JANUARY 2025

Strait of Canso Sustainable Infrastructure Strategy

Waterford ENERGY SERVICES INC

FINAL REPORT

DISCLAIMER

This report has been prepared by WESI based on information and data provided by various stakeholders, including government agencies, port authorities, industry experts, and other third-party sources. The study aims to provide a conceptual framework for the development and enhancement of port and infrastructure systems within the Strait of Canso, Nova Scotia.

While WESI has made reasonable efforts to ensure the accuracy and reliability of the information contained in this report, we do not guarantee the completeness, correctness, or timeliness of the data presented. The conclusions, assumptions, and recommendations included in this report are based on the best available information at the time of preparation. Any projections, forecasts, or estimates provided are subject to change and should be considered as indicative rather than definitive.

WESI assumes no liability or responsibility for any errors, omissions, or misinterpretations of the data provided, nor for any outcomes or decisions made based on this report.

This report does not constitute legal, financial, or engineering advice and should not be construed as such. Readers are encouraged to seek professional advice and further validation for any specific applications or decisions regarding port and infrastructure development.

WESI expressly disclaims any liability for any loss, damage, or adverse consequence arising from the use or interpretation of this report or its contents.

By using this report, the recipient acknowledges and agrees to these terms, including the restrictions on use.

Contents

Figures

Tables

Acronyms

ACOA	Atlantic Canada Opportunities Agency
DNRR	Department of Natural Resources and Renewables
EU	European Union
Greenfield Site	Land area with no existing infrastructure in place. May have had previous use.
GW	Gigawatt – 1,000,000 kilo watts
MODG	Municipality of the District of Guysborough
MW	Megawatt – 1,000,000 watts
NS	Nova Scotia
NSP	Nova Scotia Power Point Tupper
O&M	Operations and Maintenance
PDA	Potential Development Area (Offshore Wind)
PH	Port Hawkesbury
PHP	Port Hawkesbury Paper
RFP	Request For Proposals
Richmond	Municipality of the County of Richmond
SMS	Superport Marine Services
Strait	Strait of Canso
US	United States of America
WTG	Wind Turbine Generator

Executive Summary

Waterford Energy Services Inc (WESI) was contracted by the Municipality of the County of Richmond and the Town of Port Hawkesbury, in January 2024 to complete a sustainable infrastructure strategy for the Strait of Canso, which is referred to hereafter as The Strait. The Steering Committee comprised the above-mentioned groups as well as the Atlantic Canada Opportunities Agency (ACOA), Cape Breton Partnership, Nova Scotia Department of Natural Resources and Renewables (DNRR), and Municipality of the District of Guysborough (MODG).

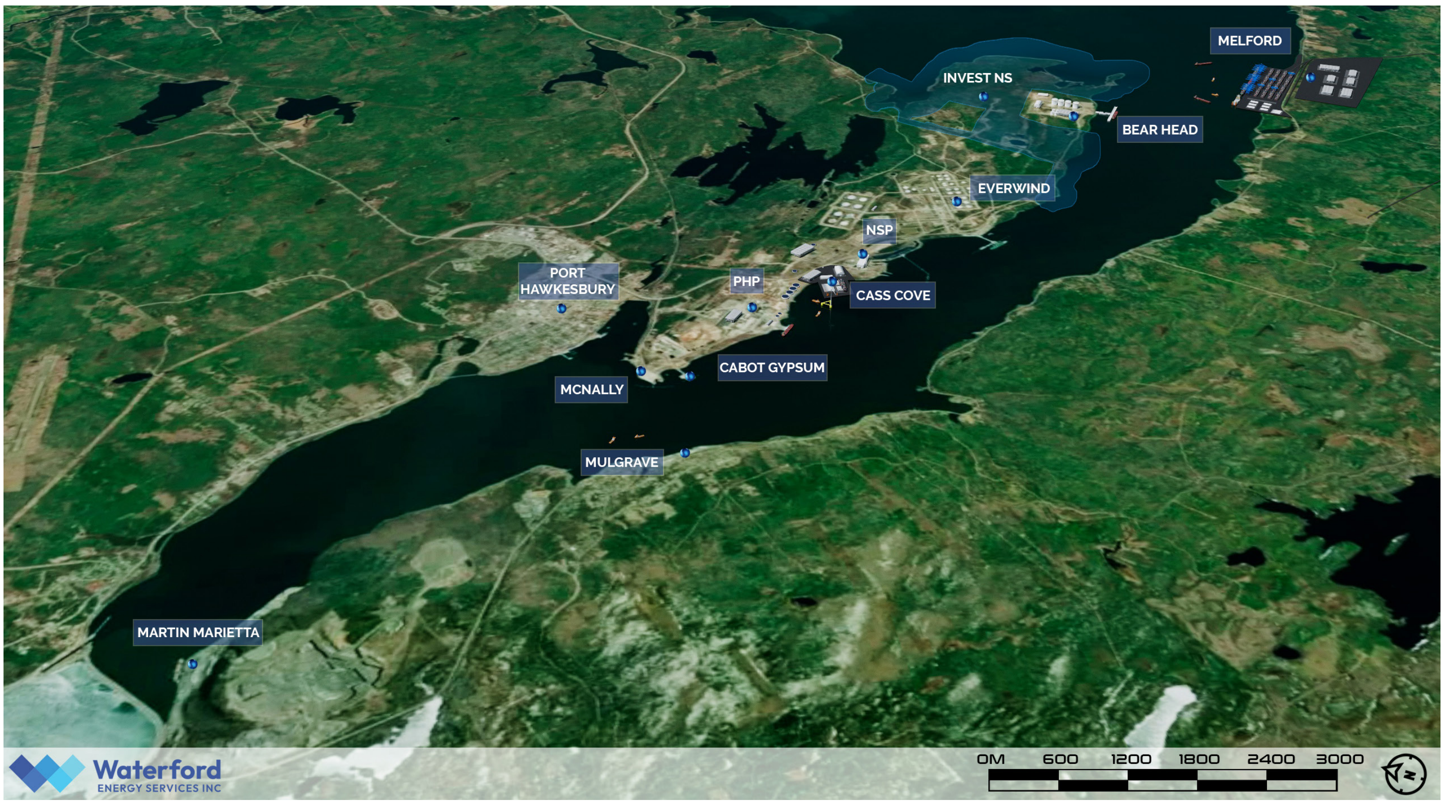


FIGURE 1: STRAIT OF CANSO

The intent of the study was to focus on the renewable energy industry including onshore wind, offshore wind (fixed bottom and floating) and hydrogen/ammonia. There are other Power to X products such as e-methanol, and sustainable aviation fuels which may also benefit from the infrastructure. The Strait was assessed for its capability to support these potential future activities as well as recommendations on where and when investments should be made to optimize the area. Although multiple ports in the region will likely be involved in construction of offshore projects, other areas were not studied as part of this work. Instead, opportunities were identified for the Strait, with the understanding that other ports may be necessary to fulfil the needs of renewable energy projects.

Desktop research was performed to understand work previously conducted for The Strait, assessing other opportunities which have presented themselves in the past. These studies and additional research combined with WESI's in house expertise aided in the recommendations going forward.

Extensive stakeholder engagement was a large component of the work carried out by WESI. It was important to understand the local government and industry's perception of renewable energy projects in general and specifically how land and ports infrastructure could contribute to future renewable energy projects and economic development. Contributions from the following organizations who were contacted as part of this work provided valuable insight to guide the content of the report.:

Allan J. MacEachen Airport
AtShip Services Ltd.
Bear Head Energy
Cabot Gypsum
CN Rail
DP Energy
Eastern District Planning Commission
EverWind Fuels
Invest Nova Scotia
Martin Marietta Materials
Melford Atlantic Gateway
McNally International
Membertou First Nation
Municipality of the County of Richmond
Municipality of the County of Inverness
Municipality of the District of Guysborough
Nova Scotia Department of Natural Resources and Renewables
Nova Scotia Community College – Strait Area Campus
Nova Scotia Power
Strait Superport Board
Port Hawkesbury Paper
Port of Nigg
SBM Offshore
Strait Superport Corporation
Town of Mulgrave
Town of Port Hawkesbury
Transport Canada

The Strait of Canso possesses numerous attributes that position it as a potential leader in the global renewable energy industry. Many of the required building blocks can be found to support projects including land, fresh water, sheltered water, ports, an industrial workforce, and a supportive local government. However, there are also limitations on land availability and wharf structures that are presently capable of supporting large equipment destined for onshore or offshore energy projects. Many ports do not have the required documentation and proof of the attributes of their facilities such as bollard testing, weight bearing capacity and water depth. Facility owners should budget the time and expense to carry out this investigative work required before a renewable project proponent can commit to a facility.

Also of note is that there are challenges on local infrastructure including housing, roads, hospitals, emergency response and other and services. With the expected increase in industrial activity in the area, additional stress may be put on these aspects of the Strait.

The study reviewed opportunities for the Strait based on current infrastructure capabilities compared to what is needed to support renewable energy developments. Existing areas were identified for potential upgrades which could make them better suited to support renewable energy projects. New areas of development were also identified where greenfield facilities could be constructed.

For the Strait, upcoming opportunities include onshore wind, hydrogen/ammonia production and export, offshore wind (fixed bottom and floating), and supporting US offshore wind developments.

Items which were not included in the scope of this work were the investigation of other Atlantic Canadian ports which could potentially have similar capabilities as the Strait to support renewable projects, roads and utilities surrounding the ports, Port Governance, and business development of the Strait area.

Onshore Wind Sector Support and Development Recommendations

Mulgrave Marine Terminal

The most immediate and feasible industry for development is onshore wind based on the announced and permitted projects. The Strait has an opportunity to support many wind developments on the mainland of Nova Scotia through receiving and storage of land-based wind turbine components. The construction projects will occur over several years which could provide an ongoing opportunity as well as long term maintenance support.

FIGURE 2: MULGRAVE MARINE TERMINAL, SOURCE STRAIT SUPERPORT CORPORATION

There are several land-based windfarm projects planned to be installed in areas on the mainland near the Strait and therefore the Strait Superport's Mulgrave Marine Terminal and adjacent lands are prime locations with potential to receive these components. For onshore wind in Cape Breton, there is likely a different solution to move turbine components from vessels to site. This would most likely involve location(s) in Point Tupper providing support through equipment receiving and distribution.

Mulgrave Marine Terminal should continue to work with onshore wind developers to maximize the port's use for offloading of wind components. The port is in a strategic location to bring in equipment to support onshore wind development in the District of Guysborough and Town of Mulgrave areas. The port should focus on this aspect of the industry as it well situated and has the needed capability.

With the larger onshore wind developments, there will be a need for a storage or staging area near the port for wind turbine components. A storage site will allow equipment to efficiently flow from a vessel to the laydown yard, minimizing the need for a large storage area immediately adjacent the wharf structure at Mulgrave Terminal. Areas have been identified within 5km of Mulgrave which are suitable for storage and have capacity to expand if needed.

Mulgrave Industrial Park has vacant lands which the Town has listed for sale. A study into potential support for renewable onshore wind farm developments on this land is recommended. The site's strategic location could make it suited for supporting onshore wind projects in coordination with the Mulgrave Terminal. The land in the Industrial Park has 21 acres and could be considered for several aspects of renewable energy projects including:

- Manufacturing or fabrication site of ancillary components, piping, secondary steel or maintenance components for hydrogen and ammonia facilities, onshore, or offshore wind components
- Marshalling of onshore wind components for construction
- Storage and repair yard for ongoing maintenance of onshore wind farms
- Marshalling for offshore wind components

Supporting onshore wind projects is a key enabler to increase capacity and skills in the Strait which can eventually transition or translate into support for offshore wind projects.

Port Development Recommendations

Melford Atlantic Gateway Terminal

The Melford Atlantic Gateway Terminal development site is a well-suited location in the Strait and coupled with the possible container terminal development provides a robust business case to pursue large offshore wind projects, however it needs a sound financial case to proceed. The site can support many aspects of the fixed and floating offshore wind industry and should be actively investigated for this purpose. As a greenfield development, the design can incorporate features tailored to the renewable energy sector. Potential uses for the site include:

- Marshalling, fabrication, or assembly for fixed bottom wind farms serving Canadian or US projects
- Receiving port for onshore wind components for nearby developments
- Assembly, commissioning, and tow-to-port maintenance for floating offshore wind projects, supporting both Canada and the US East Coast markets
- Operations and maintenance base for offshore wind farms
- Bunkering of green ammonia to aid in decarbonizing shipping industry
- Arrival port for hydrogen/ammonia construction equipment destined for Point Tupper
- Manufacturing location for renewable energy equipment
- Attracting other heavy industry stimulated by the green energy and hydrogen and ammonia availability

FIGURE 3: MELFORD TERMINAL RENDERING, SOURCE CBC NEWS

Although Melford has been proposed as a container terminal, adding features to support the wind industry may be attractive and complementary. The hundreds of acres available at Melford allows for expansion of both port and nearby lands which can be used for the many aspects of the lifecycle for either fixed bottom or floating wind.

For offshore wind, the attributes of the Strait, land, fresh water, deep water access, and an industrial workforce, means a new port development in Melford could be an ideal location and be positioned to support both the Canadian and US offshore wind markets.

Point Tupper Common User Port

It is recommended to conduct a further analysis of facilities in Point Tupper for potential as a common user port. Ideally the common user port would be available for items such as aggregates, onshore and offshore wind turbine delivery, and other users in the Industrial Parks and surrounding area. Some sites could potentially be modified to support hydrogen and ammonia equipment delivery if needed.

FIGURE 4: POINT TUPPER
Source: Atlantic Pilotage website

The Strait has a history of individual industrial users developing a fit-for-purpose port solution that addresses their vessel loading and unloading needs. This has some commercial benefits, but it has also resulted in many assets which are underutilized. Ports require long term maintenance and eventually significant upgrades to evolve with changing vessel and project owner needs. To maximize the use of government funds, minimize environmental impact and provide the greatest long-term benefit to the region, a high capability common user port could be developed on Point Tupper.

This common user port could provide opportunity for the wider industrial community lacking water access to move products in or out of the Strait efficiently. A wide range of industrial opportunities are available in the area, particularly with the development of local wind energy, as well as hydrogen and ammonia availability. Having a location in Point Tupper will also provide opportunity to move goods which are not able to cross the causeway.

Several existing locations are possible to develop a common user port including Cabot Gypsum, McNally International, Nova Scotia Power (NSP), Port Hawkesbury Paper (PHP), as well as undeveloped site belonging to Invest Nova Scotia at Cass Cove located near NSP and the Bear Head Industrial Reserve land near EverWind Fuels (EverWind) and Bear Head Energy (Bear Head).

Existing ports in Point Tupper need modifications to meet the requirements for a common user port. Overcoming shallow water constraints, upgraded wharfs or shore base improvements are needed to take on a larger role receiving vessels and goods and may be a more economic option than a new facility. After modifications, some sites could handle a wide variety of vessels, goods, and equipment.

Smaller investments at PHP or Cabot Gypsum may be sufficient to develop a common user facility, while more significant upgrades could be undertaken at McNally's, in the Cass Cove area or NSP. When Bear Head's port infrastructure is in place, it could also provide an option for a common user port.

Currently undeveloped lands held by Invest NS in the Bear Head Industrial Reserve look to have potential to support a range of facilities and opportunities. However, Invest Nova Scotia's focus for the area is on the development of an Atlantic Canada hydrogen hub, and the extension of infrastructure – including roads, water, and electricity – to support Point Tupper Industrial Park as a key asset. This vision will restrict the development of the water side and the lands for offshore wind support or a manufacturing site.

Port Strategy to Support Offshore Wind

Melford Atlantic Marine Terminal or a common user port on Point Tupper are the opportunities to support the offshore wind industry, both here in Canada and in US waters.

The timing of when offshore support will be needed depends on several factors including legislation, project development and planning, and offtake solutions. The likely case is that opportunities will be available to support offshore US based projects first. This is due to the lack of US port capacity to support local wind projects, the Jones Act, and uncertainty related to the Canadian market (grid connection, offtake, regulations and more). Opportunity will likely continue until the US domestic supply chain is mature enough to support their own renewable projects.

Several locations in Atlantic Canada have recently supported US offshore wind Developers based on the port readiness. These projects have occurred with short notice of operations commencing at the port. These alternative plans seek ports of opportunity when circumstances demand. This "ready" capability is currently lacking in the Strait for larger components or work scopes.

Without a port being "ready", there is potential for lost opportunity in a region. However, the unknown activity and timeline makes it difficult for the investment community and government to commit to the large port infrastructure upgrades required to make a location suitable for current and future offshore wind projects. Wind Developers do not typically want to own ports as they may only be involved in limited projects in specific areas. It is up to local business, government, and investors to determine how to proceed to unlock opportunity.

Canadian Offshore Wind Operations and Maintenance (O&M)

There are a few locations in the Strait with the potential to support offshore O&M work. One of the facilities that is currently suited is the Mulgrave Marine Terminal. The region should pursue opportunities as an O&M base to support offshore wind as it develops in Nova Scotia. Until then, the port should concentrate on the onshore wind market plus other small scale offshore work for the US wind farms such as repairs to components. Important services needed in the area to be more attractive include a fuel supply, welding, fabrication, cranes, tugs, hotels and more.

Other areas where O&M activity may be suited are PHP, McNally's, Superport Marine Services (SMS), Cabot Gypsum, or at Melford or another Point Tupper port, if constructed. PHP is in a near ready state to support O&M. McNally's require upgrades from the current state to be able to support O&M vessels, therefore, it may not be advantageous for McNally's to pursue this work. SMS and Cabot Gypsum have limited water depth so would need to adapt to accept larger O&M vessels and both have limited land space.

In all cases, offshore O&M support will only be required once wind farms are constructed offshore Nova Scotia. This could be up to 7-10 years away based on 2025 seabed lease sales so this opportunity should be revisited following this timeline.

Supply Chain Development

Local Industrial Parks house a supply and service industry which supports many industrial users located in the Strait. Large numbers of trades support the operations and maintenance activities at various plants. Future hydrogen/ammonia facilities and the increased number of wind turbines operating in the area will require a greater number of similarly skilled workers and specialized equipment.

There are additional municipal and private industrial park lands available which can be developed as needed to house an expanded workforce and new services. The Port Hawkesbury Business Park, the Port Hawkesbury/Richmond Country Joint Industrial Park, the Richmond County Light Industrial Park, and the Mulgrave Marine Industrial Park all have capacity to adapt as needed for these growing and new-to-Nova Scotia trades and services.

Power to X Sector Support and Development Recommendations

Hydrogen and ammonia production potential in the Strait is currently tied to two known Developers with links to onshore wind projects in early phases of development. As the sector grows, the potential for offshore wind to support hydrogen/ammonia production will increase.

For short term support, hydrogen Developers in the Strait area need to receive large modules which will make up the production plant facilities. Currently each Developer is pursuing independent solutions to receive the equipment by landing their materials close to the facility construction site, as transportation over road from the mainland does not appear feasible.

To support component delivery, the ideal port location is one close to the installation site to reduce land travel restrictions. Today, direct delivery to Point Tupper isn't possible using existing ports. If project specific ports or a common user port are not built within Point Tupper, one possible option is to use a barge system to move equipment from Mulgrave to the Point Tupper side.

While a barge solution introduces logistical challenges and increased handling of equipment, it may be cost effective and the quickest to implement. Cabot Gypsum, McNally's or PHP are potential sites which may be able to accept these large modules. Waterfront land owned by Invest NS is also a possibility depending on the availability of the lands and the desire of the Developers. In all cases, the viability of a site to receive equipment would depend on an investigation of site properties and road logistics involved in moving equipment to the installation sites.

US Offshore Wind Sector Support Recommendations

Marshalling offshore wind components destined for US wind farms is an area which can be supported by Canadian ports. Large components such as monopiles (MP), transition pieces (TP), cables, blades, nacelles, and tower sections are released from the supplier factories but may not be able to be installed right away. In such cases, temporary storage is required before installation. The Jones Act permits European flagged vessels, such as wind turbine installation vessels (WTIV), and monopile installation vessels to pick up these components in Canadian ports, but not from US ones. Thus, the proximity of Canadian ports presents opportunities to play a role in the US offshore wind industry. Unfortunately, no area of the Strait has marshaling yard capability today.

Wind components weigh upwards of 3000 T and in the case of blades, over 110m in length. Associated vessels require deep drafts, weight bearing wharfs, specialized land transport and large, flat laydown areas adjacent to the water for storage. There are gaps in current wharf structures and lands in the Strait meaning support for offshore wind construction (US or Canada) will require significant investment in either a greenfield site or redevelopment of an existing port facility.

There is competition from both US ports and Canadian ports to support marshalling activities. Therefore, construction in the Strait of a new port and associated lands to support an offshore marshalling site on its own should only be considered if the required modifications to docks and laydown areas are financially viable.

These large offshore wind components have limited places where they may be landed and stored in the Strait even with a well-planned development. Some options are: Melford Atlantic Terminal or PHP. McNally's, NSP or Invest NS Lands on Point Tupper may also be an option, albeit to a lesser degree.

1

Introduction

Waterford Energy Services Inc. (WESI) was commissioned by the Municipality of the County of Richmond and the Town of Port Hawkesbury to develop a sustainable infrastructure strategy for the Strait of Canso.

WESI was supported and overseen by a Project Steering Committee (PSC), made up of representatives from the four funding organizations, as well as a representative from the Municipality of the District of Guysborough (MODG). While the Strait of Canso is home to a wide variety of landowners and port facility operators, all of whom can bring valuable insight and expertise, it was decided to design the (PSC) this way for the following reasons:

- To make effective decisions, it was agreed among the funders that the number of people on the PSC should be as low as possible;
- The funders recognized that while private industry would bring value to the PSC, it would be difficult to choose one entity over another which would result in too large of a PSC. Industry perspectives have been captured through stakeholder engagement and reviews of draft versions of the report instead;
- The Strategy for the study is based on an unbiased review of infrastructure and its readiness to support the emerging green energy industries in the Strait. As such, it was decided that to avoid possible conflicts of interest, entities owning and operating infrastructure should not be included on the PSC; and

- The Strategy encompasses both sides of the Strait of Canso. It was therefore deemed vital to have representation from the mainland side on the PSC as well, which is the reason for MODG's inclusion.

The Strait of Canso has a long maritime and industrial history and is well-positioned to accommodate all phases of onshore and offshore wind deployment, green fuels production and other renewable industries.

The competitive advantages in the Strait of Canso include the availability of green and brownfield sites with hard surface areas ideal for extensive bearing capacity, industrial parks, and a significant existing multi-modal transportation hub complete with an ice-free, deep-water port with favourable proximity to Europe and the Eastern Seaboard of the US, airport, railway and TransCanada highway road connections.

Port and industrial infrastructure in the Strait is owned and operated by many different entities from both the private and public sectors. As the emerging green energy industries expand in North America, many of these assets can be utilised and/or repurposed to provide support for the needs of both onshore and offshore renewable projects.

The following report outlines the results of the consultation and research completed to support the opportunities pertaining to port and industrial infrastructure development in the Strait of Canso.

Background

WESI has performed specialty work for oil and gas projects around the world for over 20 years. More recently, studies have been completed in the renewable energy sector related to ports and infrastructure, floating wind foundations, oil and gas decarbonization, and hydrogen opportunities. Operationally, WESI's portfolio includes marshalling and inspection services for offshore wind components. Attending and speaking at wind conferences in Europe and the United States has enhanced the understanding of the industry and provided key contacts for technical support. The knowledge gained from these activities in the renewable space has provided a solid foundation to support numerous renewable activities such as this port and infrastructure study.

The Strait of Canso has and continues to support various industrial activities and firms. Lands near the deep water were designated as heavy industrial and have had long standing industries operate in the area. Even with the success of attracting and maintaining these industries, there remains undeveloped waterfront and lands which could be utilized to support additional industry activity including in the renewable space.

As the renewable energy industry – in particular offshore wind – has thrived in the rest of the world, Canada (and Nova Scotia), have begun to prepare policies to support the local industry. The Province of Nova Scotia released a roadmap in 2023 to outline the strategy to pursue renewable energy projects. The second module of the roadmap was released in mid 2024 outlining focus areas of supply chain and infrastructure. Federal (and mirroring Provincial) Regulations were enacted in late 2024 and the first seabed leases for offshore wind in Nova Scotia are also expected to be offered in 2025. The momentum surrounding (offshore) renewable projects is building which opens opportunities for the region to realize.

In addition to this work, there are other studies which have been completed or pending which help assess the capabilities of ports and infrastructure throughout Nova Scotia and the Atlantic Provinces. Invest Nova Scotia performed a review of Nova Scotian ports in 2024 on behalf of the province but is currently not available for distribution. Net Zero Atlantic has also commissioned a study, inclusive of the Atlantic provinces to be completed in Q2 2025. This is to assess port infrastructure availability in Atlantic Canada and the necessary infrastructure upgrades to serve the emerging offshore wind (OSW) industry for both fixed and floating wind. Aecom has also led a study on establishing a Center of Excellence for Offshore Wind which looked to envision what is needed to support development locally as well as potential expertise which could lead to international opportunities for local industry players.

These and other work being done by industry are working towards an understanding of capabilities throughout the region and identifying opportunities for investment in the renewable sector to support Canada and abroad.

The Strait, with its industrial background and available space and capacity has continued to pursue interest in becoming a significant player for Canada's renewable industry development. Outside parties are also inquiring about the possibilities which the Strait offers to support various renewable energy opportunities. The information in this study provides a detailed review of the Strait, bringing together the industry needs with the abilities of the Strait.

3

History of the Strait and Industrial Opportunities

There have been several detailed studies which have examined the Strait of Canso with respect to (then) current and potential industrial opportunities to pursue for the area.

One report of note is the 2010 Aecom report, "Strait of Canso Superport Master Development Plan," [1]. There were several key points which were studied and commented on as potential marketing of the Superport.

1. Coal transshipment – accepting barge shipments of coal from Sydney, and then loading onto large carriers for international export.
2. Transshippment terminal for bulk cargo into the Great Lakes region.
3. Oil and gas operations base - supporting offshore Nova Scotia oil and gas production and exploration.
4. Liquid bulk Petroleum Terminal.
5. Melford container terminal – establish a greenfield terminal site at Melford, Move cargo to central Canada via rail and away from congested Halifax corridor.

Due to several factors, the coal export and transshipment opportunities did not materialize.

With regards to the oil and gas operations base, the winding down of operations off Nova Scotia meant that activity is no longer taking place, and the Strait had limited activity during the operations and decommissioning phases.

Liquid bulk terminal activities are taking place in the Strait, while another planned project has morphed into production of hydrogen and ammonia, on a previously permitted site, tying the production to onshore and offshore wind development.

Container terminal operations were and are still an opportunity under study for the Strait. This activity has the potential to couple itself with the emerging wind industry. A multi-use option could help be a key component in bringing the container terminal concept to realization. As this is a greenfield development site, it has the potential to optimize the layout to efficiently support multiple industries.

4

Overview & Methodology

WESI's approach to the study was broken into four phases: Research, Outreach, Assessment & Analysis and finally Report Preparation and Delivery.

Initially, with the supporting documentation from the RFP package and other sources, a review was performed of the Strait area. Several studies have been carried out over the past 20 years, examining what opportunities existed at the time as well as emerging or potential industries or businesses. These studies were helpful to set the scene and understand areas which have been successful and others which did not materialize for assorted reasons. In addition to the provided documents, other studies and reports were reviewed to supplement knowledge of the area, enhance information related to hydrogen developments and research of ports from other areas which support renewable energy industries.

Strait of Canso Background

Previous studies of the Strait area have been performed to look at infrastructure and seeking opportunities to expand the capabilities of the Strait. A review of these and other reports on the Strait was undertaken. These documents outlined some of the history of the Strait's development and past projects as well as those projects which were proposed. Some of the proposed projects were not developed or to the extent which was anticipated, and this research helped bring context to the impacted projects.

In general, the local government support and planning for large projects has been consistent. The Point Tupper industrial area was established by Richmond County for those industries which would most benefit from the water access and many of the industries in the immediate vicinity of the harbour are utilizing the water for their operations.

The light industrial parks were developed further from water access as the requirement is lower for those local businesses. These are home to many local businesses which service the area. There are additional municipal lands which are available to develop more industrial park space to support industry as required.

Stakeholder Engagement Outcomes

Outreach was a significant scope of work and critical to the project. The discussions with stakeholders in the Strait area provided background of sites and industrial operations, demonstrated the level of knowledge of renewable energy projects, discussed possible upgrades to sites (whether renewable energy related or not), and potential effects on the Strait area in general. Topics included the strengths and challenges which exist as well as what large scale developments could mean for the towns and villages in the area. How stakeholders saw their potential role in renewable energy development and what it may mean to their future.

Overall, stakeholders who were engaged during this study were open with their thoughts and information which added significant value to this report. Local history, potential development plans and ambitions for the future of the area were all taken into consideration in compiling results and recommendations for the Strait.

The stakeholders were separated into three large groupings, Municipal/Government, Port owners and Other Stakeholders, with a base template/questionnaire prepared for each group. However, as all contact was one on one, there was freedom to explore many areas during the discussions. The main themes which were explored with each group are noted in Table 1.

Municipalities	Their needs and potential plans for renewable energy projects
	The infrastructure status and ability to expand as renewable projects begin in the region.
	Available support for renewable projects, either land or offshore. State of industrial parks and other lands.
Port Owners	What are the site's key characteristics? Water depth, length, laydown area, etc.
	What is current activity at the site?
	What are plans if any to support renewable energy development?
	What are their capabilities and capacities to play a role in the development?
	Are they a potential consumer of renewable energy – clean electricity, hydrogen, or ammonia?
	Are there synergies with other local development, decarbonisation, and energy production/consumption?
Other Stakeholders (public, small businesses)	What are general opinions regarding renewable energy projects and possible development in the area?
	How might they support renewable energy development?
	What are their capabilities and capacities to play a role in the development?

TABLE 1: STAKEHOLDER THEMES

There were a few stakeholders who were contacted but were unable to arrange participation in the study. Stakeholder participation was maximized by reaching out via direct meetings, phone calls and web-based discussions to accommodate the greatest number of participants. The preference was to conduct face to face interviews, and this was done in about half of the cases.

It was imperative to obtain as much information as possible directly from stakeholders in the community. An initial list of parties was identified by the steering committee while others were added as the study progressed. The expectation was that direct, accurate and timely information would be used for the assessment. To help with the data collection, it was planned to send questionnaires to the parties and follow up to help drive participation. After collection of the information, one on one interviews would be planned in person.

This approach was considered to minimize the in-person time required by the parties and give some flexibility in completing the background information. By having the baseline information available, WESI could also tailor interviews to probe information that was incomplete and/or focus on areas of interest to delve deeper in specific topics. However, as this process was being developed, it was recognized that the scope of study was not well known to many of the identified stakeholders. There was also a risk of limited response from some parties or lack of interest in the subject leading to little benefit when it came to the interview sessions. Because of these concerns, the questionnaire was not sent out to participants. Instead, individuals were contacted to arrange in person interviews, with the questionnaire used to guide the interview process. This proved to be an effective means of information gathering.

4.3 Port Review

As this consultation was ongoing, another important component of the study was also underway. This was a scan of ports outside Canada which have adapted or are transitioning to support renewable energy developments. The review included locations in the European Union countries, the United Kingdom, and the United States.

Research into foreign ports was performed to understand what actions were taken by some of these ports and communities to redevelop existing port areas which previously supported other industries. WESI looked at what ideas were taken to future proof their assets knowing the size and scale of offshore components are increasing and a look at spin off industries and other indirect employment which support the new port activities. Also understanding the role of power to X in the life of the port – from production to storage to utilization within and surrounding the port and its impact on potential opportunities for an area. The review was important to forecast the potential of the Strait, and the effort needed to become a significant part of the industry. Refer to Sections 6, 7 and 8 for the results of the local and international port review.

The review also noted the costs which have been allocated or planned to undertake either modifying existing ports or constructing new facilities to support offshore wind. These projects provided an indication of costs to make areas of the Strait ready for offshore wind. It is important to note that changing economic conditions and project timelines can play a major role in cost escalation.

4.4 Analysis

The analysis phase looked at all factors which were studied to provide a series of recommendations. Combining the background information on the Strait of Canso, information gathered from stakeholders and the international port study, scenarios were examined as to how the Strait may position itself to support renewable projects.

Areas of focus during the analysis were:

- Current assets of the Strait area
- What is needed to support onshore and offshore wind and hydrogen/ammonia developments, now and in the future?
- Estimated timeline and types of projects which could occur?
- Proposal for which could be pursued by the Strait.

The existing assets within the Strait were summarized (Section 7), to provide a picture of the current infrastructure. The specifications and activities taking place, including number of vessels calling on each port, and the infrastructure in the immediate area. Research into ports and regions outside Canada who are currently supporting renewable energy projects was also compiled. This provided insight into what port infrastructure is needed today and how they have prepared for the next generation of renewable energy projects.

Looking at the characteristics, layouts and capabilities of these foreign ports, a summary of requirements (Section 6), was developed which was used to identify potential activities which could occur at sites on both sides of the Strait.

Projected timelines (Section 10), for when projects may occur both onshore and offshore were developed which factored into the development activities which should be given priority. The multiple individual land (and water) rights holders and several government owners in the area and the influence of onshore wind, hydrogen and ammonia, and offshore wind potential means there is a variety of possible development scenarios (Section 13), which the Strait could pursue.

5

Renewable Energy Opportunities

Because of the tie between climate change, energy from wind turbines, grid stability and energy storage, there is a larger, more complex opportunity to deliver some of the energy needs for Nova Scotia, Canada, North America and Europe in the Strait area.

These opportunities have been discussed over the past few years and show potential to transform the local energy mix and impact the long-term prosperity of the Strait region.

5.1 Onshore Wind in Nova Scotia

Commercial onshore wind development in Nova Scotia began in 2005 with the installation of 17 turbines, providing a combined capacity of 30.6 MW [2]. Since then, the industry has grown steadily. Today, there are about 300 land-based turbines, with generating capacity of approximately 600 MW. [3] As renewable targets increase and with the advancement of hydrogen/ammonia for export, the onshore wind market has exploded. Announced project plans which anticipate deployment in the next 7-10 years dwarf existing wind farms in both turbine size and overall capacity.

The largest of the proposed wind farms are noted below with values extracted from project documents. However, there are several smaller projects pending approvals and could also utilize the Strait for equipment importing. The larger proposals total more than 3,600 MW of land-based wind power, utilizing approximately 800 turbines of 6+ MW capacity each.

- PHP Wind – 168 MW (24 turbines)
- EverWind Phase I – 650 MW (+/- 100 turbines)
- EverWind Phase II – 2,000 MW (404 turbines)
- Bear Head Phase A – 500 MW (100 turbines)
- Bear Head Phase IB – 500 MW (+/- 100 turbines)

*Note: Bear Head Phase II (1,200 MW) may come from offshore wind

Most of these turbines are proposed for Guysborough County and area, to support Power to X production in the Strait of Canso. Where possible direct connection to the hydrogen and ammonia producing facility may be used. Some of the initial farms will be located a distance away so they will tie into the electricity grid to ensure green energy is used to produce the hydrogen/ammonia.

To support potential farms in the proximity of Guysborough County and Town of Mulgrave, the components required are noted in Table 2. There is one smaller wind farm which has identified a potential site on the Cape Breton side of the causeway, but the larger scale projects announced to date are on the mainland.

Total Capacity	# Turbines, Towers*	# Blades*
1 GW	143	429
2 GW	286	858
3 GW	428	1284

TABLE 2: WIND TURBINE COMPONENT NUMBERS VERSUS WINDFARM SIZE
*Assumes 7 MW turbines

As can be seen from the proposals, these farms constitute hundreds of components required to construct these turbines. They will need to be transported via roads to final location and most of the pieces will arrive via ports. Current project schedules have these occurring over a 4-5 year time span which alleviates some potential congestion at the port. However, as Mulgrave Terminal is the ideal location for many of these pieces to arrive, a solution for temporary storage offsite will be needed. Storage sites have been identified and the amount needed will depend on equipment deliveries and project schedules. There would also be ongoing maintenance activities which may require replacement components over the life of the project. In addition, some of the ancillary electrical equipment (transformers and control buildings/e-houses) will also be very large and also require the same infrastructure for transport.

Roads around wind farm construction need to be evaluated (weight bearing capacity, grades, and turing radii), to ensure they can handle the proposed equipment deliveries. Due to the weight of the components - particularly the nacelles - there are concerns regarding potential damage to roads and equipment. Mitigations need to be implemented during transport to spread loads, perform upgrades to roads prior to moving the heavy loads, or complete repairs after activities have finished. Timing road transport to avoid times when roads are more susceptible to damage (spring thaw), is important to reduce damage.

The construction and operations of the onshore wind farms will build industry knowledge and the local supply chain. Handling and installation procedures as well as day to day and major maintenance/repair work will strengthen the ability of the Strait to support all types of renewable projects. As the offshore developments start to progress, lessons from onshore farms will assist the workforce in understanding the roles needed and the skills required to become a part of the industry.

5.2 Offshore Wind Development

Offshore wind projects in Nova Scotia waters will take time to begin operations. Regulations for the offshore activities and establishing oversight authority were completed in 2024. Seabed leases are anticipated to begin in 2025.

Using other jurisdictions as analogies, wind farms operations typically commence production about 8-10 years after a seabed lease has been awarded. This timeline is associated with seabed surveys, environmental monitoring, regulatory approvals, engineering, and financing activities. Figure 5 notes a typical lifecycle of windfarm development. Thus, turbines generating energy in Canadian waters may occur in the 2033-2035 timeframe.

As construction cycles occur 1-2 years before operations, ports and the supply chain should be ready to support Canadian offshore wind by the early 2030s. Should lease auction timelines delay, construction and other timelines will reflect those changes.

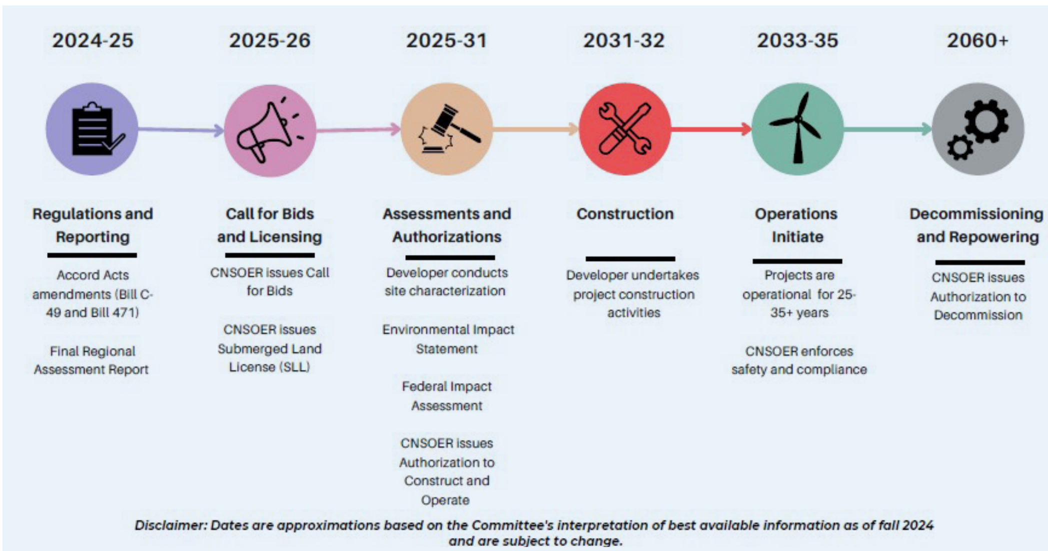


FIGURE 5: APPROXIMATE TIMELINE FOR OFFSHORE WIND DEVELOPMENT IN NOVA SCOTIA (4)

The amount of the potential production from the leases and where they may be located is also unknown at this time. The Draft report from the Regional Assessment being led by Natural Resources Canada (NRCan) has suggested up to eight potential development areas (PDA) off the eastern and northern coast of the province. There is no confirmation if lease auctions will be confined within these areas or additional areas may be identified.

The eight PFDAs are broken into two group; Tier I and Tier II. The Tier I areas have had more study during the RA process and are identified as potentially lower conflict areas. The Tier II areas require additional work and are recommended to be deferred for potential later auctions. The identified PDAs are a mix of fixed (23%) and floating (77%) locations between three floating and two fixed bottom sites. As fixed bottom technology, cost and supporting infrastructure (vessels, supply chain) are more mature, it is most probable that fixed bottom commercial scale wind farms will precede floating farms. This means that the Strait area should prepare for fixed bottom windfarm construction and operations and how it can be supported locally.

Regardless of where initial lease sales are targeted, it is well known that offshore Nova Scotia holds some of the highest and most consistent winds in the world which is an extremely attractive opportunity for wind developers for many years to come.

An aspect for wind farm developers to address is the distance from shore where the fixed bottom windfarm locations are proposed. The fixed bottom farm PFDAs identified off NS are all located approximately 200 km from shore. This means construction and operations costs will be much higher than projects located closer to shore. For example, Vineyard Wind off the Massachusetts coast is approximately 55 km from the mainland.

The other significant challenge for Nova Scotian offshore wind which differs from the United States and most areas in Europe is the limited local market for renewable energy. Therefore, wind developers must ensure offtake for the energy produced. In the case of Canada, hydrogen and ammonia production is the enabler for these large-scale projects to proceed and find a market.

5.3 Hydrogen and Ammonia Development

As noted in the Hydrogen Ports Initiative analysis [5];

"In order to deliver meaningful amounts of hydrogen to the EU, not only will Canada need to construct large-scale renewable hydrogen projects, but Canadian ports will also need to rapidly expand critical infrastructure required to handle hydrogen."

"Currently, no Canadian ports have existing infrastructure to handle hydrogen and derivatives for exports without substantial infrastructure upgrades. Numerous Eastern Canada ports are working with potential hydrogen export proponents to determine the feasibility for future hydrogen export, as well as investigating their potential for bunkering of hydrogen as a marine fuel."

5.3.1 Projects

As previously noted in the onshore wind description, there are hundreds of land-based turbines proposed in Guysborough and surrounding areas to deliver green energy for hydrogen and ammonia production in the Point Tupper area. Both EverWind and Bear Head have initial permits in place for their facilities and are progressing their developments. These are multi-staged plans to scale up both wind energy projects and hydrogen/ammonia production.

To deliver this energy to site, a key upgrade required is the transmission lines leading to Point Tupper from the mainland side of Nova Scotia. To minimize disturbances, there should be alignment between the hydrogen/ammonia developers and NSP when corridors are designated for these high voltage lines. Projects will benefit from sharing routing and capacity where possible and minimize disturbance to forests and waterways. A further consideration of these high voltage lines is the potential to create air gap restrictions when crossing the Strait. This must factor into the planning of the connection as it is important to maintain flexibility of the ports by not introducing possible conflicts. Subsea cables can also be considered to limit restrictions.

5.3.2 Port Requirements

Hydrogen and ammonia production is planned for sites in Point Tupper. For these facilities to be installed and become operational, there are dozens of large components which need to be delivered to site. Because of the size and weight of these components, they are not able to be moved across the Canso Causeway bridge. They will need to arrive in Point Tupper by water. There are also road limitations which mean an ideal solution is to limit on land transport of the components. Two potential options are:

1.0 Land the component at Mulgrave Terminal, load onto barge and move to Point Tupper.
This could help meet timelines as mostly existing infrastructure can be used. A challenge is that it involves more handling of each piece (2 x lay down and 2 x lifting operations), which is less desirable. As well, a solution is still needed on the Point Tupper side of the Strait once the components arrive via barge. This could potentially be at Cabot Gypsum or PHP sites, or a new build but this requires further analysis. Work would need to be done to ensure handling capacity at both ends was sufficient for these large and heavy components. This could present some challenges to this scenario.

2.0 Build a wharf/dock facility (near destination), capable of receiving these large components.
This scenario has the benefit of the components being handled only once while offloading from the vessel and could be located close to the installation site to minimize travel over land, and reduce interaction with power lines, signs, posts, or other concerns.

Bear Head has completed the permitting process and have approvals in place for their facilities for both ammonia loading and the material offloading facility needed for hydrogen equipment delivery.

One of the drawbacks of the permanent facility in Point Tupper is timing. Permitting and construction are potential roadblocks to establishing a permanent facility for the planned Phase I of EverWind's plant although it is expected this can be achieved.

A consideration for the purpose-built dock to support hydrogen and ammonia equipment importing is that it will be designed and heavily utilized during the construction phase but will not be needed in the same capacity between these plant expansion stages. To help offset costs, there is an opportunity for these wharfs to become a common port for other industrial users of the Strait.

Finally, both EverWind and Bear Head will have similar needs during construction phases. Therefore, if each Developer were to take this same approach, two docks would be built which would only have high activity level during expansion stages. Much lower usage is expected for long periods opening the facilities to support other users.

5.3.3 Hydrogen Use in the Area

If hydrogen production develops in the Strait as predicted, there is an opportunity for local off take by existing businesses to convert some processes to hydrogen and for other users who may be attracted to the area based on availability of hydrogen. Local industry who may benefit are NSP Point Tupper, PHP and Cabot Gypsum. These are all high energy users with potential to convert or supplement their processes to use available hydrogen as a blended fuel or potentially to displace other carbon intensive fuels.

Another local use for hydrogen is decarbonization efforts for local heavy-duty transport or service vessels (tugs, pilot vessels, etc.). Because of the limited travel for the vessels, a hydrogen refueling station in the Strait could be a solution to convert these vessels. Supplying shore power from windfarms or using windfarms and a supplement of hydrogen generated energy is beginning to take place in ports around the world as they adjust their local uses to help reduce carbon emitters in their ports. The Strait would be suited for this as well given the wind capability and local hydrogen production.

Chemical processors or other may also consider the Strait area if hydrogen was readily available. NetZero Atlantic is currently supporting a study of potential industries which could benefit from Atlantic Canada's hydrogen production. The study involves three of Nova Scotia's largest manufacturers – The Shaw Group LTD, Port Hawkesbury Paper LP, and Michelin North America Inc. The study aims to investigate the feasibility and the GHG emission reduction potential of using hydrogen in industrial process heating within Nova Scotia.

5.3.4 Hydrogen Export

The goal of hydrogen production in the area is to export ammonia to support European nations in the desire for energy security and decarbonization goals. To accomplish this, export facilities need to be in place including required Federal permits. As EverWind currently exports petroleum products it has established methods and infrastructure. However, the export jetty needs modifications to carry ammonia and environmental and safety plans need to be revisited for potential changes.

Likewise, Bear Head is planning for the export of ammonia to EU countries. In the case of Bear Head, there is no existing infrastructure which can facilitate this export. Therefore, an export jetty and vessel mooring solution would be needed for the site. Designs for this jetty have been approved by all levels of government.

Because of the proximity of the two projects, it would be beneficial if synergies could be explored which would lower the overall project costs and reduce the duplication of port and utility infrastructure.

6

Requirements for Ports & Infrastructure

There are very large investments needed to bring a new port online or to redevelop an existing port to meet the requirements for renewable energy projects. The size of onshore and offshore wind equipment and associated vessels continues to grow, which means fewer ports will be capable of supporting projects. Understanding the requirements of today and what they may be in the future is key to identifying opportunities for areas like the Strait. The wharf and land requirements, water depth, and services needed to support renewable projects require careful consideration prior to developing an area.

In determining how the Strait can support renewable energy projects, it is important to understand what is needed for a potential role. Nova Scotia onshore wind, Canadian offshore wind, fixed and floating, US offshore wind projects and local hydrogen and ammonia production are all potential opportunities for the Strait area which require different supporting elements.

Depending on the roles which may occur in the Strait, there are multiple scenarios which may be possible. For example, supporting fixed bottom offshore wind farm construction has very different requirements and timelines than floating offshore wind turbine construction, and operations and maintenance.

Onshore wind projects utilize smaller turbines compared to offshore wind, with some components being manufactured and delivered to site via road or rail, although ports can play a vital role in receiving components for many of the land-based projects planned for Nova Scotia. Offshore wind farm projects are at a much larger scale than land based. To deliver an offshore wind farm, components are manufactured near a port for transport to European and United States projects. Most components are presently being built in Europe with some coming from Asia. The completed pieces are moved from the manufacturing site via heavy lift transport vessels and delivered to a marshalling port closer to the installation site. These components may stay at the marshalling yard for many months depending on the project timelines and manufacturing schedules. Eventually an installation vessel or barge takes the components offshore to the wind farm site in Canada or the northeast United States. This installation process may take place in one season (approximately April to December) or may happen over multiple seasons depending on size of farm and installation efficiency.

6.1 Port Specifications

The trend of larger and heavier components and higher capacity wind farms (more turbines) is not slowing down which puts increasing stress on manufacturers and limits options for their location. It also makes it more difficult for ports to provide the space, water depth and bearing capacities needed for today and the future.

Even today's requirements mean that some ports are not able to adapt and take advantage of the opportunity that offshore wind farms offer. These needs will only grow in the years to come. For example, in the USA in particular, air gap restrictions can prevent some of the vessels needed for turbine installation from calling on a port. Property development of port lands over the last decade for commercial or residential use may restrict areas for component manufacturing or storage. Water depth at the dock can prevent the vessels from being able to load/unload and older docks typically do not have the load bearing strength nor area to move components on or off vessels efficiently.

The key question for facility owners to answer is to know what the infrastructure can do. Facility owners / operators must be ready to provide detailed technical information supporting potential activities at their facility. A complete technical package of information will need to be produced to determine suitability of the site for supporting activities.

As this work includes engineering, data collection, site inspections and analysis; it must be conducted in advance of pursuing potential port activities if opportunities are to be realized.

Examples of technical information package:

- Structural design and engineering details of the facility and laydown yard
- Detailed seabed bathymetry and composition
- Electronic CAD files and site survey data
- Site history and portfolio of previous activities
- Renderings or models of potential equipment offloaded or stored onsite

A concern with older infrastructure is that site conditions are not always well known. Drawings may be out of date, settling of caisson fill may decrease strength, testing of components like bollards may not regularly occur and even the water depth may be affected by sediment build up. This lack of dependable, up to date information could mean a missed opportunity for a port which cannot provide evidence of suitability to marine warranty surveyors or wind developers.

The US has been increasing capacity to support their fixed bottom wind farm developments via their ports and manufacturing facilities on the eastern seaboard. However, components have also been offloaded and stored in Atlantic Canadian ports due to availability and the US Jones Act (also known as the Merchant Marine Act of 1920), which limits foreign vessels working in US ports. The trend to use Canadian ports is likely to continue until the US supply chain is able to support their projects. An unknown for Canadian ports is that timing of projects is not well defined. Marshalling activity has occurred at ports which were ready to accept components, sometimes with short timelines. This trend may be something which needs to be considered – that long range plans for equipment storage is not necessarily how projects unfold. Decisions with short timelines are sometimes needed as projects evolve, leaving available ports as the only options.

All these factors require wind developers and investors to search the globe for viable port solutions to support todays and tomorrow's wind farms. It is also typical that one port may not be able to do everything required to support a wind farm installation which leaves activities spread amongst several ports. This division of work can be beneficial to the overall installation of a wind farm by providing a degree of risk reduction and minimizing simultaneous operations at one port which may cause congestion.

For ports, the opportunity to participate in wind farm construction, operations, and eventual decommissioning increases with the separation of components, as even small ports may be able to fulfill a role. For example, operations and maintenance requirements on a port are much less than other tasks. These ports can play a vital and long-lasting role in the life of a wind farm even if there are limited laydown areas or a shallow draft.

When reviewing the Strait (or any area), it is important to keep these factors in mind. Some ports will be able to handle aspects of renewable energy development with a range from small to a major investment while others may not have a role.

6.2 International Port Review

Looking at ports in other areas of the world, and how they have modified existing infrastructure, or added to the port to support wind energy projects gives an indication of what infrastructure and support is needed. These specifications shown in Table 3 can be overlaid in the Strait to help envision what may be achievable, and to identify barriers to some options.

Fixed bottom wind projects are constructed offshore; therefore, the port requirements are for temporary storage of equipment needed to construct the turbines. Installation vessels call on the ports in sequence as equipment is needed, for monopiles, cables, transition pieces and towers, blades and nacelles. For this reason, having staging ports with only some components is routine and can allow smaller port areas to contribute to the industry.

There are ports around the world which are presenting a model of an 'all-in-one port' for floating wind, performing all activities from construction of foundations to assembly, commissioning and ultimately installation. Wind developers and floating foundation designers understand the requirements of this type of port, and the limited number of places where this is possible. There is also potential risk of locating all the activities in one area. There is potential to complicate the port activities by trying to do too much versus being very efficient at certain phases of the process, and then moving components to another suitable location for next stages of construction, assembly, or testing.

Ports in both the United States and Europe were scanned for examples of the various layouts and type of support they provided to renewable (typically offshore wind) projects. The ports, supporting offshore wind, which were examined in more detail as part of this study include:

Hull, UK
Blyth, UK
Seaton, UK
Nigg / Cromarty Firth, UK
Dundee, UK
Barrow-in-Furness, UK
Aberdeen, UK
Dalsøyra, Norway
Pikkala, Finland
Rostock, Germany
Aalborg, Denmark
Esbjerg, Denmark
Grenaa, Denmark
Rønne Haven, Denmark
Ostend, Belgium
Cherbourg, France
Saint-Nazaire, France
Aviles, Spain

Bilbao, Spain
Fene, Spain
Rotterdam, Netherlands
New Bedford, USA

6.2 Fixed bottom Windfarm

For a 1 GW fixed bottom foundation windfarm utilizing today's equipment, approximately 67 turbines each with 15 MW generating capacity would be needed. As turbine and farm sizes are still growing, the estimates in Table 3 provide an example of the range of dockside requirements and land use based on expected dimensions for 22 MW units to help ensure development is future proofed.

Component	Space Requirements (acres)*	Quayside Bearing Capacity (t/m^2)	Quayside Water Depth (m)	Equipment Sizes (each item)
Monopiles	20 - 30	25 - 50	12 – 14	100m x 10m Dia
Transition Pieces	7 – 10	25 - 50	9+	25 – 30 m tall x 8m dia.
Blades, Nacelles & Tower Sections	30 - 40	25 - 50	6 - 9	Blades - 130 - 140 m Nacelle – 25 × 12m Tower – 30m x 10m x 4 pieces
Cables	6	25	6 - 9	Carousel 20-25m dia.
O&M	2-5	25+	5 - 9	Day to day O&M vessel will need minimum draft. Larger vessels bringing components for dockside repairs = more space and deeper draft.
Transportation Corridor	3-6			Depending on shape and size of site and component received. For transportation corridor, roll-on roll-off activity, and general port functions.

TABLE 3: FIXED BOTTOM WIND TURBINE COMPONENT – LAYDOWN YARD LAND USE REQUIREMENTS, 1 GW

Note: *The storage method for components will impact space requirements. For example, Monopiles stored on purpose-built shipping cradles will need a much smaller footprint than if they were stored on gravel berms.

FIGURE 6: FIXED BOTTOM PORT, SOURCE: ABLE, UK

Approximately 50-80 acres of level land with excellent drainage and as much as 12m draft would be needed for a port to fully support a 1 GW fixed windfarm installation. This includes laydown, transportation corridors, offices and assumes all the components from monopiles to tower, nacelles, and blades. These components would be manufactured elsewhere and staged at the port for installation.

6.3 Floating Offshore Windfarm

There are two main scenarios for construction of floating wind turbines. In one, fabrication and subsequent work occurs on site. The other involves fabrication happening at an alternate site with partially or fully constructed units brought to a local port. In either case, turbine integration activities occur at a port close to the windfarm location.

Floating Offshore Wind Ports have greater requirements than a fixed bottom wind farm of the same capacity. From a port perspective a floating wind farm has more construction activity conducted on land adjacent the wharf (or nearshore), than for fixed bottom which requires large, specialized vessels to conduct all the installation operations offshore at the site of the farm. However, the increased capability of floating ports comes at a higher cost to construct. One of the key decisions for a floating offshore wind project is the floater foundation/hull design. This is chosen based on several key factors including cost, technical capability, constructability, and operations and maintenance considerations. The floaters are typically made of steel or can be made from concrete. The choice of materials is driven by cost and capability of supply chain.

To support installation of floating wind farms there are several types of activities which may take place at the ports. Each of these need large areas and equipment to perform the tasks. For floating wind, some of the needs are Integration, concrete facility, steel/concrete assembly location as well as a port for component receiving and handling. The port may also be designed to handle major maintenance should a floating unit be towed back to port for repair (blade, nacelle) or else the turbine assembly may go elsewhere.

The style and design of the floating turbine foundation will set some boundaries for minimum specifications required of a port. The dimensional requirements of a port for floating wind are typically larger than for fixed bottom turbines but if both use cases are taken into consideration during design stage, it is possible to support either scenario during the life of the port.

Looking at requirements for floating wind ports, it is important to outline the intended use case and ensure that it can support those activities, and where possible, should be designed to future proof the area, anticipating that larger and heavier components will be used and that deeper draft vessels will need to call on the port to maintain it as a viable option. Finally, there should be consideration of different floater styles (semi-submersible, barge and tension-leg platforms), and needs when determining the port layout and specifications.

For a steel based floating platform, Table 4 notes components and a range of space requirements. These values represent estimated requirements for future turbines up to 22 MW, but it is unclear when the turbine size will peak.

Component	Space Requirements (acres)	Quayside Bearing Capacity (t/m^2)	Quayside Water Depth (m)[1]	Equipment Sizes (each item)
Nacelle Blades Tower Sections	30 - 40	25 – 50	6 - 9	25 × 12 × 12 m high 130 - 140 m 35 - 50 m tall x 6-8m dia. x 4
Crane for Floating Installation	2 - 4	50	6 - 12 +	+1000-ton lifts at 150m+
Cables	6	25	6 - 9	Carousel 20-25m dia.
Anchor and Mooring Chain	10	25	6 - 9	Upwards of 8 sets of 175mm chain x 800m and 50+ ton anchors
O&M	5-10	25	5 - 12 +	Day to day O&M vessel will need minimum draft. Type of major equipment repair will determine maximum requirements.
Foundation	15 - 30+	25 - 50	12 +	80 m x 80 m

TABLE 4: STEEL FLOATING WIND TURBINE AND FOUNDATION - LAND USE REQUIREMENTS, 1 GW

[1] Water Depth refers to vessels offloading components to the dock for later installation.

Ports designed to manufacture concrete floating foundations, will require a large footprint for the concrete manufacturing portion as well as for the foundation construction. Weights of these floaters tend to be much higher than steel design (5,000 t for steel versus 20,000 t range for concrete), so the quayside bearing capacity and launching mechanism (submersible barge, slipway), must be carefully selected to accommodate these needs. Tower and blade/nacelle integration is similar for either steel or concrete designs so the same laydown areas and crane capacities will be required for those tasks. The cranes needed to install the nacelle and blades are some of the largest ring cranes available today. Figure 7 is a representation of what a floating wind port could look like.

FIGURE 7: FLOATING WIND PORT, SOURCE: MARINE ENERGY WALES

6.4 Operations & Maintenance

With the construction of an offshore wind farm complete, the longest phase of its lifecycle takes over – the operations and maintenance (O&M) stage. This may last 25-35 years and will depend on the planned service life of the turbines and any service life extensions which may be granted. The method of support for the O&M phase is impacted by the foundation type (fixed bottom versus floating) and in the case of floating, potentially by the design of the floating unit. The facility design is also affected by the type of O&M carried out, whether it is routine work, or if major repairs can be conducted locally.

Shore base support for fixed bottom wind farms consist of a port which the vessel can call on, and stage equipment nearby for small maintenance operations and amenities such as fuel, water, and skilled labor. Larger replacement components required for major repair (blades, gearboxes) will not generally be stored locally as specialized vessels are needed. An O&M base in the UK is shown in Figure 8.

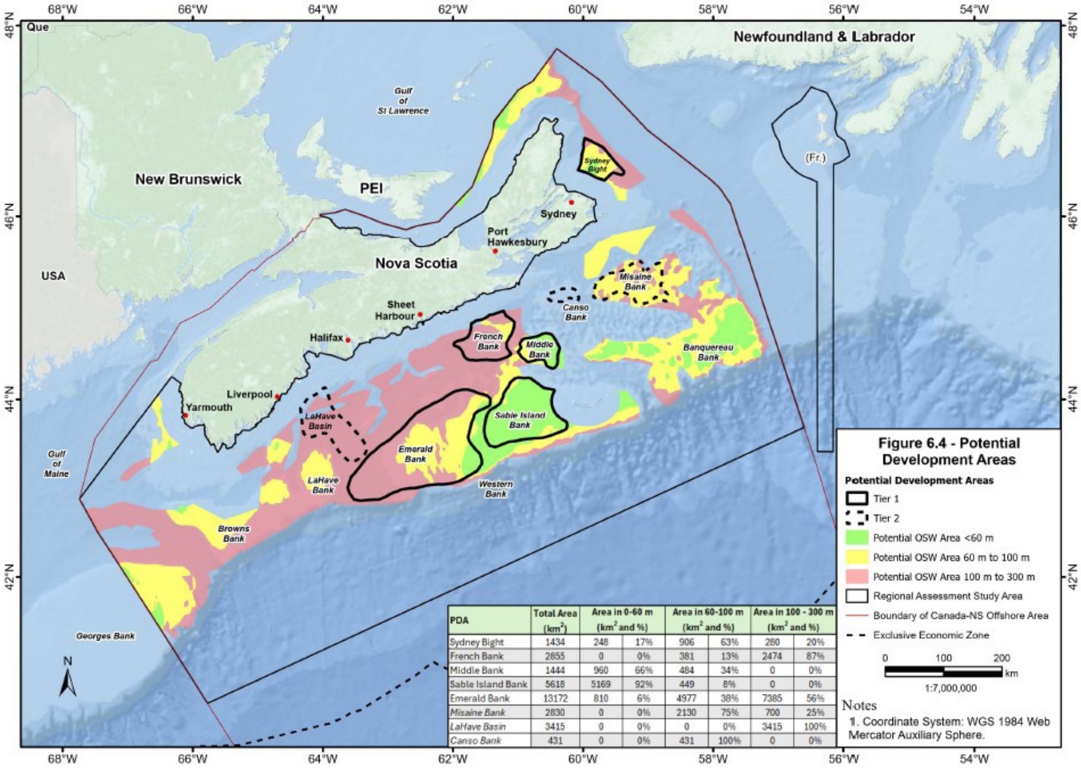
For floating wind farms, there are similar O&M vessel requirements as for fixed bottom farms but with added potential need to tow the structure to port for a major repair solution in sheltered waters. This is due to motions between the vessel and floater which may make this type of work too complex or hazardous at sea. The port required for these repairs needs to have deep draft of 12m or more, sheltered waters, an area for large components and a large crane available to complete these major repairs. The tow distance with the floater is also a factor as to where it can be moved for major repair, with the closer to the offshore farm the better.

In both fixed bottom and floating O&M scenarios, the location of the windfarm relative to the onshore support base will dictate the vessel types which are used for servicing.

FIGURE 8: O&M PORT, SOURCE: OCEAN WINDS

6.5 Potential Development Areas in Nova Scotia

The ongoing Regional Assessment of Nova Scotia's offshore has released an draft final report and with it, eight potential development areas, five designated as Tier I and three as Tier II. Tier I locations have been recommended for immediate consideration while Tier II locations require additional investigation or engagement prior to making a determination on suitability. Figure 9 and Table 6 show the locations of these potential areas as well as approximate distances to Point Tupper. Note that Sable Bank and Middle Bank cover nearly all of the fixed bottom locations identified in the report.



PDA	Total Area (km^2)	Area in 0-60 m (km^2 and %)		Area in 60-100 m (km^2 and %)		Area in 100 - 300 m (km^2 and %)	
Sydney Bight	1434	248	17%	906	63%	280	20%
French Bank	2855	0	0%	381	13%	2474	87%
Middle Bank	1444	960	66%	484	34%	0	0%
Sable Island Bank	5618	5169	92%	449	8%	0	0%
Emerald Bank	13172	810	6%	4977	38%	7385	56%
Misaine Bank	2830	0	0%	2130	75%	700	25%
LaHave Basin	3415	0	0%	0	0%	3415	100%
Canso Bank	431	0	0%	431	100%	0	0%

FIGURE 9: REGIONAL ASSESSMENT MAP OF POTENTIAL WIND DEVELOPMENT AREAS [6}

Early offshore wind developments in Nova Scotia will most likely be fixed bottom turbines. This is due to the technical maturity of the industry and lower LCOE compared to floating wind. Fixed bottom will have challenges because the shallow seabed is further from shore than most countries. There is a narrow shelf off the coast before water depths increase beyond +/-60m. Larger, shallow shelf areas which could be ideal for fixed bottom turbines are located 100-200 km from shore. Construction costs in these areas will increase due to distances from ports. The distance from shore will also increase the cost of the export cable and potentially impact the substation requirements. Operations phase costs will also increase due to distances travelled.

The operations and maintenance (O&M) strategy for a wind farm largely depends on its distance from shore. Whereas some fields can be serviced from local ports with a crew transfer vessel (CTV) going to and from shore daily, the fields which are located further from land will rely on a service operations vessel (SOV). The SOV is a larger, more capable vessel which stays in the field for a prolonged period and can operate effectively in higher sea states. This reduces travel time back and forth to the port and more effectively services the turbines which are located further from a port. However, this comes at a cost as the vessel day rates are much higher than for a CTV. For SOVs, crew transfer is completed via helicopter or a day's long trip back to port. Table 5 highlights some of the differences between CTVs and SOVs.

	CTV	SOV
Draft (m)	1.2 – 3.5	5 – 6.5
Length (m)	25 - 40	60 - 90
# of personnel	20 – 30+	44 – 130+
Normal Trip	<100km to location. Travels out and back in same day	>100km from shore, remaining on site for weeks
Speed (kts)	15 – 50	10 - 20
Capacity	30 T of components	Up to 1,500 T of equipment
		Many with helidecks, cranes and walk to work systems

TABLE 5: CTV AND SOV SPECIFICATIONS

As shown in Table 6, the fixed bottom farm locations of Sable Island Bank and Middle Bank are both significantly far from shore and would use a SOV strategy for O&M. Because of the support services offered in the Strait (service companies, metal fabricators, laydown area, capable ports), the Strait could be a suitable location for an O&M base. Typically, the base supports day to day servicing and repair tasks, so a large laydown area is not required. Most major repair work (e.g. blade changes) is performed in the field and would require a specialized wind turbine installation vessel (WTIV), or equivalent capable vessel.

TIER I

Sydney Bight	French Bank	Middle Bank	Sable Island Bank	Emerald Bank
200 km	120 km	130 km	200 km	>300km

TIER II

Misaine Bank	LaHave Basin	Canso Bank
150 km	>350 km	100 km

TABLE 6: APPROXIMATE DISTANCES FROM POINT TUPPER TO POTENTIAL WIND DEVELOPMENT AREA

In contrast, floating opportunities may be established closer to shore and potentially could use a CTV vessel for their O&M plan. However, with significant potential for fixed bottom turbine locations offshore Nova Scotia, it is expected that floating wind farms in Canada will follow global trends and have a longer timeline to become reality.

6.6 Port Assembly – Floating Wind

One of the biggest differences between fixed bottom and floating wind farms is the activity at the port and nearshore. Development of a floating offshore wind farm has several phases which are carried out on land or nearshore while fixed bottom wind farm construction happens mainly offshore. This means more land is required for construction, assembly, and fabrication steps and either partially or fully constructed floating units will need a location nearby the port between stages.

Steel hulls will likely arrive in Canada in “Lego block” style or fully assembled structures. In both cases heavy lift transport vessels would be used for delivery to the local port. Delivery of fully constructed concrete units is also possible, but these hulls can also use local materials to construct the floater structure in country. In either the steel or concrete design, the next stage of assembly is integration of the tower and nacelle onto the floater. The timing of the integration may vary depending on the construction sequence and availability of equipment being used. For turbines anticipated such as 15 MW units, the largest style ring cranes, positioned quayside are required to perform the integration work due to the weights and heights of the lifts. Figure 10 shows an example of a ring crane supporting floating offshore wind.

Depending on the timing of operations, foundation units may be constructed and then floated off the dock but not immediately proceed to an integration phase. Integration of the tower and nacelle may also occur, but the unit may not be able to be towed to the field location due to vessel availability, weather, or other factors. In either case, depending on the amount of space at the dock, the floater may need to be moved and wet parked. This means it must be moved to a secure location and temporarily moored until its next phase of construction or installation.

FIGURE 10: RING CRANE, SOURCE: MARINE LINK

Space requirements for wet storage depend on whether the tower and nacelle have been integrated or only the foundation. For ten (10) of foundations only, approximately 70 – 170 acres is needed, while for integrated units, those values climb to 200 – 700 acres.

There are several considerations when determining how and where to wet park a floating unit. For example, a unit with tower and nacelle assembled is much larger and must give more consideration to the elements. With blades installed, there will be additional forces acting on the unit should a heavy weather event occur during the temporary storage. Although a high seas and wind event will impact a foundation as well, its lower profile will mean there will be lower forces acting on the unit.

Elements to consider for a wet storage location:

- shelter from ocean swells and severe weather;
- current and future uses of the seabed area;
- footprint for temporary mooring / anchoring system to maintain the floaters in position;
- anchored, or sitting on seabed, or both;
- security of site and unit when they are left unattended; and
- how the floating units will be monitored (anchor chains, etc.)

.

To determine a suitable wet storage location in the Strait, a more detailed study focussed on the key parameters is required. However, as commercial floating wind is likely 10+ years away for Canada, this work can be deferred until these developments proceed.

7

Port & Infrastructure Summary for the Strait of Canso

Industrial locations in the Strait were studied for both their existing capabilities and potential areas of support for renewable projects. Infrastructure to support land-based wind and Power to X projects is available and appear achievable. Limited capability currently exists to support large scale offshore projects however there is opportunity develop needed infrastructure.

The deep water access in the Strait means that areas could be transformed to support any aspect of floating wind. Large investment would be needed, but the natural attributes exist if floating technology becomes commercial.

As noted, the industrial areas near the Strait were designated and have been used for heavy industry. Several local businesses have been in place for many years and are utilizing water access to varying degrees. Apart from Martin Marietta and the EverWind Fuels Terminal, other ports in the Strait are underutilized.

Because of the age of the port infrastructure in the Canso area, there is some uncertainty as to the full capability of the port facilities. Bearing capacity and bollard testing are not verified at many wharfs which may mean some discrepancies between reported and proven values. Water depth at quayside is also critical for projects contemplated in this report and may need confirmation that sufficient depth is available for vessels calling the port.

For facility owners in the Strait who wish to support the renewable industry and the large vessels which will call to deliver or pick up components, it will be mandatory for water depths, load capacity, and bollard capacity to be confirmed and approved by appropriate marine warranty personnel. This process takes time and effort to produce files or perform required confirmation testing.

With the increase in vessel traffic in the area it will be important to efficiently support the needs while at port. There is an opportunity for additional services to be available in the Strait including fuel supply, potable water and other provisions.

7.1 Port Specifications

A summary of the larger port owners in the Strait and their associated infrastructure are noted here.

Location	Water Depth	Length of Wharf	Structure	Area on Wharf	Other Laydown Area	Other Comment
Martin Marietta	13 m	183 m	dolphin	N/A	>20 acres	
Mulgrave Marine Terminal	6 – 10 m	425 m	Concrete cribs & Steel sheet piles	4 acres	N/A	Warehouse and office space available
Port Hawkesbury Pier	5 - 6 m	300 m	Timber cribs	N/A	N/A	Suitable for small cruise ships, service vessels, tugs or barges.
Strait Superport Marine Services	4-5 m	50 m	Timber cribs	N/A	N/A	Suitable for service vessels, tugs or barges. Floating dock extends 100m along quay
McNally's International	5m at docks	320m	Pile dock	N/A	Approx. 8 acres on Georgia Pacific area of the site, some used for buildings	Could infill from dolphins to shore for additional ~7.5 acre Water lots: 36 acres
	10-12m at jetty	N/A	Jetty & dolphins	N/A	17 acres overall	1275m Water Frontage. Jetty is older but dolphins could be used.
Cabot Gypsum (Dock leased from Invest NS)	6m	80 m	unknown	N/A	1 acre	Could infill between dock and land for additional area
Port Hawkesbury Paper	10.2 m	185 m	Sheet pile and concrete deck	N/A	Approx. 30 acres non continuous within site	
Nova Scotia Power (Point Tupper)	18 m	140 m	Jetty	N/A	Removal of coal facility, potential for 7+ acres of laydown space. Needs new dock to receive or via land.	Additional 16 acres behind coal pile
EverWind Fuels	32 m	600 m	Jetty	N/A	N/A	
	10m proposed	Unknown	Piles			Offloading Equipment/Tugs
Bear Head - Proposed	20m + 10m	160m + 166m	Jetty Pile	N/A	N/A	Offloading Equipment/Tugs
Melford Terminal - Proposed	18 m	730 m (1,095 m Phase II)	caisson	103 acre (170 acres Phase II)	250 acre logistic park	Greenfield, so can be developed as business case needs. Option for additional 1200-acres for logistic park.

TABLE 7: PORT SUMMARY, STRAIT OF CANSO

For wharfs which are not constructed, values are based on public plans or estimates of requirements.

Existing locations were assessed using the Strengths, Weaknesses, Opportunities and Threats (SWOT) method in the following section.

The Melford terminal was included in the assessment as it is a significant component to the potential in the region. Although primarily planned as a container terminal it may also be a prime location to support offshore wind, onshore wind, and power to X development. The Invest NS lands near Bear Head and EverWind and at Cass Cove were also reviewed as locations for larger port and laydown areas which have potential for supporting renewable energy development or a manufacturing location.

7.2 Martin Marietta

Martin Marietta could readily supply aggregates which are needed to provide cable protection in many offshore windfarms. The site has potential for large vessel offloading (draft ~ 13m), but there currently is not a dock in place and due to core business operations, have no space available for any material storage. If the current operation or process changes, there is potential to repurpose the site for some windfarm support activity, but this is an unlikely scenario as the remaining life of the facility is expected to be 50+ years. An additional drawback to the site is a limited laydown area before a significant grade change which would limit large component marshalling.

Strengths	Existing aggregate business which can immediately support offshore windfarms. Deep water near land. Heavy industrial area.
Weaknesses	No wharf at present. Lack of laydown area with ongoing operations. Large elevation gains behind wharf.
Opportunities	Potential to support large component storage/marshalling if current business model was reduced.
Threats	Aggregates supplied to industry vis alternate ports (Sheet Harbor and Bayside NB) Proposed Vulcan Materials mine which could compete for local aggregate market.

7.3 Mulgrave Marine Terminal

Mulgrave Marine Terminal is operated by Strait Superport Corporation. It has an excellent dock and wharf structure, with semi-deep water (draft range 6-10 m), and capacity to take on additional work. It is currently the only common port in the area and serves a variety of clients throughout the year. Opportunities to support onshore wind components and transport of blades to storage sites on the mainland side of Nova Scotia has been established at the port. Based on the proposed onshore wind farms and their proximity to the Strait area, the Mulgrave Terminal has the potential to serve many projects over several years. As Mulgrave does not currently have the capacity for long-term storage of the wind components needed for a farm size development, nearby storage sites are being developed to overcome this challenge.

With respect to offshore wind, the 10m water depth at Mulgrave is sufficient for some of the vessels associated with offshore wind development. Service vessels, support vessels, and the wind turbine installation vessels which can jack up near the wharf can call on the Mulgrave Terminal. However, larger roll-on, roll-off, heavy lift or other vessels may require deeper draft than what is presently available.

O&M activities may be supported via Mulgrave, and it has a history of similar services. For example, in 2024 the port received accommodation modules which were temporarily stored on site prior to being installed on a vessel destined for wind farms in the US as shown in Figure 11. Opportunities such as this should help Mulgrave to promote its services which the offshore renewable sector may need. A drawback for the site is laydown area. At approximately 4 acres, it cannot handle large amounts of cargo such as from heavy transport vessels and may impact other vessel operators who call on the port.

The Mulgrave Marine Terminal could play a significant role supporting onshore wind activity in Nova Scotia and look for opportunities to support US offshore wind where applicable. O&M is an activity well suited for Mulgrave once Canadian offshore wind farms have been established but this may not occur until mid 2030s. Offshore wind vessel calling, and anchorage will also be an activity with significant potential.

Strengths	Relatively deep-water wharf and good load bearing capacity. Close to onshore wind farm locations, can support offloading and transport to storage area. Common user port – willing to work with groups who need a solution.
Weaknesses	Lack of a large laydown area with ongoing operations. Limited space for easy expansion of laydown yard. Not suitable to support offshore wind component storage or assembly. Lacking some services such as fuel
Opportunities	Potential to support onshore component landing for mainland Nova Scotia and won't tie up dock space when components are moved directly off site. Land components for Power to X (EverWind & Bear Head) O&M support base for Canadian offshore wind. Possible to perform repair and warranty work for offshore US wind components
Threats	Water depth is not sufficient for latest generation vessels and may need dredging to make the port marketable in near future. Business case to support the Mulgrave operations. With size of offshore wind components, it falls below standards being sought by major wind developers for assembly or storage potential.

FIGURE 11: OFFSHORE WIND ACCOMODATION VESSEL AT MULGRAVE TERMINAL, SOURCE STRAIT SUPERPORT CORP.

The Strait Superport Corporation operates a second location, the Port Hawkesbury Pier near the town of Port Hawkesbury. This is typically a berthing port for smaller vessels with approximately 3m draft but has capability for tugs, barges and service vessels. There is no additional land behind the pier for laydown so it would have limited capacity to support renewable projects.

7.4 Melford Terminal

The Melford Terminal is a proposed location for container terminal, located in Guysborough County, across the Strait from the EverWind and Bear Head sites. The location has been initially planned as a container terminal and has the potential to be a world class facility. Plans include a large wharf structure, laydown area, rail access to mainline and an industrial park adjacent to the site. investment estimated to be $300M - $350 range for the development of renewables only and circa $600M+ for complete construction of all aspects of the development. A large component of this amount is the land leveling and infilling needed to construct the wharf into the deeper water.

The site may also have potential as a renewable energy port. This could include the full range of support from marshalling and storage to construction, assembly of floating wind foundations, turbine integration, O&M and major repair for floating wind turbines/foundations. There is also opportunity to support onshore wind if there is a need and the site is available during onshore project timelines. Finally, the site and facility would have land and water access which could support a common user port for users in the area from manufacturing facilities for renewable energy components or other heavy industries.

Because Melford is a greenfield site, it is ideal to handle large offshore components as it can be developed to suit any needs. Marshalling, storage, construction, and assembly activities require the space which a location such as Melford can provide. Other areas of the Strait can support the sector via fabrication, cable or mooring storage, aggregate supply, and wet storage of units but there are limited areas for larger components and their operations.

Strengths	Greenfield development so can accommodate designs which future proof the facility where possible. Land and water access is secured as is rail line path. Permitted for development. Support of container terminal – multi use case can make economics more favorable than standalone renewable port. Heavy industrial area designation.
Weaknesses	Not constructed. Will need financing, partner, shipping contract. Missing near term US wind opportunities
Opportunities	It is the one area in the Strait which could handle a range of offshore wind development – from marshalling to assembly to maintenance – if the design includes these features. Wharf planned to extend to deep water and built to high load bearing capacity. Large laydown area behind wharf is available. Potential to support onshore component landing and storage for Guysborough/Mulgrave area. Could act as a Common user port. Can support manufacturing facility for onshore or offshore wind components in the vicinity.
Threats	Need financing to put in place. Several years from development so may miss offshore US wind opportunity. Existing container work at Port of Halifax. Sydney, NS and Argentia, NL already serving US offshore wind. Renewable energy projects are not the key drivers for the terminal, so there needs to be a business case to support extension of plans to include wind turbines – marshalling, assembly, maintenance, or manufacturing.

7.5 Strait Superport Marine Services

SMS has a wharf located in the Ship Harbour area with draft limited to 6 m. There is also very limited laydown space available in the property boundaries.

The site is currently used for research vessel tie up and many maintenance projects for smaller vessels. Because of the history and capabilities, SMS may be able to support O&M for offshore wind activities from medium sized vessels with acceptable drafts. Larger vessels may have an issue with draft if an alternate solution isn't available (e.g. spacer barge, crane with extended reach).

Strengths	Long history in location of supporting their vessel fleet as well as other smaller vessels for repair or maintenance.
Weaknesses	No laydown area or land expansion capability due to location in Port Hawkesbury. Active with current operations. May be a concern adding other work to the site. Limited draft.
Opportunities	Has capability to handle small 0&M vessels. (CTV)
Threats	Competition as other ports with better draft are chosen to support the O&M phase.

7.6 McNally International

McNally International has wharfs which are limited to 5m draft. They may be able to support CTVs and other offshore wind O&M vessels but are unable to accept the larger heavy transport vessels. They also own the former Federal Gypsum property which has a jetty with dolphins which could be used, however it would need major upgrades such as a high strength wharf extended out to support large equipment movements from vessels.

Some laydown space is available in the property boundaries of approximately 17 acres of which some is used for office buildings. There is an opportunity to increase laydown area by infilling from dolphins back to shore as shown in Figure 12.

FIGURE 12: MCNALLY INTERNATIONAL SITE WITH INFILL

The site could be considered as a common user port for Point Tupper given presence of rail and nearby road access features. Upgrades would be substantial if the new dock was situated near the existing dolphins and thus there are likely more suitable options in the area such as PHP or Mulgrave.

Strengths	Rebuilt wharf with up to 200T crane capacity. Heavy industrial area designation. Flat laydown area (17 acres total land). Road and rail access. McNally can perform upgrades to their own location.
Weaknesses	Jetty needs to be replaced with proper loading facility to support offshore or onshore wind components. Low draft at existing wharf for large vessels. Furthest distance in Point Tupper by road to transport equipment to hydrogen/ammonia sites. (EverWind & Bear Head). Large upgrades needed to support renewable energy projects (infill and wharf).
Opportunities	Has capability to handle several aspects of wind energy projects depending on what design features are built. Infill to new wharf which would give load capacity and draft needed and increase the laydown or storage area within the site by approximately 7 acres onto existing 17 acres. Potential to support onshore wind component landing and storage for Port Hawkesbury/Richmond County area. Could be used as a Common user port.
Threats	Need financing to put in place. Several years from development. Competition from other ports weaken the business case.

7.7 Port Hawkesbury Paper

PHP has been looking at alternatives to diversify their operations in addition to the core papermaking business. On site there is a wharf with a draft of 9m which comes close to the water depths needed for large vessels like those used in the renewable industry. PHP has or could have approximately 30 acres of laydown area within their facility boundaries. The wharf would need upgrades to facilitate the largest offshore wind vessels and components, but it could be a more economic option for storage than a new facility elsewhere.

There is potential for PHP to assist land-based wind operators in the area via offloading site as projects come forward for the Cape Breton side of the province. This has been done previously at PHP for a local windfarm. The PHP site also has road and rail access if needed to move material on or off location.

The PHP site could provide a location for a common user port in Point Tupper. The site could support barges for wind, hydrogen/ammonia equipment or other projects and other industrial users in the area who lack direct water access. However, due to the active papermaking, the power generation plant, rail line and ancillary buildings within the facility boundary, there are some challenges to being a common user port. While some structures could be removed or relocated, there are others which are key to ongoing operations and unable to be modified.

Strengths	Open to look at opportunities including wharf upgrade. Existing draft of 9m. Up to 30 acres laydown space within property. Road and rail access. Has previously received onshore wind components destined for installation on the Cape Breton island side.
Weaknesses	Infrastructure for operations may impede movement to laydown sites. Elevation gain behind wharf and resulting grade needs to be considered. Wharf would need upgrade to reach water depth and capacity to service large vessels and components. Active site with the current operations, so other opportunities (renewable or common user port), would require coordination to avoid conflicts.
Opportunities	Potential for additional laydown space in yard to support large component storage/marshalling if wharf upgrade was in place and realign roadway. Potential for common user port in Point Tupper. Site is close to Invest NS lands at Cass Cove which could be used for additional storage.
Threats	Competition from sites more suited to support equipment receiving for hydrogen development, reducing the case for investment in wharf upgrades. Unable to move the infrastructure or roadways to accommodate marshalling work.

7.8 Cabot Gypsum

Cabot Gypsum is located near the tip of Point Tupper and has a wharf with 6m draft. The wharf is leased from Invest NS and is minimally used, so there is capacity for more vessel traffic. Water depth is less than required for larger vessels, but it can support barges which could permit receiving equipment such as hydrogen/ammonia modules via barge if offloading from transport vessel is performed at another location like the Mulgrave Terminal.

Cabot Gypsum's site has limited laydown space on the existing lot (approximately 1 acre), and expansion of laydown would only be possible by infilling between the wharf and the land. This would still not provide a large flat area.

Current operations at Cabot plan to continue without significant changes in the near future. They are a large energy user so are looking at opportunities for a more stable energy supply and to be more affordable. This could be in the form of wind or solar or other options such as hydrogen.

The wharf could also be utilized as a common user facility for Point Tupper with modifications dependant on the types of products moving and the drafts of the vessels calling. It is situated close to road and rail access but has some drawbacks that may not be as attractive for widespread common usage. There are space limitations for laydown or warehouse/office buildings and a narrow connection to the land may limit the type of loading/offloading activity which can be performed. The rail line could present opportunity but also cuts across the site which creates challenges for any handling and storage activities.

Overall, the wharf and lands are not sufficient in the current state to support large offshore renewable themed activity. Although open to supporting wind development, limitations exist on the site making it more suited to equipment receiving or could possibly function as a common user port for the area.

Strengths	Existing wharf with low activity level. Open to look at opportunities including wharf upgrade. Road and rail access
Weaknesses	Small laydown area currently available with limited expansion capability. Wharf would need upgrade to reach water depth (6m current draft), and capacity to service large vessels and components. Infilling behind wharf can increase available land, but it is still very limited in size.
Opportunities	Potential for additional laydown space by infilling between wharf and land. Potential for common user port but limited capacity. Could support barge transport and receiving large components
Threats	Other sites more suited to support equipment receiving for hydrogen/ammonia development, reducing the case for investment in wharf. Unable to carry out infilling operations. Competition from other ports.

7.9 Nova Scotia Power

The NSP Point Tupper power plant is a coal fired plant located near the mid point of Point Tupper and contains a jetty which extends into the deep water to offload the coal. There is a large area for coal storage near the facility. Due to renewable energy targets and phase out of coal fired power by 2030, the future of the facility is unknown. Conversion to a lower carbon fuel source is likely with natural gas being the preferred option. If this transition takes place, there is also potential for the facility to blend the fuel with locally produced hydrogen. The availability, operational and plant requirements and cost will determine the role of hydrogen in the fuel mix.

Converting power generating process to use hydrogen could help promote the hydrogen industry in the area by being a large local customer. The plant could provide peak load capabilities and supplement when wind turbine production drops, while using a clean burning fuel source.

Regardless of what alternate fuel source is used, the coal unloading, and storage areas would no longer be used as well as some other facets of the plant. The current coal storage areas as well as an adjacent unused tract of land could be utilized for laydown/storage. The challenge with the site is there is no wharf so an entire structure would need to be constructed. Alternatively, if unloading was possible nearby (PHP, Cabot Gypsum, other), components could be moved to the NSP site for storage.

Because of the unknowns with NSP operations and lack of existing port for equipment offloading, the site's potential for supporting offshore renewable project development is less certain at this time, and would require working closely with neighboring industry or a major investment of its facility.

NSP may have a potential role in hydrogen use locally and helping to build the industrial base.

Strengths	Rail access
Weaknesses	No wharf, only jetty in place.
Opportunities	Potential offtake for locally produced hydrogen Potential laydown area (23+ acres) if coal facility removed
Threats	Major investment needed for a wharf and no clear business case at this time to pursue it.

7.10 Bear Head Industrial Lands - Point Tupper

With the rise in renewable projects (particularly offshore wind turbines), large open areas immediately behind a deep-water port are becoming increasingly valuable assets. The Strait is fortunate to have a greenfield development site in Melford that would rank as a top prospect in most jurisdictions.

There are areas of land in the Strait with water access which are still available for development. As noted in previous studies, there are some limitations as to what these sites may be best suited for based on existing infrastructure (homes, roads, rail). As well, the topography of the Strait varies from relatively flat areas to those with significant elevation gain which would be difficult to economically develop.

7.10.1 Bear Head Terminal

The Bear Head site is cleared and permitted for both land development for hydrogen and ammonia production and the associated marine needs. Planned marine infrastructure includes a jetty and dolphin arrangement for vessel loading of ammonia and a wharf for equipment delivery and tug berthing.

The wharf is planned to extend to approximately 10m water depth, to allow receiving of large modular components required for the hydrogen and ammonia production. This will be utilized for phase I and will include berthing for tugs in support of construction and ammonia transport. The wharf itself will have high usage during each Phase of hydrogen/ammonia production expansion but will have capacity during other periods. This presents an opportunity to support other industries on Point Tupper who lack easy access to vessel shipments.

7.10.2 Bear Head Industrial Reserve

Four areas were identified, in the Aecom report – *Strait of Canso Superport Master Development Plan [1]* as shown in Figure 13 as sites D, E, J and K*. These were selected for their potential with E & K noted as greater slopes while sites D & J were described as more level land. Site D is adjacent to the Melford container terminal site and has similar characteristics. Site E is more sloped and there is limited potential for a large land area. Sites J and K are discussed below.

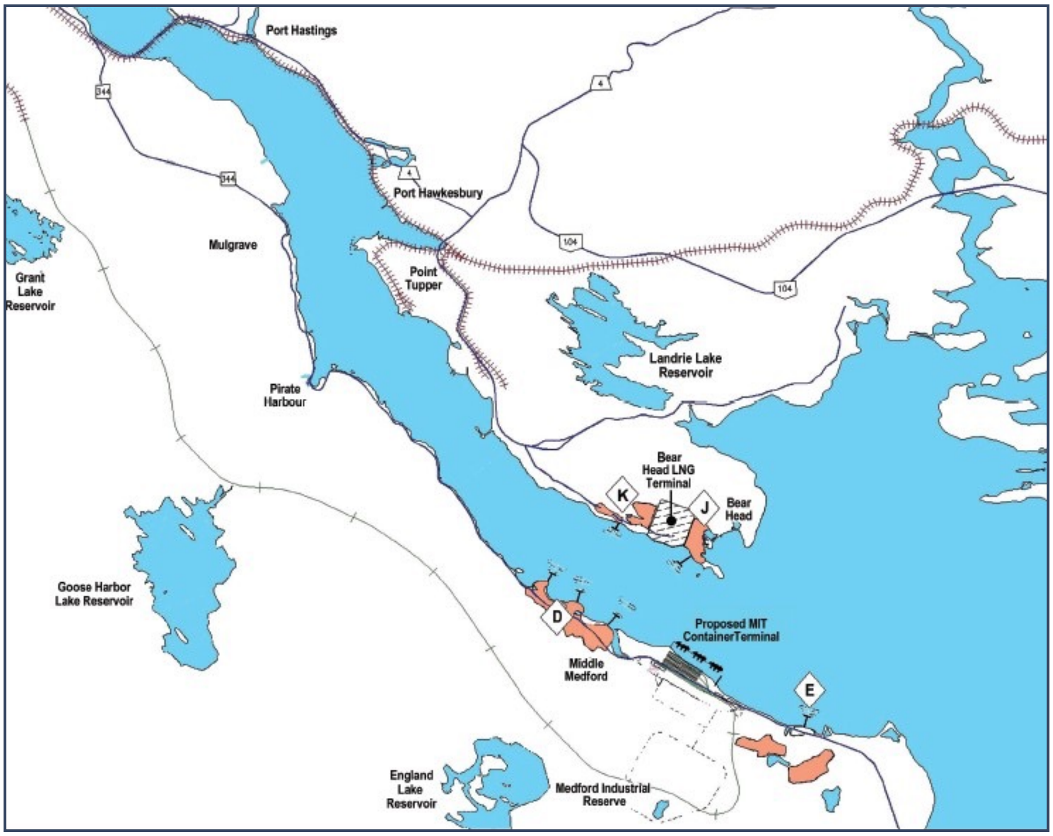


FIGURE 13: AECOM – STRAIT OF CANSO SUPERPORT MASTER DEVELOPMENT PLAN MAP [1]

7.10.2.1 SE Bear Head Industrial Land

The parcel of land near the southeast side of the Bear Head terminal in Figure 14, (Site J) and surrounding lands are currently owned by Invest Nova Scotia.

The water depths are more moderate in this area so significant work would be needed to extend a wharf depending on the depth of water required.

This area has many features which could make it an ideal location for development including land topography which could be suited for a laydown area. However, per Invest Nova Scotia, there are restrictions due to the Bear Head and EverWind future expansion plans, required utility corridors and other infrastructure needed to support the area as a key asset for hydrogen development.

FIGURE 14: SOUTHEAST OF BEAR HEAD SITE

Strengths	Greenfield Development. Generally level land.
Weaknesses	Limitation on space due to hydrogen/ammonia developments and supporting infrastructure (roads, water and electricity). Shallow water so port would need to extend further to reach required depth.
Opportunities	Common user port, can support marshalling or manufacturing site with deep water access and purpose-built wharf.
Threats	Land is required for hydrogen/ammonia production expansion or utility corridors limiting other users. Unclear business case if EverWind and Bear Head separately build receiving wharfs.

7.10.2.2 NW of Bear Head, SE of EverWind

Another site, on the Point Tupper side was also identified. This is a parcel of land northwest of the Bear Head terminal, and adjacent to the EverWind land (Site K), with water rights and land behind belonging to Invest NS.

This area has many features which could make it an ideal location for receiving components for the hydrogen/ammonia developers and could be established as a common user port. A laydown area is also possible but would require significant work due to the elevation change moving away from the water's edge.

A wharf has potential to be whatever length desired and would need to extend out approximately 120m from the shoreline to reach water depths of 12+ meters. Figure 14 shows the potential wharf and development area.

If a significant portion of the site was available, its access to water could also support a manufacturing facility for either wind components or other industries. However, the availability of this site may depend on the hydrogen and ammonia production and future expansion plans similar to the SE Bear Head Industrial lands described above.

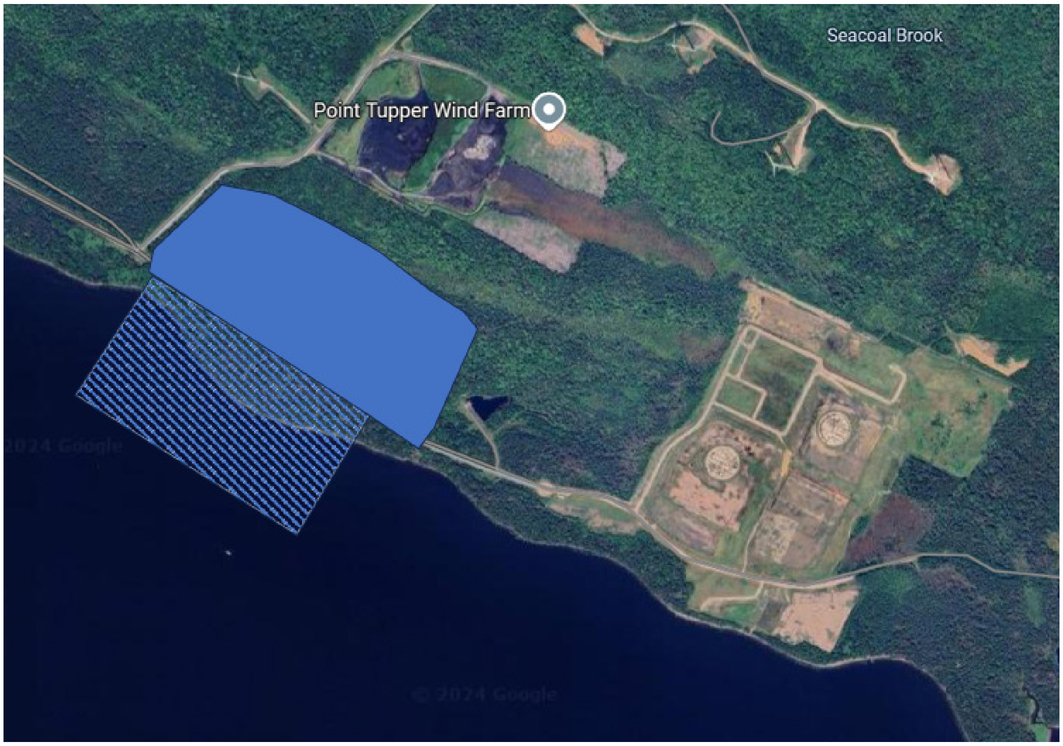


FIGURE 15: NORTHWEST OF BEAR HEAD SITE

Strengths	Underutilized land. Deep water is relatively near land.
Weaknesses	Existing land leases and future use for hydrogen/ammonia projects. Sloped land requires significant works to level.
Opportunities	Common user port. Large laydown area behind port which could support marshalling or manufacturing site with deep water access and robust wharf.
Threats	Land is required for hydrogen and ammonia production expansion plans or utility corridors, limiting other users. Less desirable business case if EverWind and Bear Head separately build receiving wharfs. Previous history of site and adjacent lands includes potential remediation which needs to be assessed.

7.11 Cass Cove

Cass Cove has an area of water and lands owned by Invest NS. This location currently supports transmission lines from the NSP site into Port Hawkesbury. There is an area of interest which is close to both the road and rail system which could be considered for a common port. It is currently undeveloped and is shown in Figure 16. The hashed area is potential wharf structure while the darker colored area is possible laydown or office/warehouse area. The land portion is about 12 acres and could increase with some infilling.

The straight, flat access from the site and onto the road system is a benefit if large pieces were being considered for loading or offloading from the site.

Strengths	Underutilized land. Easy access to road and rail line.
Weaknesses	Needs business case to construct. Wharf needs to extend up to 400m to reach 10m+ water depth. Existing utility corridor on part of lands. Small laydown area behind water lot.
Opportunities	Future Common user port.
Threats	Other site(s) in the area redevelop and take on common user port capability reducing feasibility of this site.

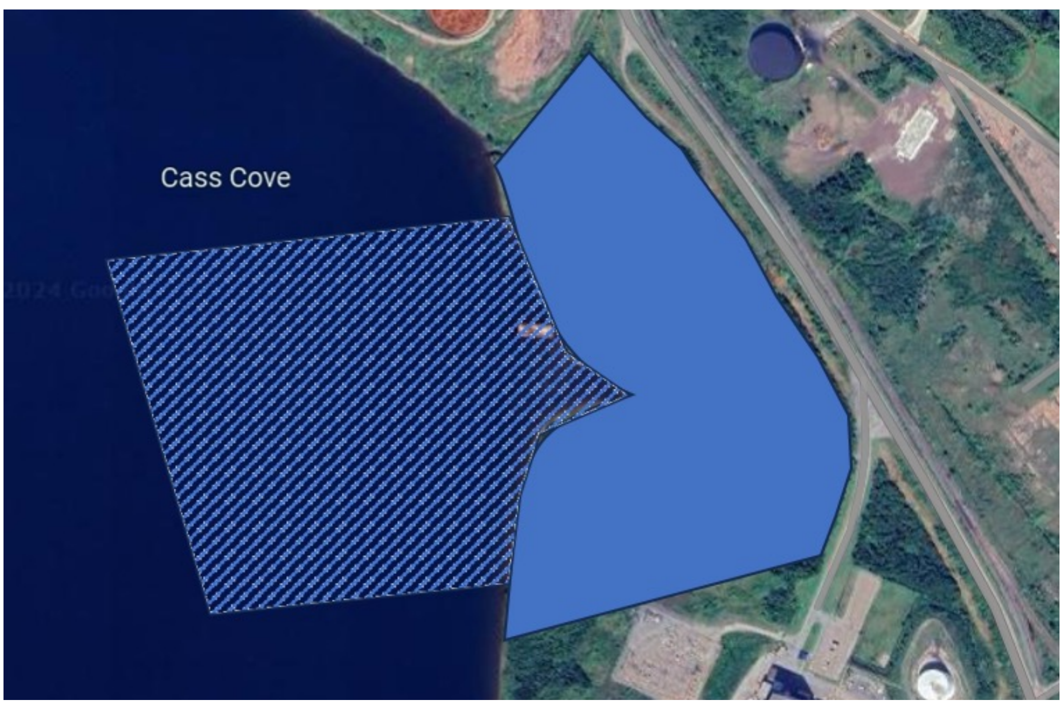


FIGURE 16: CASS COVE LOCATION

7.12 Other Infrastructure - Mulgrave Marine Industrial Park

There is a large tract of land in the Mulgrave industrial park boundary that is undeveloped. The approximately 21 acres which is for sale as well as additional lands on the south side of DSM facility and bus garage, extending towards Loggie Street as seen in Figure 17.

The area was reviewed for a potential port development. However, access would cross a local roadway and there is limited amount of land available. With Mulgrave Terminal nearby it would be a difficult business case to construct another port in proximity. Additionally, a waterfront development at McNair's Cove is planned, and if constructed, it may not be desirable to locate additional heavy industrial port facilities in the immediate vicinity.

FIGURE 17: MULGRAVE MARINE INDUSTRIAL PARK

Manufacturing or fabrication activities could be suited for this area. There are many secondary components which can be produced to support the vessels, or the turbines themselves. Having local capability for this work is important. These industries can also support US offshore wind projects, something which has already occurred. Transportation via Mulgrave Terminal opens the area to supporting areas outside the local region.

There is an opportunity to function as support for onshore wind developments locating on the mainland side of Nova Scotia. Although it will require additional study, part of the industrial area could be utilized as short-term storage for the many planned land-based windfarm components as well as longer term maintenance area. The connection onto England Avenue may need modification to accept large offshore wind or longer components. The smaller, heavy loads would have fewer restrictions.

It should be noted that there are also private lands available adjacent to Highway 344, just outside of Mulgrave which are flat and are being investigated as storage areas for these components. These may be preferable sites for wind Developers because of the straighter route and ease of development.

The land-based windfarms will take several years to construct; therefore, the industrial location could potentially serve multiple projects. After the installations are complete there will be a need for a longer-term storage site for blades, gear boxes and other components required for ongoing maintenance and repairs. The longer-term scenario would not require the same land space, therefore some of the lands could be repurposed to service other opportunities.

8

Overview of Other Ports

Many port locations in Europe and the US have been supporting offshore wind projects. A scan of ports outside Canada which have adapted or are transitioning to support renewable energy developments was performed as part of the study to highlight some of the approaches taken and the level of investment needed to complete the modifications.

These ports have spent from $50 to $700 M USD on renovations to existing ports to make ready for offshore wind support. The review noted what has taken place in these ports to redevelop existing areas which previously supported other industries or additions which have been performed at the port. This included examining Ideas to future proof their assets knowing the size and scale of offshore components are increasing and a look at spin off industries and other indirect employment which support the new port activities. Finally, understanding hydrogen's role in the life of the port – from production to storage to utilization within and surrounding the port and its impact on potential opportunities for an area.

Five of the ports are outlined below to provide insight into their infrastructure, and the modifications which were performed or are planned to support offshore renewable energy projects.

8.1 Port of Aberdeen (Scotland)

This is a major Scottish port with a history of support for many industrial and commercial activities. Renewable energy projects are the focus for current port expansion and redevelopment work. Some £400M were announced for modifications to the port to support new berthage, laydown areas, civil works, and preparation to perform fixed bottom turbine marshalling and storage, O&M, as well as floating wind assembly, integration, O&M and major repair capabilities. This is an example of the scale of the industry and what even fully developed ports need to undertake to provide facilities and land which can support the offshore renewable industry.

8.2 Port of Nigg (Scotland)

The Port of Nigg is in the Moray Firth, Scotland near the Port of Cromarty Firth. This area is a location with a rural population which more resembles the Strait then some of the larger European ports active in the offshore wind industry.

The local port facilities have a rich history of support for the oil and gas industry including many mobile drilling units which have called on the ports for maintenance, upgrades and repairs and anchorage. Even the British aircraft carrier HMS Queen Elizabeth has called on the port for maintenance.

Because of the Scottish offshore developments, ports have examined what role they could pursue in support of the projects. In the case of Nigg, marshalling of jackets and other components for wind turbine installation, pre-assembly work, and fabrication have occurred as well as many vessels calling during support activities. Expansion plans have been developed to provide additional space and capability to the port to support a wide variety of vessels and services.

The port has also begun construction of a cable manufacturing facility which will be located adjacent to the port. This £350M investment will provide long term employment to the region in addition to the activities which the port will directly support.

8.3 Port of Aviles (Spain)

Located on the Atlantic coast of Spain has several kilometers of dock space, of which a 2km long marginal wharf is associated with wind development and +75 acres of laydown space which is currently being used for manufacturing and storage of tower sections and Transition Pieces. The port is approximately a 10-day sail to Nova Scotia and has been supplying components for US offshore wind projects.

8.4 Port of Rotterdam (Netherlands)

Like the other ports, the Port of Rotterdam has a rich history of supporting many industries and has evolved over time as vessels, cargos and needs change.

In the renewable space, Rotterdam is one of the leading ports not only in supporting offshore wind farm construction and maintenance, but also to supply clean energy to Europe and in their efforts to decarbonize port activities. This includes solar, developing sustainable fuels and use of hydrogen for various port activities. In the case of hydrogen, there is a planned pipeline which will move hydrogen through the port and into Europe as part of a larger system. Locally available hydrogen will be used in refineries, chemical plants and road transport.

8.5 Port of New Bedford (United States)

Ports in the United States are starting to develop capacity to support offshore wind farm construction. Vessels are regulated under the Jones Act, which controls which vessels can call on US ports and work in US waters. As the majority of the monopile and wind turbine installation vessels are foreign flagged, they are not permitted to call on a US port to load the components.

To comply with the requirements, alternate methods have been developed to move components from shore to the installation site. In the case of New Bedford, a 29-acre shore-based terminal for storage was built in 2015 for $133 M USD. The components are delivered via heavy lift transport to the port and when needed, they are loaded onto barges and towed to the wind farm location, meeting the installation vessel on site. This method involves more risk than the installation vessel calling on the port and loading components from shore but is necessary based on the current regulatory environment.

Note: Canadian ports have been identified as an alternative storage site to avoid this additional handling. Heavy lift vessels offload components in Canada and installation vessels then pick them up and sail directly to site in US waters.

For ports to be successful and an integral part of the offshore renewable industry, there are several key features required. These include large tracts of flat land, with high lift capability, deep water at the quay, and proximity to the wind farms being developed.

These types of large-scale port investments and facilities are limited as to where they are possible due to impacts from other port users, lack of space, overhead restrictions, and insufficient water depths. Because of its location and capacity, the Strait has the capability and the opportunity to be among the leaders in support for renewable energy projects.

8.6 Port Upgrade Costs

A review of some of the recent investments made in ports is shown in Table 8. This describes the cost, and the activity planned to support. Note that these ports and upgrades are focused on one or a few offshore wind tasks but are not being developed as an all-in-one port. They rely on other nearby ports to provide other services and equipment needed to fabricate, install, and maintain the offshore turbines. This is a common approach and one which can benefit wind Developers and the supply chain by reducing space requirements and becoming a specialized port.

Port	Cost	Scope	Comment
Port of Salem, MA[1]	$300 M USD	Logistics and operations center for turbine pre-assembly, transportation, staging activities and storage of assembly components	42 acres Planned open 2026
Brayton Point Marine Commerce Center, Somerset, MA[2]	$300M USD	Submarine cable manufacturing facility	47 acres
North Terminal 1 – New Bedford[3]	$13 M USD $50-60M USD $100M+ USD	O&M Storage/Cables Monopile/Transition Pieces/ Towers/Blades/Nacelles	Repurpose of an existing port – cleanup, demolition, and rebuild to spec.
Port of Seaport (Maine- Sears Island)[4]	$760 M USD	Assembly and deployment of floating wind turbines. & build of a heavy lift semisub barge	No dredging required. Previously undeveloped land
California North Coast Offshore Wind Studies[5]	$130-310M USD	Large-Commercial – OSW project assembly and O&M 1,600 ft. long wharf – Yard ground improvements, surface treatments and dredging	60 acres
Paulsboro Port Expansion, NJ[6]	$250 - 500M USD	550 ft barge berth and two additional deep-water wharf extensions, >1,500 ft of wharf	Incl utilities, new buildings and connection from wharf to land
Port of Coruna, Spain[7]	€650 M	New outer port. Can allocate different business opportunities related to offshore wind.	The construction and industrialisation of offshore floating structures, in steel or concrete
Port of Hull, UK[7]	£310M	New harbour, service facility and manufacturing site.	135 acres, Pre-assembly of turbines, blade manufacturing

TABLE 8: PORT UPGRADE COST SUMMARY

[1] ENR New England Report
[2] Prysmian Group Press Release
[3] 2017 Dollars, Massachusetts Clean Energy Center
[4] Mainebiz Article – *Sears Island Selection* February 21, 2024
[5] Port Infrastructure Assessment Report, 2020
[6] Port Planning and Transformation, Stantec
[7] Ports a key enabler for floating offshore wind sector 2020, WindEurope

Estimates from the European Union for port infrastructure works include:

- **Upgrading / extending Ports facilities** for a port already in the bottom-fixed offshore wind business: **€20-80 million**
- **Building a new energy port/ terminal** for bottom-fixed offshore wind (of around 15-20ha): **€80 - 110 million**
- **Building a decommissioning facility** in the Port area: **€5-10 million**
- **Floating port adaptations or new terminal: €200 million**
- **Renewable hydrogen production in Ports** - pilot / small scale projects - **€100 million**

9

Strategic Planning Opportunities for the Strait of Canso

There are numerous areas of support required for the various phases of an offshore wind project. Effective planning aligned with these key support areas can enable the region to capitalize on renewable energy opportunities, driving economic growth and sustainability.

9.1 Port Readiness Assessment

The six major project phases identified as most crucial are:

1. Manufacturing – large component manufacturing such as monopiles, tower sections, cables, nacelles. May not be finished pieces.
2. Assembly – for fixed bottom turbines, this involves tower components being assembled on the dock prior to load out, and other small components. For floating wind this is assembly of large components to construct the foundations.
3. Fabrication – building and joining components or providing finishing work for other items.
4. Marshalling – offloading large wind components to a dock for temporary storage.
5. Integration – for floating wind, this is the installation of tower sections, nacelle and blades onto the foundation which typically happens at the local port.
6. Operations and maintenance (O&M). – servicing the wind turbines during operational lifetime (25 – 35 years typically).

Table 9 shows the existing port facilities in the Strait of Canso area, along with a rating for their potential to support these six operations. Currently, most ports are not equipped to handle the necessary activities, particularly those involving larger offshore components. However, several ports could support these activities if financing, permitting, and timing align. In some cases, certain activities will not be feasible without such significant investments that other locations would be more attractive.

	Melford	Mulgrave	PHP	Cass Cove	McNally	Cabot Gypsum
Manufacturing	Yellow	Orange	Yellow	Orange	Yellow	Orange
Assembly	Yellow	Orange	Yellow	Yellow	Yellow	Orange
Fabrication	Yellow	Orange	Yellow	Yellow	Yellow	Orange
Marshalling	Yellow	Yellow *	Yellow	Yellow	Yellow	Orange
Integration	Yellow	Orange	Orange	Orange	Yellow	Orange
O&M	Yellow	Green	Yellow	Yellow	Yellow	Yellow

TABLE 9: PORT CAPABILITIES – POTENTIAL OPPORTUNITIES

*Mulgrave Terminal capable of unloading equipment but they need to be moved off site to make way for additional components. Storage would be offsite.

- (Green) **Activity is currently possible.**
- (Yellow) **Activity is possible but will require upgrades/modifications to wharf or lands.**
- (Orange) **Activity is not possible, or only possible with very large investment.**

Melford Atlantic Gateway Terminal

As shown, a purpose-built Melford Terminal could support all phases of a project lifecycle. Any limitations would be determined by the final design and site features. The advantage of the Melford site is its status as a greenfield development, allowing for customization to meet specific needs. Water depth, wharf bearing capacity, and assembly or laydown areas can all be tailored during the design and construction phases.

Mulgrave Marine Terminal

Mulgrave Marine Terminal faces limitations primarily due to its small laydown area and lack of expansion capability. The total storage area is restricted to approximately 4 acres. If other users require dock space, it further limits the storage of onshore or offshore components, even temporarily. The dock could accommodate some components for a short period, but is better suited for land-based turbine components that can be quickly relocated. Offshore components, which typically require longer storage times and more space due to their size, would quickly crowd the dock. While there is potential to perform maintenance on larger offshore components (such as blades and transition pieces), this would be limited to emergency or one-off scenarios due to the restricted laydown area.

Port Hawkesbury Paper

Port Hawkesbury Paper offers significant potential for upgrading the wharf structure to suit various use cases, with some laydown area available a short distance from the quayside within the site boundaries. With a well-executed plan, several operations could be feasible at the PHP site. However, potential limitations include the restricted amount of laydown area, elevation changes, and the distance from the quayside. Existing production operations mean that certain buildings and infrastructure, such as the rail line, cannot be easily moved or repurposed, resulting in a less contiguous area. Additionally, the presence of the NSP power generating station and other essential buildings further complicates the layout, potentially making the PHP site less desirable for some activities due to less optimal routes and non-contiguous storage areas for large components.

Cass Cove

Cass Cove is an additional site which could be investigated for use. The area has both a water lot and lands which are owned by Invest NS. The parcels are located between the NSP and PHP sites and include land being used as a right of way (power lines), which stretches from the Strait to the municipal industrial parks in Port Hawkesbury.

Reaching 10m water depth at the site would need between 250 – 450m in length depending on where a wharf was built. There is limited storage or other space immediately adjacent to any potential wharf. However, a potential wharf at this site would be central for many users in the industrial park and beyond as the location connects to the road system and the rail line runs nearby. More detailed study is needed of this site to determine full potential and the opportunities which it could support.

McNally International

McNally's site at Point Tupper has existing capabilities and significant potential for expansion, depending on business strategy. The current wharf structure is being upgraded while the loading jetty requires major work to become an operating asset again.

To handle the loading and unloading of heavy equipment, a new, robust wharf structure would be necessary, extending into the deeper water channel to accommodate the largest vessels. The site includes approximately 17 acres of generally flat land, currently used for material storage and offices, with some of this land available for other purposes. Additionally, there is rail access to the site entrance. If a new wharf were constructed and business warranted it, the McNally water lot could be filled in to the desired water depth, potentially adding >7 acres for laydown, storage, O&M and other uses, thereby expanding the site's opportunities.

Cabot Gypsum

Cabot Gypsum's wharf is suited for small vessels or barges but not the larger vessels associated with hydrogen/ammonia plant or offshore wind component delivery. Use of the site would require unloading at another location and then loaded onto a barge for delivery to the

Point Tupper side. Very little laydown capacity exists at the site as well, so most other activities are not viable.

If an expansion of the wharf was carried out, other it could provide additional laydown area (with infilling) and a deeper water option for vessels. An opportunity could be receiving hydrogen and ammonia plant equipment, onshore or offshore components, all of which would need to be moved offsite for storage. O&M is another option which could be carried out from the site but may be better suited to other ports.

Table 10 breaks these potential tasks down with respect to work scopes related to hydrogen and ammonia, land-based wind or offshore projects which could occur in the Strait.

Project	Melford	Mulgrave	PHP[1]	Cass Cove[2]	McNally[1]	Cabot Gypsum[1]
Hydrogen/ Ammonia Component Receiving	Yellow [3]	Yellow [3]	Yellow [4]	Yellow	Yellow [4]	Yellow [4]
Onshore Wind Component Receiving	Yellow	Green	Yellow [5]	Yellow [5]	Yellow [5]	Yellow [5]
Onshore Wind Storage	Yellow	Green [6]	Yellow [5]	Yellow [5]	Yellow [5]	Orange
Offshore US Wind - Marshalling	Yellow	Orange	Yellow	Yellow	Yellow	Orange
Offshore Can – Fixed bottom Installation	Yellow	Orange	Yellow	Yellow	Yellow	Orange
Offshore Can – Floating – Assembly/ Installation/ Major Repair	Yellow	Orange	Orange	Yellow	Yellow	Orange
Offshore O&M Servicing	Yellow	Green	Yellow	Yellow	Yellow	Yellow

TABLE 10: SUMMARY OF PORT OPPORTUNITIES

[1] PHP, McNally and Cabot Gypsum have potential port or land upgrades which could meet a variety of use cases depending on level of investment.

[2] Refers To lands adjacent to NSP and PHP properties which could be developed into common port: receiving hydrogen modules and suitable for other users including large wind components.

[3] Receiving can be done but hydrogen units still require movement to Point Tupper side of Strait so would need additional water transport. Possible option to receive at Melford or Mulgrave Terminal, and then barge across Strait, to land closer to location.

[4] Receiving hydrogen components via barge only unless upgrades performed.

[5] Currently no wind projects on Cape Breton Island. Component receiving is possible but not yet explored.

[6] Offsite component storage is required and available.

9.2 Cost

Examining the locations above which were identified, there are opportunities to support the renewable activities at several sites in the Strait. The level of investment needed will depend on several factors including timing of investment, the activity a facility chooses to pursue, the desired draft needed, the wharf structure and design, laydown, or storage area requirements, restrictions, or conditions of any permits.

A sample of the scenarios are noted in Table 11. These are costs for various projects at the potential sites in Point Tupper and the mainland side of the Strait.

These projects provide an indication of costs to make areas of the Strait ready for offshore wind support. It is important to note that changing economic conditions (supply chain, cost of borrowing), can play a major role in cost escalation. The projects will also continue to become more expensive as time goes on and because some work may not occur for 5+ years, the investment needed could grow substantially in that time. Costs shown below are in 2024, Canadian Dollars, and are considered as +/- 50%.

Port	Cost M (Cdn)	Scope	Deepen Draft Y/N	Comment
McNally	$25M+	Develop site to suit O&M support at existing wharf.	N	Wharf work & land facilities needed.
	$300M+	Remove jetty, replace with pile/caisson wharf to 10+ m depth. Can support large vessels, offshore wind or hydrogen/ammonia module movement.	Y	Wharf length approx. 50m from shore to reach needed depth.
	$30M+	Infill portion of waterfrontage to increase laydown area.	N	Add 7+ acres. Additional space is available depending on permitting, and development plan.
Cabot Gypsum	$25-50M	Upgrade wharf and unloading area for hydrogen/ammonia components or common user, (with limitation of 6m draft).	N	Water depth would restrict larger vessels from calling.
	$100M+	Upgrade & extend wharf to 10m+ water depth. New structural addition and built to spec for handling heavy equipment and large vessels.	Y	No laydown or storage area available on site. Goods/Equipment would have to move offsite after receiving.
PHP	$25-50M	Upgrade existing wharf to better handle equipment and goods (receiving and exporting).	N	This would allow larger vessels but does not improve laydown/storage. May require relocation of a building currently on wharf to receive larger components or equipment. Wharf needs verification of capability.
	$100M+	Upgrade wharf, extend to 12m water depth. Wharf design would depend on business case being pursued – smaller investment for common user port versus larger amounts required for offshore wind component receiving and storage.	Y	As above and additional reconfiguration of buildings on site may be needed to increase storage/laydown area and provide transport routes.
NSP	$300M+	Remove jetty, replace with pile/caisson wharf capable of common user port needs, offshore wind components or hydrogen/ammonia equipment depending on design case.	Y	Extend 200m into 10+ m water depth. Has laydown/storage area available on site.
Cass Cove	$300M+	New wharf, and land-based support (Buildings, laydown area, other)	Y	Build 250-450m into channel to reach 10 + m water depth.
		This could handle any material from common user port needs to hydrogen/ammonia and offshore wind if design allowed.		Up to 12 acres available land. Restrictions of utility corridor nearby.

TABLE 11: ESTIMTED COSTS FOR STRAIT AREA UPGRADES

10

Timeline of Potential Developments in the Strait

Timing for renewable energy projects which may be supported by the Strait area will vary based on the type of project.

Onshore wind will be an early project needing support with hydrogen development likely following. The larger offshore projects, US fixed wind, Canada fixed, Canada floating, and US floating are likely to come later.

A large wharf and laydown area needed for these offshore activities is not present today in the Strait but will be needed to attract and support the large scale offshore wind projects.

Locally, there is growing momentum for all forms of renewable energy and the Province of Nova Scotia and Federal government area supporting this through efforts such as the recently released second module of the Offshore Wind Road Map and funding support announced for ammonia export development.

This work and the Regional Assessment work sponsored by NRCan are helping to promote areas for possible wind farms, address the needs of the supply chain community, and help accelerate project development.

In considering offshore wind developments or the hydrogen and ammonia projects proposed for the Strait, specific timelines are not defined due to the nature of these large-scale undertakings. Development of either fixed bottom or floating offshore wind farms are large investments and have typical timelines of 8 – 10 years between a seabed lease award and when a windfarm begins operations. Other concerns such as regulatory uncertainty, major changes to supply chain or financing ability and terms all play a role in development cycles and whether projects that are awarded make it to an operational phase. Hydrogen/ammonia projects which are based on these renewable sources of energy and, are large construction projects on their own will have similar circumstances to contend with.

Based on developments which have happened in other areas of the world, an expected timeline (Table 12) was developed for renewable development projects which could be supported in Eastern Canada – particularly Nova Scotia.

This summary takes into consideration the stage of development for both US and Canadian projects.

Development	Timeline	Capacity Needed
Onshore Wind to support Hydrogen /Ammonia Production	2024-2030	Up to 2 GW of land turbines may offload in the Strait, destined for Guysborough, Mulgrave and area. Approx 280 turbines (840 blades)
Hydrogen/Ammonia Production	2027 -	Need to offload large components for hydrogen/ammonia plants and also prepare ammonia export facilities. Large dock in Point Tupper area (closer to site is ideal), is required. Export jetty – modification of EverWind's current jetty and a new jetty at Bear Head site is expected scenario.
US Offshore Wind Support	2025-2030+	Monopiles, transition pieces and other materials looking for a temporary storage location. Strait is not currently able to provide laydown for the largest components because there is not a port with the needed specifications for water depth, weight capacity and space. Potential for PHP to receive some components with modifications to site (mostly ground works). Otherwise permitting and construction of suitable facility will be 4-5 years away.
Offshore NS Wind – Fixed bottom	2032 -	1 GW+ farms likely to be planned for this time. The Strait could potentially be used to marshal components to support installations, but there are also already established options. Large area (e.g. Melford) needed for a full farm's components: +/- 60 turbines. O&M activities will accompany new developments. SOV strategy needed for wind farms located far from shore bases.
US Floating Offshore Support	2031 -	Gulf of Maine proceeding with floating projects (First lease sale October 2024 with 4 leases awarded). This is an opportunity to support the early work and future floating projects. The Mid-Atlantic is also pursuing floating wind concepts to augment the fixed farms which are planned. Scale of support is unknown. Dependent on what infrastructure is built and available in Canada and on US needs. Melford is the key area with potential to support the larger floating requirements.
Offshore NS Wind – Floating*	2035-	Depending on scale of new infrastructure, opportunity from cables, mooring and anchors to assembly or installation of floating turbines. Small size projects won't justify a purpose built facility.

TABLE 12: TIMING OF RENEWABLE ENERGY PROJECTS

*Smaller scale Floating wind project(s) may occur prior to this timeframe but larger (1 GW+) developments are not likely to happen until well into the 2030s due to the potential seabed areas available for fixed bottom turbines.

11

Other Opportunities

The availability of renewable energy and hydrogen and ammonia establishes potential for industries to adjust their operations to reduce emissions or for new business to locate to the area and take advantage of these green energy sources.

Some examples would be local industries investing in wind energy or solar projects to offset their electrical energy use or reduce carbon tax exposure. This is a common practice, especially for large energy users and those who are diversifying their portfolio to include renewable energy projects as part of their general investment plans.

In the Strait, PHP is investing in a local wind farm of approximately 168 MW to offset their energy needs. Cabot Gypsum is another large energy user who could benefit from a renewable power source. There is an ongoing study sponsored by Net Zero Atlantic to investigate feasibility and GHG emission reduction potential of using green hydrogen in industrial process heating in Nova Scotia. As regulations and company policies change, the electrification of port infrastructure, including vessels at dockside, and harbor pilots and tugs will likely become more prevalent. Onshore or offshore wind projects and solar could support these initiatives. Battery or other storage means can also help supplement these decarbonization efforts.

As previously noted, many of the required building blocks for industry can be found in the Strait including, land, fresh water, ports, an industrial workforce, and local government support. These ingredients are important for facilities working not only in the wind farm space but could include any industry who may also look for clean energy for their processes. The ability to supply green energy may be a competitive advantage to new industries (e.g. data centers), considering the Strait as a potential location.

The presence of ample fresh water in the Strait for both hydrogen/ammonia production process and to support large industries is a significant benefit. In Point Tupper, the Landrie Lake Watershed has capacity to support the town of Port Hawkesbury, local industry, and the proposed Bear Head and EverWind developments. In Guysborough County, England Lake is available to support the proposed industrial growth (Melford Terminal and adjacent industrial park). These are key pieces which will help permit the growth of both the renewable energy sector and other residential and industrial users.

The availability of green hydrogen and ammonia can also provide opportunities for businesses in the chemical or manufacturing industries and heavy transport uses. These companies can help reduce their emissions and potentially enhance their reputation in the market by their actions.

11.1 Manufacturing

There is an opportunity for the Strait and Canada in general to attract a manufacturing facility to support renewable energy development.

The proximity of the Strait to both Eastern Canada and Northeast United States presents an opportunity to serve these markets more efficiently than a European solution.

The offshore wind industry in North America is immature, and therefore current wind farms being installed in the NE US are reliant on delivering large components from European manufacturing locations. Most of the cables, blades, nacelles, towers and monopiles originate from various countries in the EU or Asia, with some US destined equipment being marshalled at Canadian ports for temporary storage until installation vessels are available. Inserting Canadian service and supply into this flow of materials should be an objective.

The US market is expected grow steadily over the next few decades with less than 1,000 MW installed by end of 2024. This contrasts the target of 30 GW (30,000 MW) by 2030 and 86 GW by 2050. An expansion to 30 GW of offshore wind requires between 1,600-1,900 additional turbines. European countries have a long history with offshore wind and currently over 6,000 turbines installed. There continues to be considerable goals to increase their offshore wind capacity. The ability of plants in Europe to support both local markets and the North American market will be challenged thus it makes sense for manufacturing capacity to increase in the US and Canada. An important note is that the expansion of US manufacturing capability of renewable components will reduce the need for Canadian ports as storage sites. Figure 18 shows an example of an approximately 60-acre manufacturing site (outlined in red), located in Port of Rostock, Germany where monopiles are produced.

FIGURE 18: EEW MONOPILE MANUFACTURING - PORT OF ROSTOCK, GERMANY

Attracting an offshore wind manufacturing facility to the Strait would be a significant accomplishment. Supply of components such as blades, cables, turbine towers and nacelles would require space, water access and a steady workforce to be successful. All these factors are found in the Strait. Although distance to market is not always a barrier, it could be beneficial to have this work happening in the Strait versus a European country.

Some approximate requirements for manufacturing facilities are shown in Table 13.

Component	Land Usage (acres)	Loading Dock (water depth/style)	
Blades	50 - 70	12 - 14m	Dock, Load bearing
Tower Sections	30 – 40	12 - 14m	Dock, Load bearing
Transition Pieces	15 - 20	12 - 14m	Dock, Load bearing
Turbine Generator	30 - 45	12 - 14m	Dock, Load bearing
Cable	35 - 60	12m	Jetty / Dock
Monopiles	40 - 80	12 - 14m	Dock, Load bearing

TABLE 13: MANUFACTURING FACILITIES FOR OFFSHORE WIND COMPONENTS
(note: water depths are meant to futureproof the potential industry advancements)

Based on available land and water access in the Point Tupper, Mulgrave and Guysborough County areas, there is potential to establish these key pieces of the wind farm industry in the Strait.

Examples of locations which have potential to support a manufacturing facility include:

- Melford Terminal
- Invest NS lands on Point Tupper
- Mulgrave Marine Industrial Park

11.2 Other Offtake

There are also some non-traditional users who have been early promoters and adopters of renewable energy and green hydrogen to enhance their business practices.

In Scotland, several projects have been announced and are in the study or development phase; using wastewater from the distillation process to support green hydrogen production and using hydrogen to power boilers.[7] A few examples are noted here.

- Cromarty Hydrogen Project (Diageo, Glenmorangie and Whyte & MacKay – Scotland)
- In 2021 Aberdeenshire distiller Ardmore announced plans for a “WhiskHy” project to install an electrolyser at its facilities in Kennethmont.
- InchDairnie Distillery in Glenrothes recently received funding support from the UK government to install a boiler powered by hydrogen.

These examples of spin off impacts of renewable energy and green hydrogen are some of the opportunities for an area such as the Strait which has the fundamental elements available. (wind, solar, fresh water, land and ports).

12

Port Governance

Throughout the stakeholder engagement work, it was generally agreed that the current state of harbour dues collection by Transport Canada may not be ideal but that an alternative solution would be difficult to agree to and implement. The regulatory process limits authority of ports which are not designated as Port Authorities in Canada and the Federal government mandate is to pursue divestiture of ports, not to add additional ones.

During the stakeholder engagement, the intent was to gather opinions from local parties on the oversight of the Strait area.

With current activity, and expected levels which the projects could bring to the Strait, the questions to the stakeholders were:

- Is there sufficient oversight of safety, coordination, and spill response in the Strait now?
- What might be needed with new developments in place?

The overall opinion was that the current situation is generally acceptable. The volume of traffic in the Strait is not significant and therefore the services are sufficient with the available tugs and pilots.

With additional work which may come to the Strait, the opinions were similar. Construction projects supporting onshore or offshore wind have limited development cycles and so it is expected that the increase in vessel traffic would not be significant considering the size of the Strait and available ports.

Likewise with the early stages of hydrogen/ammonia development and transport to foreign markets, this would not involve a significant increase in vessel traffic relative to the Strait's size and capability.

In review of other jurisdictions involved in wind energy projects, the governance was noted. In most cases, European ports are managed similar to the Canadian Port Authority model, with local governance responsible for fee collection, marketing and infrastructure improvements. In the case of in Antwerp-Brugge ports, there is a Port Authority structure where the local governments are the owners, (city of Antwerp (80%) and city of Brugge (20%)). This model is similar in Rotterdam, where the port ownership is split between the municipal government (70%) and the Federal government the remaining 30%,

Having local governments with a stake in the ports is made easier by only having a single entity responsible for the port development. For the Strait, the multiple independent owners and governments involved makes this more difficult to implement.

13

Strait Development Summary

A thorough review was completed on the current facilities in the Strait of Canso, the state of the renewable industry and consideration for what role(s) could be possible.

This was completed via stakeholder engagement activities, research into the Strait and the worldwide renewable industry. The offshore wind roadmap released by the Province of Nova Scotia as well as information regarding what other countries and ports have done to play a part in offshore wind development were also examined as part of the study.

The areas of focus were:

- Onshore wind support
- Hydrogen/Ammonia
- Ports
- Offshore wind – Canada
- US offshore wind support
- Industrial Parks

Although some ports such as in Esbjerg, Denmark have been built as all-in-one solutions to support offshore wind projects, these are exceptions. Offshore wind development in Europe and the early stage in the US demonstrates an industry where multiple ports are used to support projects. Monopiles, transition pieces, towers and nacelles may all come from different ports before being installed in a wind farm. This specialization of the industry allows ports to become efficient without having to find the space, materials, and expertise to perform all necessary activities. Throughout the Eastern US and Canada, a similar pattern has emerged and looks to continue as the industry becomes more stablished.

The Strait has an established industrial base, trained workforce and local service companies to maintain and perform some repairs as needed to vessels, and wind turbine components such as blades. This access to equipment and skilled labour are similar to what is needed to support renewable projects in the area. Fabrication and installation work for original components and O&M support are also potentially available in the Strait although there are some limits based on current infrastructure..

The deep water and open areas in the Strait permit vessels of any size to visit the area without overhead or depth restrictions. The low level of traffic in the area coupled with sheltered, deep waters can be beneficial when a location is needed for planned or unplanned port visits.

Floating wind projects can be supported in the Strait for similar reasons. This includes having potential area to wet park floating turbines of any design. The Strait's deep water is also beneficial for future assembly and integration of floating turbines and any maintenance activities which would require a tow to port solution to complete the work.

13.1 Onshore Wind

Both onshore wind and hydrogen/ammonia development in the Strait are progressing and their adoption will have a major impact on the region as construction programs get underway. There are several large windfarm projects being planned to proceed over the next 5-7 years consisting of approximately 3.6 GW of energy. The Strait is well positioned to be a key player to support the land-based turbines installation.

Mulgrave Terminal's ability to receive vessels and the large components used on land without major investments will be an enabler for that industry to expand in the Guysborough and Mulgrave area via the Strait.

Utilizing the open lands at Mulgrave Marine Industrial Park as a potential manufacturing or fabrication site can provide support to both the renewable industry and others. Additionally, the area could support a staging area and eventual maintenance base for onshore wind components. These scenarios can enhance the capacity of the region and help reduce potential delays by having components at the ready for construction season. Establishing nearby local storage can help reduce potential congestion at Mulgrave Terminal by permitting components to be received and moved off, to avoid just in time deliveries and issues which may arise from delays.

Knowledge gained via onshore wind and hydrogen and ammonia projects will enable the Strait to be well positioned to support offshore activity.

Hydrogen/ammonia production plans are major investments with several potential phases of development in the Point Tupper area. They will be the initial drivers of the renewable energy sector for the Strait and provide long term benefits through the production plant as well as wind turbine O&M. The onshore windfarms and the hydrogen/ammonia production will be important in preparing for eventual offshore renewable energy projects. Construction activity will expand the knowledge and capabilities of local supply chain to support these new opportunities. O&M workers and supporting industries will help enable offshore wind farm construction and operations to find the skills and local support which will drive future development.

13.2 Ports

The fixed bottom and floating industries have different port and infrastructure requirements, which do not exist in the Strait although the potential is there.

In determining port requirements for offshore wind construction projects there are several potential areas which can be supported. Marshalling and fabrication for US based offshore fixed bottom turbines, and marshalling, fabrication, and installation support for Canadian fixed bottom turbines. A range from construction to assembly and integration for floating offshore projects in either Canada or the US are also possible opportunities.

Wind Developers generally do not seek long term ownership of assets such as ports as they may only have a single project in an area. Therefore, in most cases private investment with government support will be needed to either upgrade existing or to build a purpose-built port to support offshore wind projects. In some cases Transportation and Installation contractors may also look to invest in ports.

13.2.1 Melford

The proposed Melford container terminal site in the Strait is the only confirmed area which could handle not only fixed bottom turbine storage and marshalling, and fabrication but any aspect of floating wind production and O&M although it is beyond the scope of this report to comment on the economics of this scenario. A rendering of what the Melford site could look like is presented in Figure 19.

Because offshore turbines have become so large, the requirements for port and infrastructure are not readily found around the world without significant investments. Melford would also require investment money but coupled with the container terminal and considering the deep water, land access around the site, and its greenfield status to be able to plan the layout make it the ideal opportunity for the Strait.

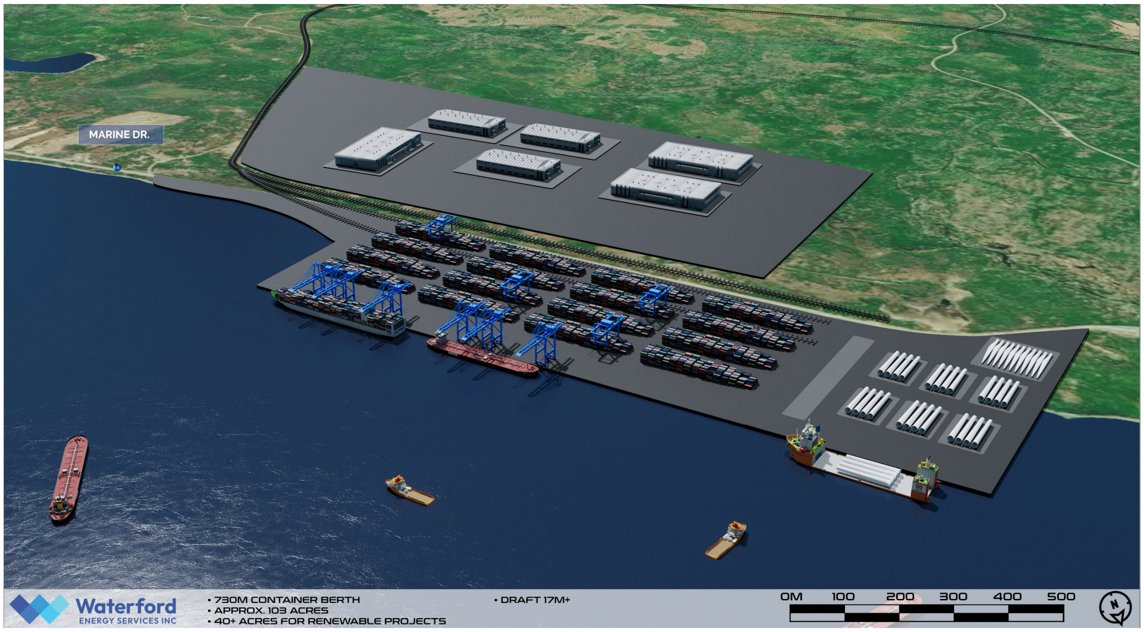


FIGURE 19: MELFORD TERMINAL WITH RENEWABLE ENERGY COMPONENT (FOR ILLUSTRATIVE PURPOSES)

There is potential to expand the scope of the container terminal to include additional wharfage, laydown area and other supports needed for either fixed bottom or floating offshore wind activities. This could include the full range of support from marshalling and storage to fabrication, construction, assembly of floating wind foundations, turbine integration, O&M and major repair for floating wind turbines/foundations. There is also opportunity to support onshore wind if there is a need and the site is available during project timelines. Finally, the proposed site and facility has land and water access which could support a manufacturing facility for renewable energy components or other industries. With unknown timing of the Melford site, there are limited opportunities for the current Strait infrastructure to support the large, fixed bottom or floating offshore wind components.

13.2.2 Point Tupper – Common User Port

There is potential for existing industrial locations or undeveloped lands on Point Tupper to support a common user port. There are a range of potential scenarios from expansion of current facilities to a new build common user port. Modifications to existing facilities will depend on the planned use.

Examples of what this infrastructure could bring to the area can be seen at the Mulgrave Terminal but could be expanded to include larger items if the dock facilities were appropriately designed.

- Aggregates
- Fishing Vessels
- Location for landing hydrogen/ammonia equipment
- Receive land-based wind turbine components for developments on the Cape Breton Island side of the causeway.
- Available for other users like NSP, Cabot Gypsum and PHP if needed to import/export equipment or products for their facilities.

- Provide opportunity to other users without direct water access including the Municipal industrial parks and Cooper's property in Point Tupper.

The areas reviewed for potential development were PHP, Cabot Gypsum, NSP, McNally's, and Invest NS lands.

PHP

The dock is centrally located in Point Tupper and has features which could be beneficial for a common user port. These include a capable wharf with approximately 9m+ water depth, low usage, some open lands on site for temporary storage, and access to rail lines.

The combination of features makes the PHP site a good candidate for supporting other businesses who do not have water access on the Point Tupper side of the causeway. Wharf characteristics would need to be reviewed when considering movement of larger components as current production activities require some of the facilities like the loading system on the dock to be in place. Modifications would be required to make the wharf and site more user friendly for other parties but there is potential to carry out the necessary work with significantly less investment than a new port development.

Landing of the large hydrogen and ammonia modules for the EverWind or Bear Head plants requires more detailed study because of the infrastructure on site and the transit route from PHP to the destination. Logistics need to confirm the route is clear from restrictions and the trade-off in using a lower cost receiving site versus the increase transport over roadways.

If onshore wind was to occur on the Cape Breton side of the causeway, PHP site would be a good candidate to receive those components as well and has done so in the past. Receiving offshore wind is also a possibility for the site, however the deeper draft vessels (12m+), would require significant modifications to the wharf to reach required depths or other solutions. Temporary storage for onshore or offshore components may be available depending on modifications to the site.

CABOT GYPSUM

There is a wharf on site which is under lease from Invest NS. Very little activity occurs at the wharf as imports and exports from the plant generally utilize trucking or rail. Water depth is 6m, therefore vessels with large loads of product either fully unload at Mulgrave or partially unload at Mulgrave and then offload the remaining at the Cabot Gypsum site once acceptable draft is achieved. These are intermittent deliveries which means there is potential to accept material and equipment from other users. The land behind the wharf is limited to approximately 1 acre of laydown area so it could not handle large component storage.

Because of proximity to roads and rail, and the option to deliver goods via barge, the Cabot Gypsum site has potential to support both hydrogen and ammonia equipment deliveries and potentially serve as a common user port for other industrial users. Hydrogen and ammonia equipment would have a fair distance to travel to project site so logistics would need to consider any road or utility restrictions which may be along the route.

The wharf may warrant some upgrades but because it is an existing facility it would be much less expensive than some other options including new builds.

Support for large offshore wind vessels calling on the wharf or direct delivery of large hydrogen and ammonia modules would not be possible without a large investment to reach the necessary drafts and ensure components could readily travel to a nearby location off site due to the restricted land. Although possible, the location would be less desirable than others to receive large vessels.

MCNALLY

McNally's site has an unused jetty extending into deeper water so it would require a major rebuild to install a suitable wharf structure to receive larger vessels and enable material movement. This is a significant undertaking and would require the appropriate business case to pursue. Local road and rail access and a modest amount of laydown space means the site has the underlying characteristics if there was a desire to take on expansion activities. Infilling in the area could also increase the available space for equipment storage and movement as the site has a large waterfrontage.

Because of the cost to develop this type of facility, it would likely be designed for multi-purpose including offshore wind support. In that case, it could potentially handle hydrogen/ammonia module delivery and onshore wind projects which may occur.

The location and site features make the property attractive in the right investment scenario and as the core business for McNally, they would be well suited to carry out the marine work.

NSP

The NSP site would require a large investment to become a viable option as a common user port. The NSP site currently has a jetty extending about 500m into deep water for coal deliveries. The coal moves onto a storage pile within the NSP lands. This is not suitable for any type of hydrogen/ammonia or wind turbine equipment offloading.

Based on the mandate to retire coal powered production by 2030, this site should have underutilized land when the transition happens.

The current coal storage area as well as adjacent lands total approximately 23 acres of flat land. Some of this land may be marked for other use but there is an opportunity to have lands available for storage. Access to water will be a challenge from this site as a complete wharf structure would need to be constructed and would be >200m long to reach 10m water depth. Alternatively, equipment could be offloaded at a nearby site (e.g. PHP), and the open land at NSP be used for storage.

The large investment needed is like a greenfield development and therefore is less attractive than other sites in the area as a common user port.

BEAR HEAD INDUSTRIAL RESERVE LANDS (INVEST NS LANDS) NEAR BEAR HEAD AND EVERWIND

There are large tracts of land owned by Invest NS in the SE portion of Point Tupper. Separating them for assessment, one area is between the EverWind and Bear Head sites and there is another larger piece to the southeast of Bear Head.

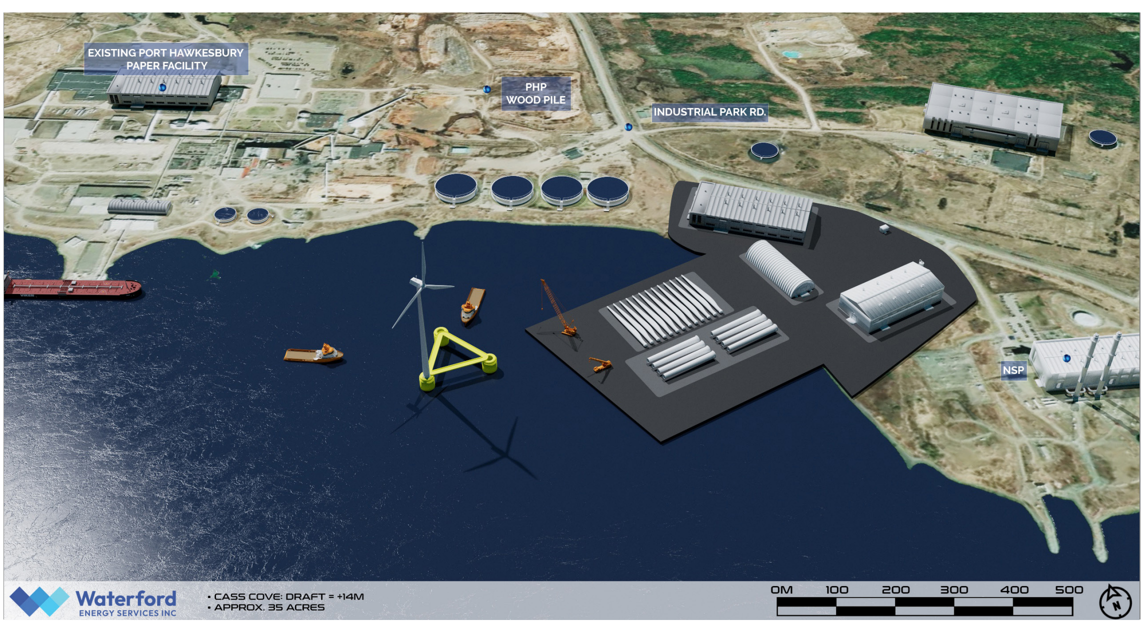
Unfortunately, it was learned that the remaining lands are legally encumbered and are therefore not available from Invest Nova Scotia for alternative development. Of the provincial lands within the park with development potential, focus is on the optimum use of these provincially owned parcels through the establishment of a master servicing plan for the extension of infrastructure – including roads, water, and electricity – to support Point Tupper Industrial Park as a key asset in the development of an Atlantic Canada hydrogen hub and a preferred location of Nova Scotia's premier hydrogen hub.

CASS COVE

Cass Cove was identified as a potential location for a common user port. The parcels include a water lot between the NSP and PHP sites and a right of way (currently used for power lines), which stretches from the Strait to the municipal industrial parks in Port Hawkesbury. Both the water lot and lands are owned by Invest NS.

Reaching 10m+ water depth at the site would need between 250 – 450m in length depending on where a wharf was built. However, a potential wharf at this site would be central for many users in the industrial park and beyond. A rendering of what the Cass Cove site could look like is presented in Figure 20.

FIGURE 20: CASS COVE COMMON USER PORT (FOR ILLUSTRATIVE PURPOSES)



More detailed study is needed of this site to determine full potential and the opportunities which it could support. It is centrally located, connects to the road system easily, and the rail line runs nearby which could be beneficial to users. However, there is limited storage or other space immediately adjacent to any potential wharf and the existing use of some of the land may restrict other development opportunities.

OTHER

Examining other areas of Point Tupper which could accommodate a wharf capable of receiving the large hydrogen and ammonia facility components reveals limited options. Substantial upgrades to existing structures, a barge solution from Mulgrave or a new build wharf are required. As well, significant travel over roadways would also be required to get to the planned hydrogen and ammonia plants' locations and no site currently has the capability needed.

13.3 Offshore Wind

Marshalling equipment to support US offshore wind or performing many of the requirements to support the Canadian wind farms can potentially be accomplished in the Strait. Providing the support for fixed offshore farms will introduce the skill development and expertise which can transfer to floating technology, both of which can be accomplished in the Strait. Particularly at the Melford Terminal, space could be allocated for fixed wind but also maintain flexibility to repurpose lands as needed to shift into the floating wind space.

The Strait is fortunate to have the physical conditions and location which can help Nova Scotia, Canada and the Eastern US achieve both fixed and floating wind development. With the deepest water on the Eastern seaboard, the Strait is a natural place to develop a floating wind facility. The area will be able to evolve with future changes from fixed to floating units as water depths will not be a limitation.

For offshore wind, a key unknown is the timing of when projects may take place. Developing Canada's offshore windfarms is expected to begin in the mid 2030s, but this timeline is not well defined. The Strait possesses many of the attributes and potential which can support the industry, however this uncertainty creates challenges to transition the area to take advantage of the new opportunity and to provide a long-lasting impact.

Several reasons contribute to the uncertainty with one of the main ones being onshore windfarm development. There are still significant lands available for onshore wind in NS and because the turbines are now reaching 6 – 7 MW capacity, the cost difference to an offshore field is an important consideration. The planned onshore developments can provide a cleaner grid and support the early phases of hydrogen/ammonia projects.

The timing of floating wind will be challenged further by the immature technology and costs which have yet to see reductions similar to the fixed bottom projects. As well, the land requirements for floating wind are significantly greater which puts more limitations on areas which are suitable for development activities. Fortunately, the Strait can fulfil the needs of floating wind, but the projects are most likely more than a decade away.

Particularly for Canada, the other major hurdle for offshore wind development is the offtake of the wind energy. Because the local energy market in NS is only approximately 2.5 GW at peak load, there is a question as to where the offshore energy will flow. Offshore farms take advantage of economies of scale in their development, meaning windfarms of 1 GW or higher are desirable. This amount of intermittent energy cannot be connected into a small grid system without alternate arrangements in place.

Thus, offtake by Power to X or hydrogen producers and/or an upgraded grid system to reach other markets (Canada and eastern US) is critical to move forward any meaningful offshore wind activity. Fortunately, the Strait has two proposed hydrogen/ammonia projects which can provide the necessary offtake to propel the onshore and offshore wind sectors in the area to become a Canadian leader in the industry.

13.4 US Offshore Support

The growth in size of wind turbines also means these larger, heavier components need more lay down areas at factories or storage locations. To maintain efficiency at the manufacturing plants, finished products need to be moved away from site in a timely manner to make way for new components. This situation has already occurred to the benefit of Atlantic Canda. Both Newfoundland and Labrador (Argentia) and Nova Scotia (Atlantic Canada Bulk Terminal & Sheet Harbour), have received monopiles and transition pieces destined for offshore US wind farms. The trend is likely to continue unless there is a slowdown in US installations, Jones Act compliance vessels become available, or several major infrastructure upgrades are completed in the eastern seaboard. Canadian ports have an opportunity to alleviate pressures on US ports and European factories/ports and provide an ideal solution to the fixed bottom offshore market.

Sites which received offshore wind components needed investment to be ready, but they were existing sites with attributes which made them favorable locations – water depths, flat laydown area, wharf strengths and availability. Unfortunately, there are not any areas in the Strait which can currently support offshore wind marshalling with modest investment.

13.5 Industrial Parks

The advancement of the onshore windfarms will require service support which the local area should be able to provide. This includes an operations workforce and auxiliary equipment such as cranes. With increasing numbers of onshore turbines installed, there will naturally be a greater need for all maintenance related services from welders, electricians, turbine technicians, and heavier equipment such as cranes for component repair and replacement, and eventual decommissioning. Some of these services will require expansion to businesses which can lead to an opportunity for new locations with more space. This will be a gradual transition as the land-based wind farms develop.

Hydrogen and ammonia production development will also require an increase in the workforce and added services to support the production operations. These support services may look to the industrial parks to establish operations. Many of the needed services are in place now, as part of the industrial workforce serving the large clients in the Strait. Additional personnel and skills will be required for operations and maintenance of the hydrogen and ammonia plants. The extent of need and timing will depend on the roll out of these opportunities The Port Hawkesbury/ Richmond County Joint Industrial Park and Port Hawkesbury Business Park will have a role as the industrial base grows.

If other industries can be attracted to the area via the clean energy or hydrogen/ammonia products, there will be a need for other support. These directly related businesses could be for equipment servicing or rental, materials, contract personnel, fabrication, and others. These may be filled with current businesses, but some may open opportunities for a new business who would need space and buildings.

As no port in the Strait can currently provide marshalling activity for US based offshore wind projects, there is limited requirement for auxiliary services to support this sector at this time. Development of a large port site on Point Tupper or the Melford terminal with capacity to receive and store wind component or use for assembling of turbines, is needed to kick off the offshore industry and auxiliary support from industrial parks.

13.6 Risks

There are risks to the Strait being able to capitalize on the renewable energy industry. These relate to timing of projects and infrastructure work, permitting, other countries' activities, overall industry growth and other global trends which cannot always be foreseen.

Hydrogen and ammonia development is progressing in the Strait but needs to have more firm markets and commitments for offtake to ensure it will deliver the planned local industry cost competitively. Current estimates are that green hydrogen costs up to 3 times that of hydrogen derived from natural gas. With technology advancements, costs are expected to become comparable in the 2030 timeframe. Developments in the hydrogen space is cause for optimism. If the world hydrogen market does take off, the Strait is positioned better than many international jurisdictions from a capability standpoint and is located closer than most to the European market demand.

Timing for offshore renewable projects in Canadian waters is a significant unknown. There are several factors which will impact when it may occur, and these also contribute to timing of port (re)development in the area.

- The large potential for onshore wind development near the Strait and other areas of Nova Scotia and Newfoundland and Labrador may cause offshore projects to be delayed as economics will favor onshore wind, especially with the larger turbines now being planned. (6 – 7 MW units)
- Offshore wind development timing will also be affected by regulation development, permitting, grid concerns being addressed and questions of offtake via hydrogen/ammonia or other means. These could cause delays to the offshore windfarms being constructed which impacts port development timing. These factors risk Canadian port capacity lacking the ability to support these projects and allow US to grow capacity to support domestic projects and possible Canadian projects also.

Although a common user port could potentially be established in Point Tupper to serve the hydrogen/ammonia projects, it must meet the timelines required for component delivery which is unlikely to happen.

Alternatively, a smaller common user port could be established at one of the existing facilities for a more modest investment. The scale of the port could vary from supporting local industry to the ability to handle the largest offshore components depending on location and investment. Development of new port infrastructure is required to support the largest components being used offshore. The ports need to ensure engineering work is complete to support current and potential future activities, obtain permits, secure financing, and ultimately perform the construction activities. These are significant steps which do not have fixed timelines and make investment decisions more difficult.

13.7 General

For any work contemplated in the Strait and further across Nova Scotia, there needs to be coordination in developing both the local projects and utilities and other needs. For example, transmission lines from windfarms located on mainland Nova Scotia need to connect with hydrogen and ammonia plants in the Point Tupper area. These should be optimized both in capacity and routing. Minimizing environmental disturbances by considering multiple projects will help permitting and reduce concerns from residents. This notion extends to roads and other utility works which each constitute major projects.

These major infrastructure developments should not all be looked at as project specific needs but be a part of an overall renewable energy development strategy. The Strait can support this through their own permitting controls and dialogue with other government agencies who have input in authorizations.

14

Conclusions and Recommendations

Several themes emerged during the study with respect to the Strait's potential role in supporting onshore and offshore wind and Power to X development in Canada, the US and beyond.

1. Onshore wind projects planned for Nova Scotia is a great opportunity for the area. The Strait is well situated to support onshore wind equipment delivery and the long-term O&M needs for the area.

2. As the volume of onshore wind installations grows in Nova Scotia (and other provinces), the offshore wind market may face challenges competing for capital and offtake.

3. The Strait is known for its deepwater asset, however existing wharfs do not extend into waters far enough to receive the heavy transport and installation vessels used for wind farm construction today. These vessels require between 12m and 14m water depth at the wharf and are likely to require deeper drafts in the future. Thus, modification to existing wharfs, dredging, or a new wharf are required for current and future offshore wind vessels.

4. An observation related to offshore wind developments in the US in particular is that ports that serve all purposes are not economically viable. Instead, a regional approach is generally taken in support of the offshore windfarms. Multiple ports are used for projects following the strength of each. This can encourage specialization and efficiencies, aiding in project success.

5. Attracting an original equipment manufacturer (OEM) for the renewable industry is a strategic endeavor. A local OEM will help bolster the industry and spin off opportunities, complimenting the port capability of the region. Areas such as New Jersey or Massachusetts have successfully brought in cable, and monopile factories which will support multiple projects in the eastern seaboard proving long term employment and economic activity. In Canada, GE is making blades for onshore and offshore wind turbines in the Gaspe Bay region.

6. Current supply chain to US offshore turbines is still largely from European and Asian countries. This makes Canadian ports a viable intermediary. Should the US supply chain displace European suppliers, Canadian ports may become less attractive to support US offshore wind.

7. In Point Tupper there are many industrial facilities with water rights and ongoing operations. This independence can produce conflicting drivers at times and inhibit growth of the Strait. Construction of a common user port in Point Tupper would provide a long-term asset for all users of the Strait and if it met criteria could also be a more economical solution then singular facilities being constructed for each hydrogen/ammonia development, for example.

8. The local aggregate supply has the opportunity to support US offshore and Canadian offshore wind.

9. Stakeholder engagement showed general support for additional industrial activity in the Strait related to renewable projects. However, there was not a clear vision of what activities may occur and what is needed from port owners to support the work.

10. A port capable of supporting floating wind development does not exist in North America.

11. Globally, floating wind is challenged to become commercial scale.

12. Any location studied for port expansion in the Strait must look at potential environmental concerns.

Recommendations for the area include:

1. In the near term, the Strait should concentrate efforts on the onshore wind and hydrogen/ammonia markets. Recent announcements from wind Developers [8] and the Federal [9] and Provincial governments [10], [11]] indicate support to push the market forward. There is great potential and available lands to support new wind farms and initiate a green hydrogen and ammonia production industry.

For the Strait, this opportunity involves:

- For the mainland side, optimize logistics for wind turbine component receiving via Mulgrave Marine Terminal
- Providing storage area and road enhancements for components to support movement away from Mulgrave Terminal

2. For longer term strategy for the Strait, investment opportunity includes:

- Construction of Melford Terminal with a design that should support fixed bottom and floating wind. The design should anticipate the ability for Melford to transition from fixed to floating wind and be future proof - to maintain status a strategic location for offshore wind support.
- Develop a common user port on Point Tupper to be available for other industrial users.
- Examine the opportunity to extend a Point Tupper common user port to include adjacent lands where available. This could be suitable for marshalling or storage of wind components for both fixed bottom and floating wind, or a potential manufacturing location with ready access to water. Manufacturing could be related to wind energy projects, or another industry who may be seeking renewable energy and / or hydrogen for their operations.
- Attracting an OEM to the Strait.

3. Existing providers of offshore wind marshaling in Atlantic Canada makes similar work in the Strait less appealing.

4. The Canadian offshore market has uncertain timing, and a new build standalone marshalling port may lack a plausible business case. As the renewable energy industry evolves there will be more clarity on the offshore development and makeup of the industry including:

- How significant the offshore development will be in Canada
- Locations of windfarms
- Maturity of the Hydrogen/ammonia industry and demand for the product
- Fixed bottom versus floating technology deployment, floating is not commercially developed yet globally

5. To support the offshore wind fleet, it would be advantageous for the Strait to be able to offer all ancillary services at competitive prices required during port calls including tugs of adequate size and quantity, fresh water, fuel and provisions.

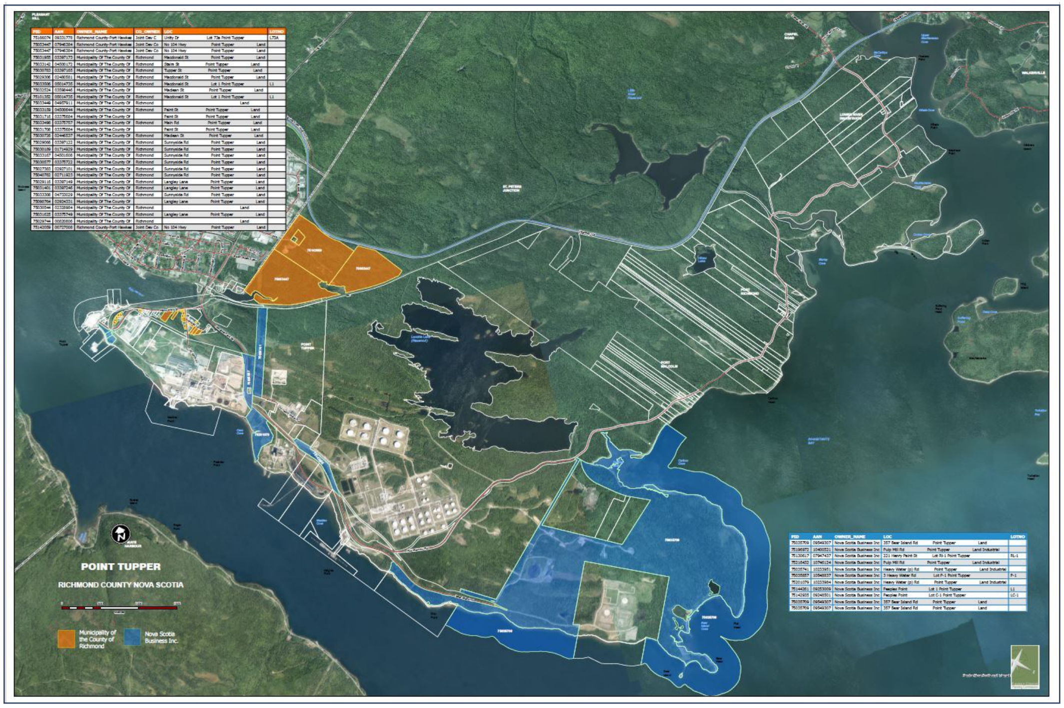
15

Appendices

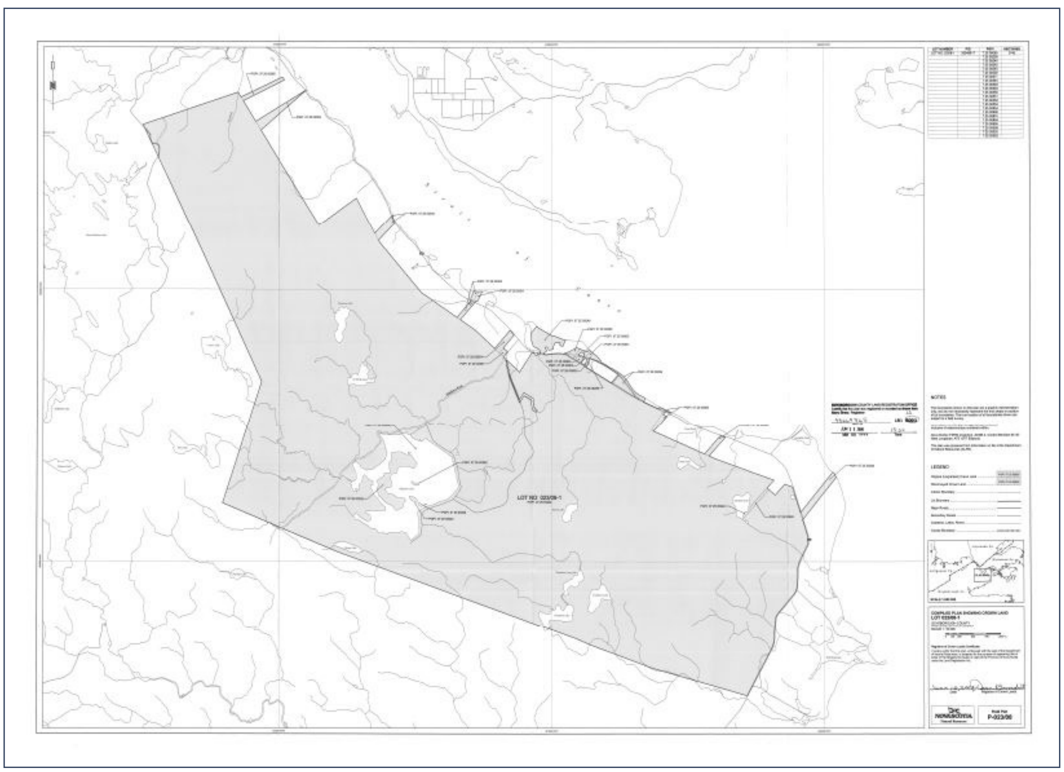
15.1 Stakeholder Consultation List

Stakeholder	Contact Name
Strait Superport Corporation	Tim Gilfoy
Invest Nova Scotia	Virginia Bonn
Nova Scotia Department of Natural Resources and Renewables	Shawna Eason
Transport Canada (hydrogen)	Peter Lavallee
Transport Canada (Port Authority Oversight)	Heather Moriarty
Transport Canada - Real Projects group (harbour bed owners)	Philp Cheung / Aiden Johnson
AtShip Services Ltd.	Ed Rafferty
Superport board	Iaian Langley
EverWind Fuels	Adam Trudeau / Paul Currie
Bear Head Energy	Paul MacLean Ghislain Pitre
Nova Scotia Power	Roy Dobson
Port Hawkesbury Paper	Geoff Clarke
McNally International	Ricky Penny
Cabot Gypsum	Marcel Girouard
Martin Marietta Materials	Eric Gamble
Melford Industrial Land Reserve	Gordon MacDonald
Melford Atlantic Gateway	Mike Uberoi
CN Rail	Dave Thomas Thomas Bateman
Municipality of the County of Richmond	Troy MacCulloch Martin Thomsen
Town of Port Hawkesbury	Terry Doyle
Municipality of the District of Guysborough	Sean O'Connor
Town of Mulgrave	David Gray
Municipality of the County of Inverness	Keith MacDonald
Eastern District Planning Commission	John Bain
Allan J. MacEachen Airport	Kyle Cyr
Nova Scotia Community College – Strait Area Campus	Vivek Saxena / Bert Lewis
DP Energy	Anne-Marie Beliveau
SBM Offshore	Gerry Sheehan
Richmond County	Amanda Mombourquette
Port of Nigg	Iain Sinclair
Membertou First Nation	Kelsea MacNeil

15.2 Map



Invest Nova Scotia and Richmond County Ownership - Point Tupper Map



Melford Industrial Reserve

References

[1] *Strait of Canso Superport Master Development Plan*, AECOM, December 2010
http://www.straitsuperport.com/wp-content/uploads/2022/12/SCSC-Final-Master-Dev-Plan-12-2010.pdf

[2] Wind Energy: Nova Scotia's First Wind Farm Opens
https://www.canada.ca/en/news/archive/2005/05/wind-energy-nova-scotia-first-wind-farm-opens.html

[3] Government of Canada: Environment and Natural Resources website detailing Nova Scotia wind turbines: https://www.canada.ca/en/services/environment/weather/climatechange/climate-action/powering-future-clean-energy/overview-nova-scotia.html

[4] *Nova Scotia Offshore Wind Roadmap Module 2 – Supply Chain & Infrastructure*, June 28, 2024
https://novascotia.ca/offshore-wind/docs/offshore-wind-roadmap-module-2.pdf

[5] *Hydrogen Ports Initiative – Techno-Economic Analysis*, Natural Resources Canada, May 2023

[6] *Regional Assessment of Offshore Wind Development in Nova Scotia*, Interim Report, March 25, 2024
https://iaac-aeic.gc.ca/050/evaluations/document/158104

[7] *A 2030 Vision for European Offshore Wind Ports*, Wind Europe, May 2021
https://windeurope.org/intelligence-platform/product/a-2030-vision-for-european-offshore-wind-ports-trends-and-opportunities/

[8] EverWind Wind Farm Approvals
https://www.cbc.ca/news/canada/nova-scotia/nova-scotia-approves-another-wind-farm-to-power-green-hydrogen-plant-1.7279135#:~:text=391-,Nova%20Scotia%20has%20approved%20a%20third%20and%20final%20wind%20farm,just%20north%20of%20Debert%2C%20N.S.

[9] Government of Canada Announces $300 million in Port Hawkesbury
https://www.newswire.ca/news-releases/government-of-canada-announces-300-million-in-port-hawkesbury-on-canada-germany-hydrogen-alliance-851810153.html

[10] Province of Nova Scotia Wind Farm Approvals
https://novascotia.ca/nse/ea/projects.asp

[11] Province of Nova Scotia Bill No. 471, (Clause 7 to 109)
https://nslegislature.ca/legc/bills/64th_1st/1st_read/b471.htm

WATERFORD ENERGY SERVICES INC.

6940 Mumford Road, Suite 504, Halifax, Nova Scotia, B3L 0B7
45 Wabana Court, Sydney, Nova Scotia, B1P 0B9
606 Water Street, St. John's, Newfoundland & Labrador, A1E 1B5

902-404-3052 (Halifax) | 709-793-9374 (St. John's)

www.wesi.ca

Waterford
ENERGY SERVICES INC