribution to the Green Spine Linear Park at 1541-1557 Bond Street and a portion of lane allowance.

What changes?
Bylaw 8623 proposes to amend the OCP land use designation of the portion of the subject site and lane allowance outlined in red from Residential Level 5: Low Density Apartment (RES5) to Residential Level 6: Medium Density Apartments (RES6) and the portion of the subject site and lane allowance outlined in green to Parks Open Space and Natural Areas (POSNA).

Bylaw 8622 proposes to amend the District's Zoning Bylaw by rezoning the portion of the subject site and lane allowance outlined in red from Single Family Residential 6000 Zone (RS4) to create a new Comprehensive Development Zone 144 (CD144) and the portion of the subject site and lane allowance outlined in green to Neighbourhood Park (NP). The CD144 Zone addresses permitted and accessory uses, conditions of use, and Zoning provisions such as density, amenities, setbacks, height, site and building coverage, landscaping and stormwater management, flood construction requirements, and parking and loading requirements.

Questions?
Kevin Zhang, Development Planner
604-990-2321 or zhangk@dnv.org



PROPOSED*

**Provided by applicant for illustrative purposes only. The actual development, if approved, may differ.*

When and How can I provide input?

We welcome your input on June 13, 2023 at 7pm. You may sign up to speak at the hearing by contacting the Municipal Clerk at signup@dnv.org prior to 3pm on Tuesday, June 13, 2023. You may also provide a written submission at any time prior to the close of the public hearing by sending it to the Municipal Clerk at input@dnv.org or by mail to Municipal Clerk, 355 West Queens Road, North Vancouver, BC, V7N 4N5. After the speakers list has been exhausted, there will be an opportunity for additional speakers who had not signed up in advance to make submissions. *Please note that Council may not receive further submissions from the public concerning these applications after the conclusion of the public hearings.*

Need more info?

Relevant background material and copies of the bylaws are available for review at the Clerk's Office, 355 West Queens Road, North Vancouver, BC, Monday to Friday, 8am to 4:30pm, except holidays, from May 30, 2023 to June 13, 2023 or online at **DNV.org/public-hearing**.

DISTRICT OF NORTH VANCOUVER

DNV.org/public-hearing

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