OFFSHORE WIND OVERVIEW

May 2023 | Elisa Obermann, Executive Director



marine renewables canada

About Marine Renewables Canada

Who we are

- National industry association for offshore wind, tidal, wave, and river current energy
- Headquartered in Halifax
- ~160 members (technology and project developers, utilities, supply chain, researchers, Indigenous organizations, municipalities) - includes offshore wind developers and green hydrogen technology and project developers

What we do

- **Advocacy:** Support sector growth through policy development and advocating for enabling measures
- **Supply chain development:** Support supply chain development by facilitating collaboration and connections amongst industry, suppliers, and communities



International business development: Provide market intelligence, lead international business development activities, and facilitate investment attraction



Our Mission: To champion Canada's growing marine renewable energy sector through advocacy, gagement, and education and expand market opportunities across the country and globally.

Education & engagement: Share information,



Why offshore wind?



Coal phase out

- Emission reductions needed
- Nova Scotia target of 80% renewable electricity by 2030
- Net-zero by 2050



Electrification

- Decarbonization = electrifying transport, buildings, industry
- Electricity demand will increase



Energy security and resiliency

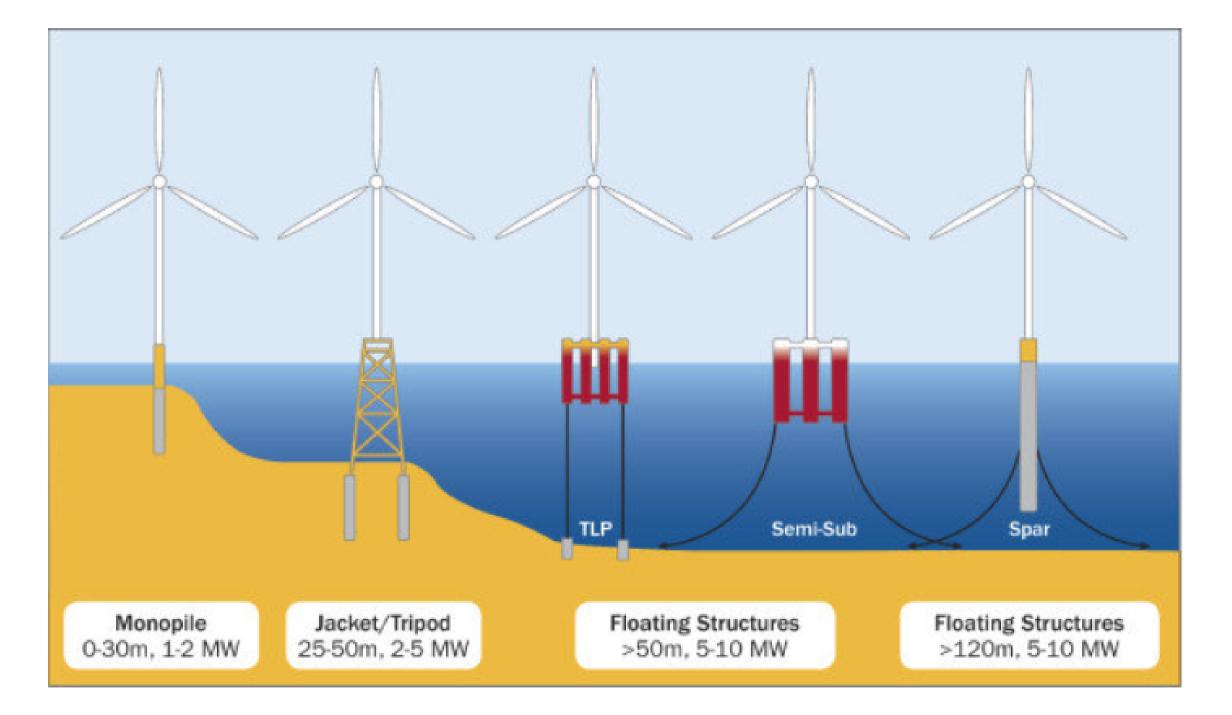
- Domestic renewable energy resources to support needs and protect against volatility
- Contribute to global needs (ex. green hydrogen export)



Economic opportunity

- Development requires skilled workforce
- Existing offshore and marine expertise, experience, and infrastructure

Technologies: Fixed & Floating



- Foundation acts to anchor the turbine in place and support its weight.
- Foundation type generally categorized as either fixed or floating -- depends on water depth and seabed/geological conditions.
- **Fixed foundations** more common (lower cost to implement in shallower waters).
- Floating foundation technologies have potential to unlock opportunities in deeper waters or different geological conditions.
- 80% of the world's offshore wind resource potential is found at depths greater than 60 metres = potential for floating offshore wind is high



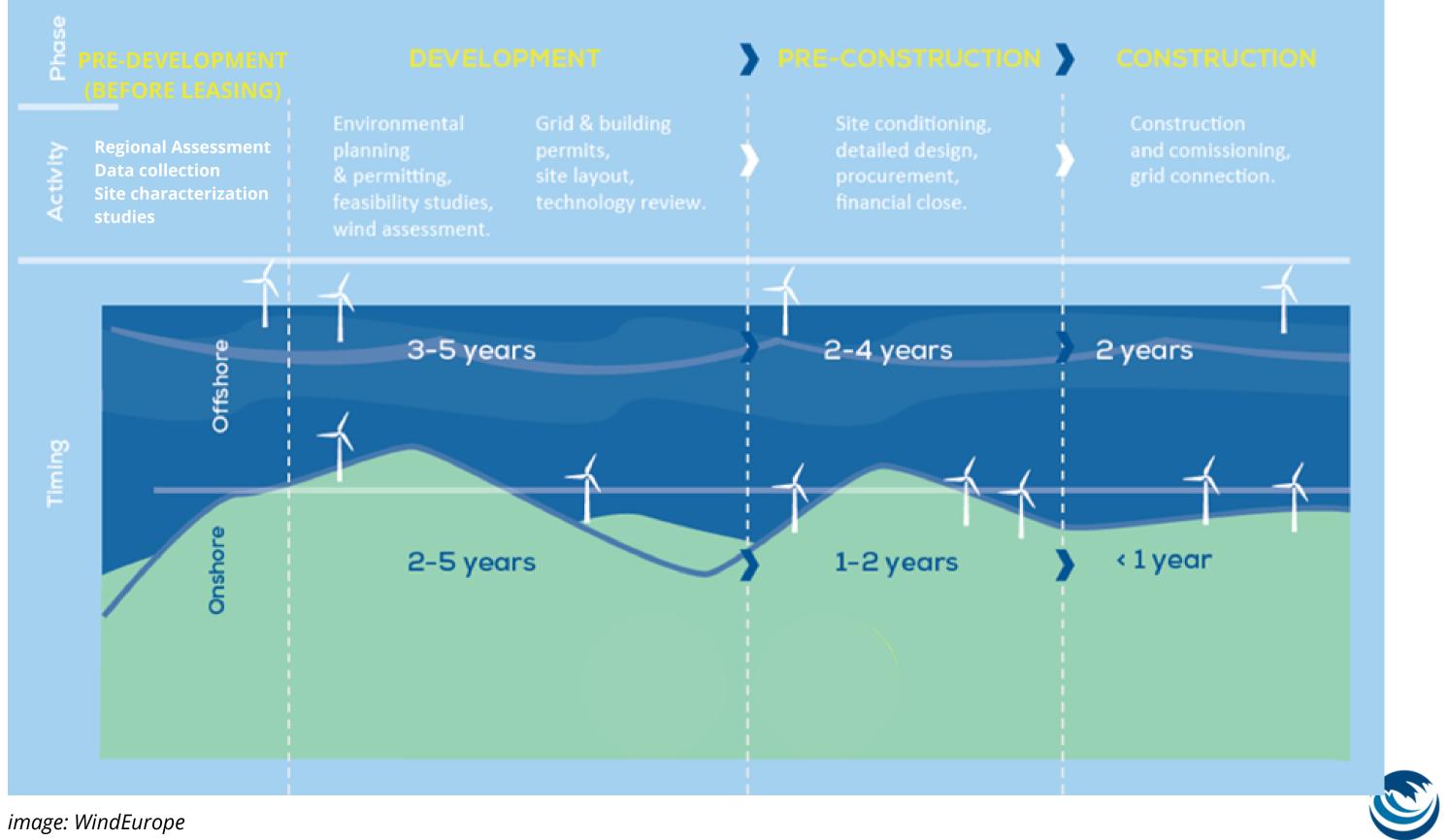
Technologies: Foundation types and conditions

Foundation Type	Water depth ¹ (m)	Embedment depth ¹ (m)	Ideal substrate ²	Suitable substrate ²	Major considerations
Gravity	< 20	< 5	 Bedrock (low relief) Stiff clay/till (overconsolidated) 	 Sands and gravels 	 Scour Flat surface required
Monopile	< 30	30 – 50	 Sands and gravels 	 Glaciomarine / postglacial mud (underlain by competent sediments) Till (sandy or less consolidated) 	 Cobble to boulder sized clasts could cause refusal
Jacket /tripod	30 – 60	30 – 70	 Sands and gravels 	 Glaciomarine / postglacial mud (underlain by competent sediments) Till (sandy or less consolidated) 	 Cobble to boulder sized clasts could cause refusal
Suction caisson	30 – 60	15 – 30 ³	 Sand Glaciomarine / postglacial mud 	• n/a	 Refusal from any size hard bed
Floating	> 60	< 10	 Sands and gravels Bedrock⁴ Glaciomarine / postglacial mud 	 Till (boulders may be ideal for anchors) 	 Range of embedment types

Image: Natural Resources Canada - adapted from Fugro Marine Geoservices



Offshore Wind Development Timeline



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Environmental considerations

- Offshore wind development can potentially have positive and negative impacts on marine ecosystems
- Impacts from the construction phase are generally viewed as having the highest potential for significant adverse impacts on aquatic marine life, but short-lived.
- Impacts from the **operation phase** can often be longer-lasting and more complex.
- A lack of baseline data for species in a given area can hold back understanding of the resultant impacts to changes in the environment, so proactively collecting data prior to projectrelated disturbance is an important consideration for any new developments.

Biological group	Project stage	Impact source	Example of Potential Impacts
Benthic organisms	Construction	Disturbance of sediment	Increased turbidity, reducing light penetratio limiting growth (-)
			Smothering of benthic organisms and suspen of pollutants (-)
		Pile-driving noise and vibrations	Further review required to properly quantify
		Footprints of turbine bases and cable areas	Displacement and loss of species and habitat reduction of abundance and diversity
	Operation	Operational noise and vibration	Further review required to properly quantify
		Reduction of fishing activity	Population increase (+), changes in communi composition (-)
		Artificial reef affect	Colonization, attraction of fish (+)
		Structure presence	Hydrographic changes, impacts on stratificati affect local primary production and carbon fl benthos (-) (Dannheim et al 2020)
	Construction	Disturbance of sediment	Smothering of eggs, exposure to re-suspende pollutants (-)
		Pile-driving noise and vibrations	Displacement, physical injury (-)
Fish	Operation	Electromagnetic fields from cables	Impairment of orientation, avoidance behavi
		Operational noise and vibration	Potential permanent relocation (-)
		Turbine foundations	Reduction of fishing impacts (+)
	Construction	Noise and vibration from pile-driving	Hearing damage, disturbance, impaired communication, temporary displacement (-)
		Construction vessel traffic	Collisions causing physical damage or mortal
Marine mammals	Operation	Operational noise and vibration	Potential permanent relocation (-)
		Maintenance vessel traffic	Collisions causing physical damage or mortal
	Construction and operation	Noise emission	Disturbance of breeding and staging (-)
	Construction	Construction vessel traffic	Displacement, light attraction (-)
	Operation	Rotating blades	Collision fatalities (-)
Birds		Wind turbine obstacles	Displacement, habitat loss, flight avoidance, migration disruption (-)
		Light emission	Attraction to navigational lights (-)
		Maintenance vessel traffic	Displacement, light attraction (-)
		Artificial reef affect	Attraction (-/+)

Image: CanmetENERGY, Natural Resources Canada

Environmental considerations

- Potential environmental effects and/or interactions with other marine uses can depend on multiple factors including type of technology, project location, seabed type, etc.
 - Environmental monitoring and mitigation tools essential part of project planning
 - Wind farm design important factor in coexistence with other marine uses
- Large body of research and studies available from experience in European countries where offshore wind has been developed and operational for over two decades; US has growing number of studies/research initiatives





International Studies & Research Initiatives

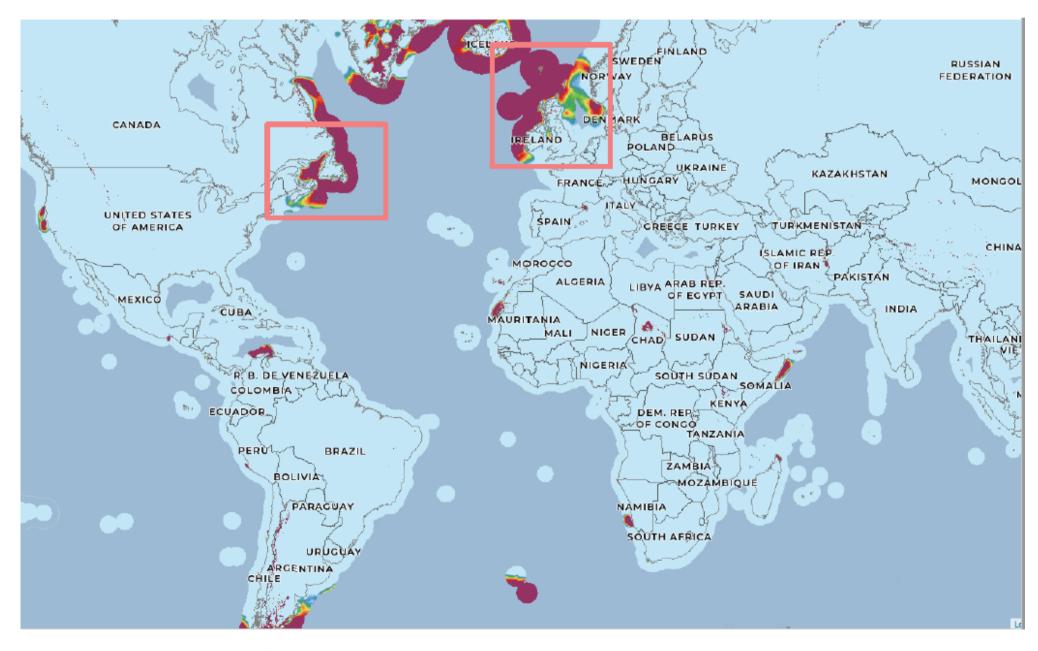
• Tethys (large database of research findings) • Bureau of Ocean Energy Management (BOEM) & NOAA Fisheries • NYSERDA State of the Science Initiative • The Crown Estate (UK) - Offshore Wind Evidence & Change Programme



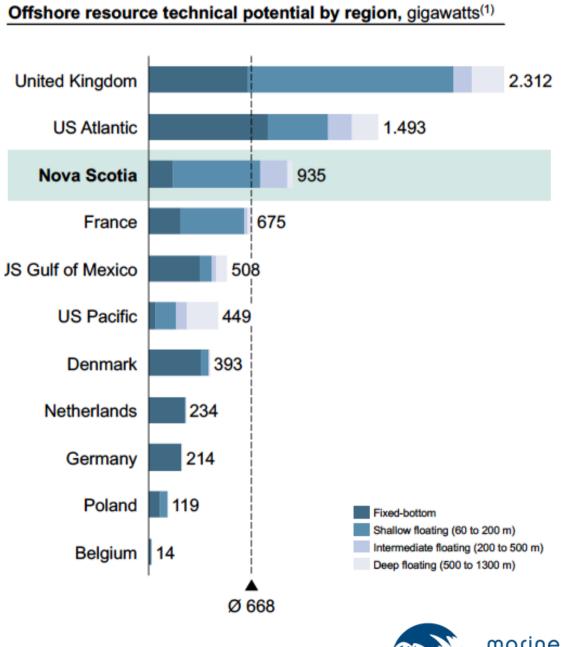
Atlantic Canada: Offshore Wind Potential

Atlantic Canada has some of the best untapped offshore wind resources in the world

- Nova Scotia has wind speeds of 10-11 m/s (rivalling those of the North Sea)
- Suitable seabed and capacity for both fixed and floating technologies

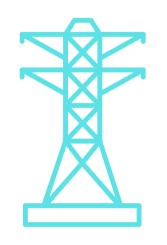








Atlantic Canada: Markets for offshore wind



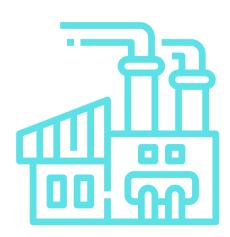
Clean electricity to the grid

- Provincial
- National?
- Export to the US?



Green fuels (hydrogen, ammonia)

- Domestic use
- Export high demand (ex. Canada-Germany Hydrogen Alliance Agreement)



Heavy industries

• Clean electricity and green hydrogen for energy intense industries





Atlantic Canada: Offshore wind activities underway

Legislative amendments

Amendments to Accord Acts announced in April 2022 to evolve mandate of offshore boards to include regulations of offshore renewables; oversight of bidding processes *Target date for completion: 2025*

April

2022

April **2022**

Regulatory framework

Federal government developing Offshore Renewable Energy Regulations (ORER) underway *Target date for entry into force:* 2024

2020

Canada and Nova Scotia Announce Intent to Expand the Mandate of Offshore Energy Regime to Support the Transition to a Clean
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Regional Assessment of Offshore Wind for NS and NL

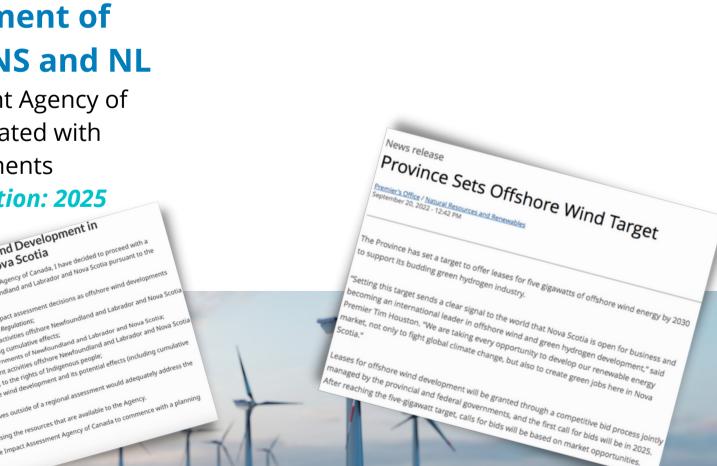
Led by Impact Assessment Agency of Canada (IAAC); coordinated with provincial governments *Target date for completion: 2025*

Offshore wind targets

Nova Scotia announced target of 5 GW of offshore wind leasing by 2030 *Target date for leasing process to*

start: 2025

September 2022



Thank you



Get in touch

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