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OFFSHORE WIND OVERVIEW

May 2023 | Elisa Obermann, Executive Director

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

Education & engagement: Share information, educate, and engage

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, engagement, and education and expand market opportunities across the country and globally.*

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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

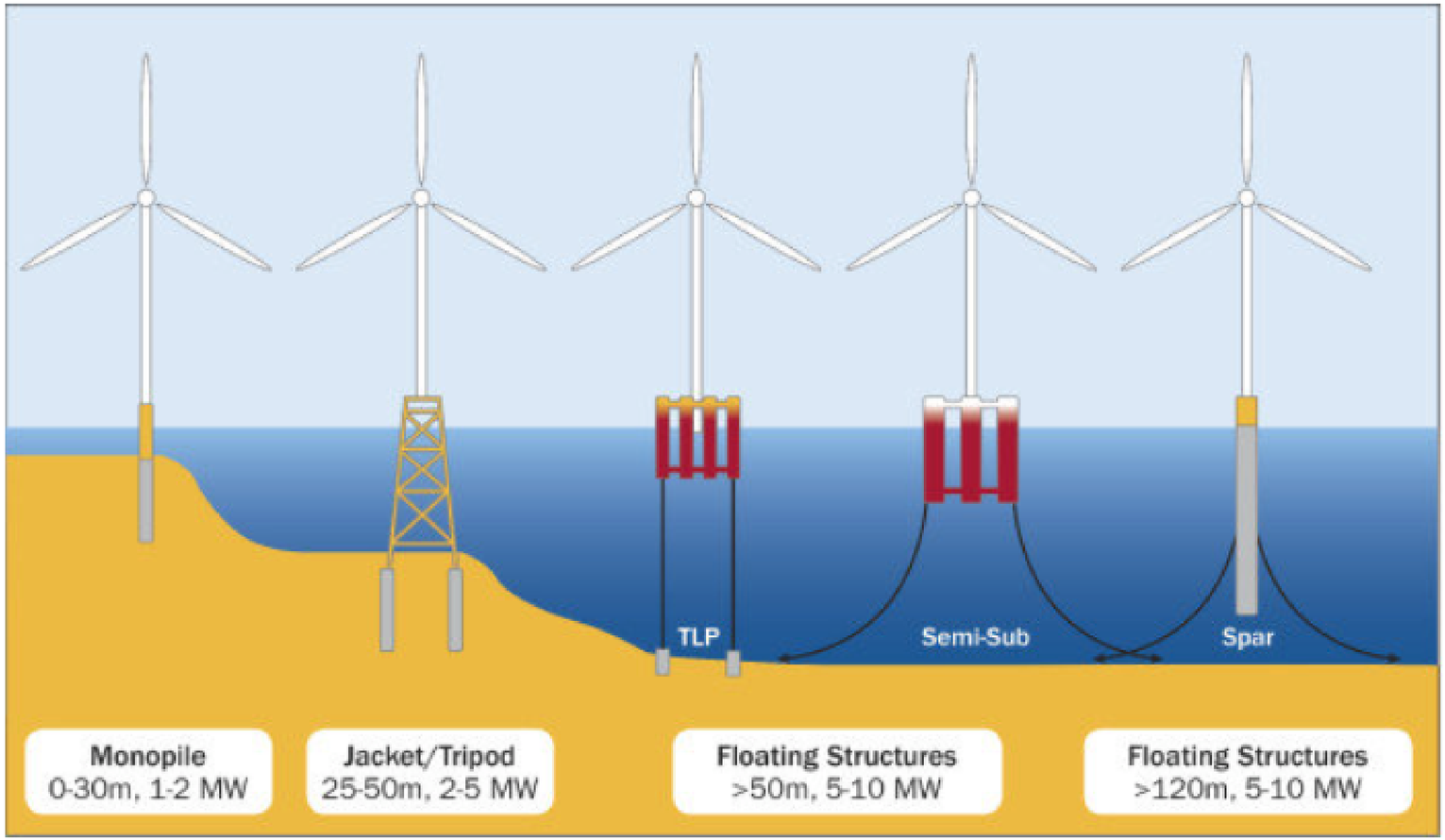
Energy security and resiliency

- 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

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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 • Bedrock[4] • Glaciomarine / postglacial mud	• Till (boulders may be ideal for anchors)	• Range of embedment types

Image: Natural Resources Canada - adapted from Fugro Marine Geoservices

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Offshore Wind Development Timeline

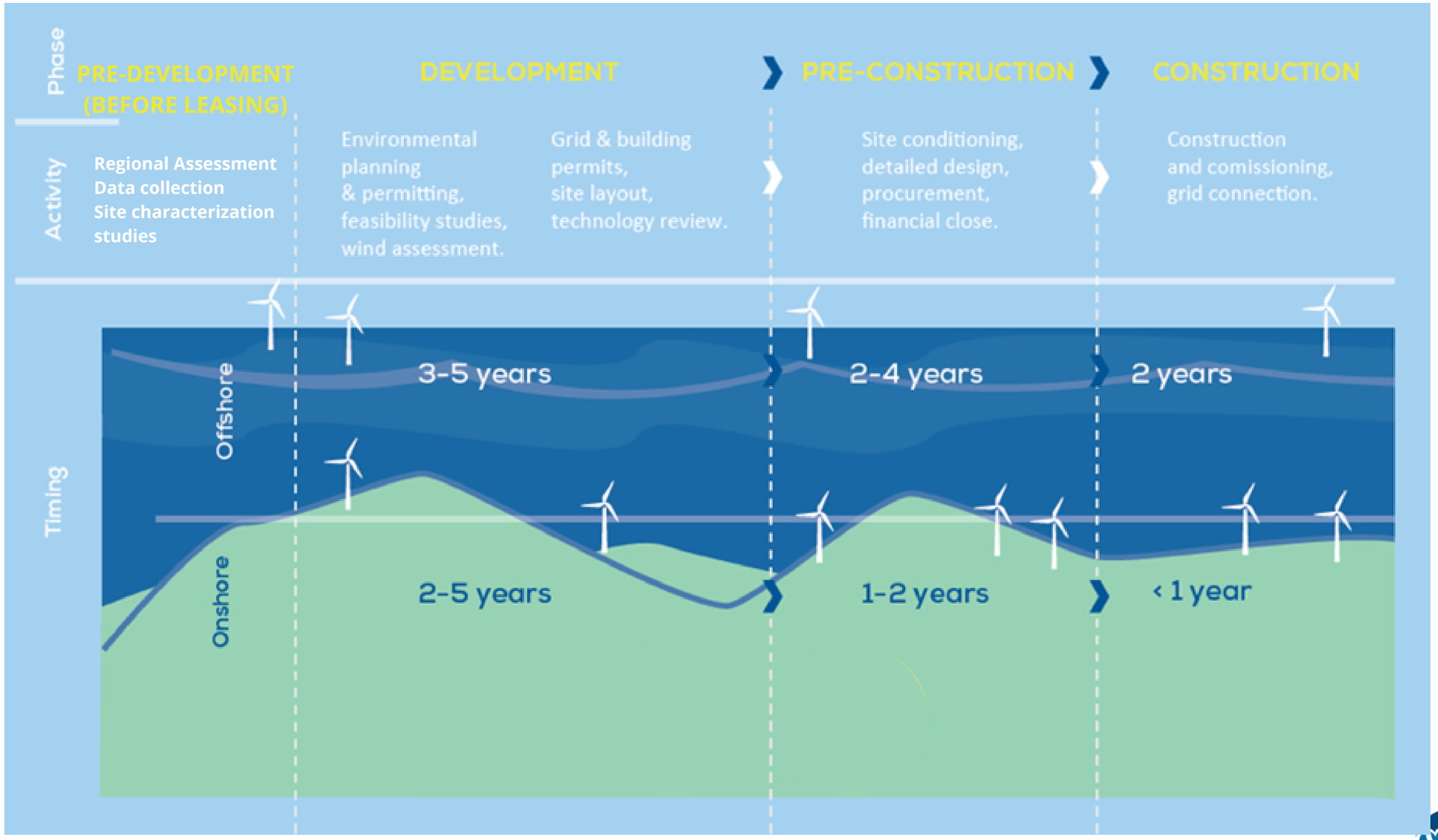

image: WindEurope

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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 project-related 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 penetration limiting growth (-)
			Smothering of benthic organisms and suspension 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 habitats (-), reduction of abundance and diversity
	Operation	Operational noise and vibration	Further review required to properly quantify (-)
		Reduction of fishing activity	Population increase (+), changes in community composition (-)
		Artificial reef affect	Colonization, attraction of fish (+)
		Structure presence	Hydrographic changes, impacts on stratification affect local primary production and carbon flow to benthos (-) (Dannheim et al 2020)
Fish	Construction	Disturbance of sediment	Smothering of eggs, exposure to re-suspended pollutants (-)
		Pile-driving noise and vibrations	Displacement, physical injury (-)
	Operation	Electromagnetic fields from cables	Impairment of orientation, avoidance behaviour (-)
		Operational noise and vibration	Potential permanent relocation (-)
		Turbine foundations	Reduction of fishing impacts (+)
Marine mammals	Construction	Noise and vibration from pile-driving	Hearing damage, disturbance, impaired communication, temporary displacement (-)
		Construction vessel traffic	Collisions causing physical damage or mortality (-)
	Operation	Operational noise and vibration	Potential permanent relocation (-)
		Maintenance vessel traffic	Collisions causing physical damage or mortality (-)
Birds	Construction and operation	Noise emission	Disturbance of breeding and staging (-)
	Construction	Construction vessel traffic	Displacement, light attraction (-)
	Operation	Rotating blades	Collision fatalities (-)
		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

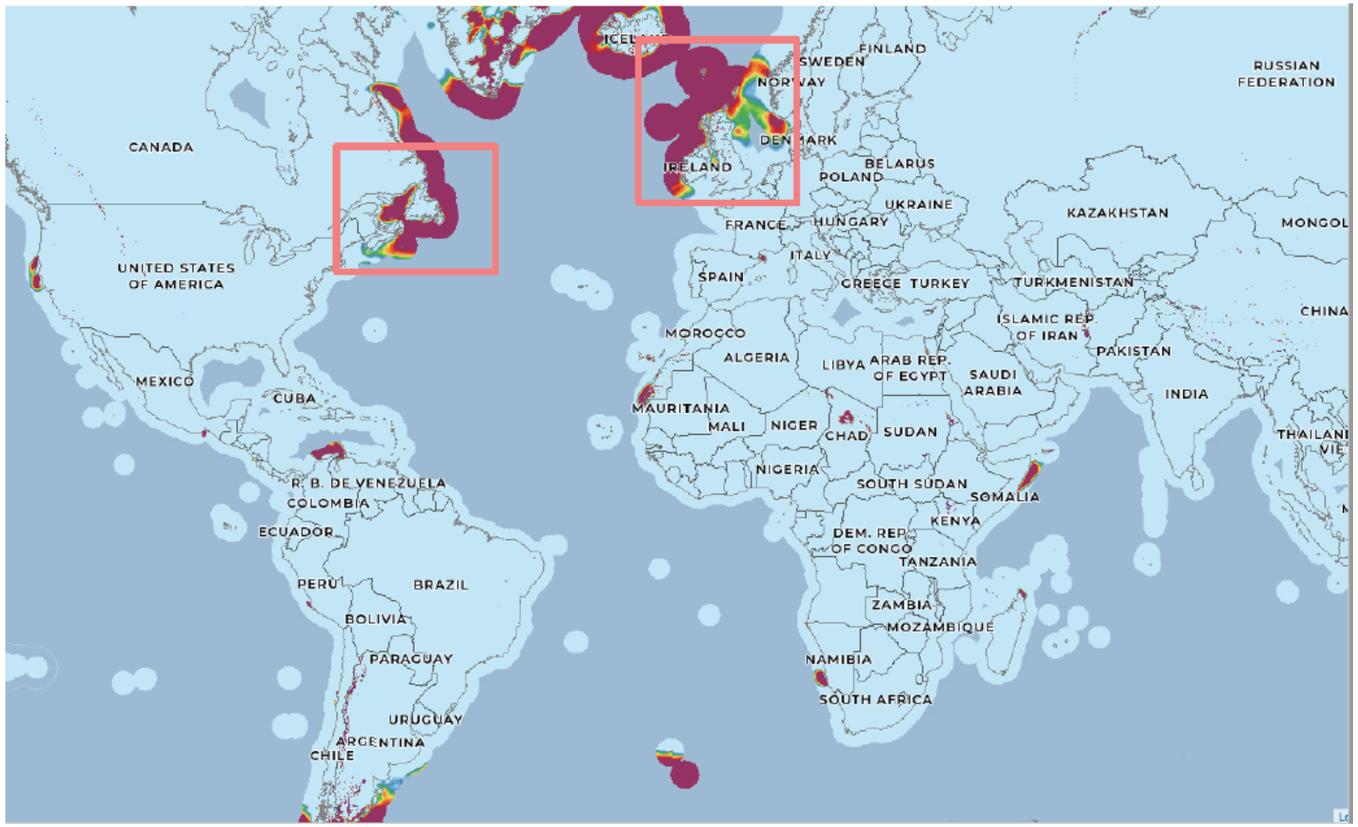
International Studies & Research Initiatives

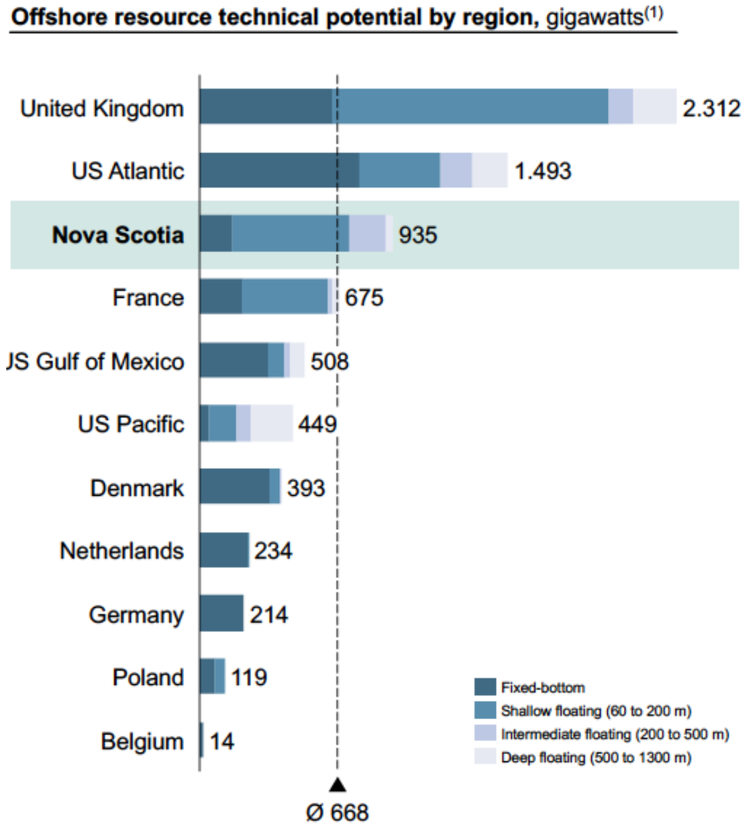
- Tethys (large database of research findings)
- Bureau of Ocean Energy Management (BOEM) & NOAA Fisheries
- NYSERDA State of the Science Initiative
- The Crown Estate (UK) - Offshore Wind Evidence & Change Programme

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





Images from Aegir Insights

AEGIR

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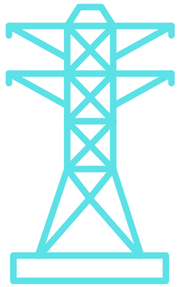
Atlantic Canada: Markets for offshore wind

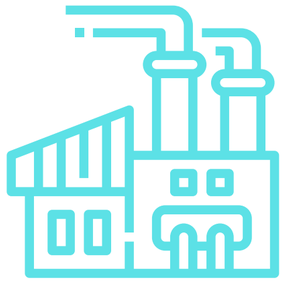


Clean electricity to the grid

- 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

Offshore wind targets

Nova Scotia announced target of 5 GW of offshore wind leasing by 2030

Target date for leasing process to start: 2025

2020 — April **2022** — April **2022** — September **2022**

Regulatory framework

Federal government developing Offshore Renewable Energy Regulations (ORER) underway

Target date for entry into force: 2024

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

Thank you

Get in touch

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