Natural Resources Canada
Ressources naturelles Canada

Discussion Paper

CANADA'S APPROACH TO OFFSHORE RENEWABLE ENERGY REGULATIONS

Canada

1. Introduction

Canada has the longest coastlines in the world and an abundance of offshore renewable energy resources (wind, wave, and tidal). Globally, offshore renewable energy (ORE) technologies are currently in different phases of development. While wave and tidal projects primarily remain in research and demonstration stages, offshore wind projects have reached large-scale global deployment and are now providing clean electricity that is increasingly becoming cost competitive with other sources of electricity. As they continue to mature, ORE technologies have the growing potential to help Canada achieve its climate change commitments by enabling the transition to a low carbon energy system, while creating jobs and building on Canada's existing expertise in marine activities.

To ensure future ORE projects in Canada follow the highest safety and environmental protection standards, the Government of Canada established a legislative framework for offshore renewable energy projects under Part 5 of the Canadian Energy Regulator Act (CER Act). The CER Act came into force in August 2019 and provides the Canada Energy Regulator (CER) with legislative authority to review applications for proposed ORE projects and their associated offshore power lines in Canada's offshore areas, as well as oversee these facilities throughout their lifecycle. The CER Act also provides the authority to make regulations respecting safety and environmental protection, as it pertains to these projects. The Offshore Renewable Energy Regulations (ORER) are required to ensure industry and other stakeholders have a clear understanding of expectations regarding safety and environmental protection, and to ensure project proponents adopt best practices and best available technologies throughout the lifecycle of ORE projects.

The purpose of this paper is to provide an overview of ORE projects and Natural Resources Canada's proposed approach to developing regulatory requirements under the CER Act for these activities in Canada's offshore areas.

The paper covers the following topics:

1. Lifecycle overview of ORE projects and principle considerations to safety and the environment;
2. Proposed guiding principles for the ORER;
3. Proposed regulatory components to be addressed in the ORER;
4. Project timelines.

2. Context

Mandate & role of the CER as a Lifecycle Regulator

The CER (formerly the National Energy Board or NEB) is the lifecycle regulator of federally regulated energy infrastructure. In addition to ORE projects, the CER also provides oversight of oil and gas pipelines and certain power lines that cross a national, provincial or territorial border, as well as offshore and northern onshore oil and gas exploration and activities not otherwise regulated under territorial law or joint federal/ provincial accords.

Lifecycle regulation begins with the Commission of the CER considering an application for the construction and operation of a new or upgraded energy project to ensure that it is safe, protects people and the environment, and is in the public's interest. If a project is approved, the CER continues to monitor, assess and review the facility's operations as long as it is in service. This is done through regular inspections, audits and incident investigations to make sure the operator complies with regulations that protect public safety, property, and the environment. Where Indigenous peoples have interests in the area of a project, the proponent whose project is regulated by the CER may work with them so they can be involved in aspects of monitoring a project. If a company wishes to permanently cease operation of a facility, they must file an application for decommissioning and/or abandonment with the CER, and will be required to take all necessary precautions to ensure these activities are carried out safely.

While the CER is the lifecycle regulator for ORE projects, other Canadian authorities have complementary responsibilities in the offshore, such as Transport Canada, Employment and Social Development Canada, Department of Fisheries and Oceans, and Environment and Climate Change Canada. Transport Canada, for example, has existing safety and environmental regulations governing maritime operations. Its regulations apply to various types of vessels including those that support the offshore renewable energy industry, such as construction vessels, cable-laying ships, offshore support vessels, crew boats and other similar vessels.

Seabed Authorization Process

As the focus of this paper is on the development of safety and environmental regulations under the CER Act, this paper is not about the regime established to acquire an authorization for the use of federal seabed lands (land tenure regime) for ORE projects in Canada's offshore. The land tenure regime is not a component of the CER Act or within the CER's authority. Public Services and Procurement Canada (PSPC) under the *Federal Real Properties and Federal Immovables Act* administers the process to issue authorizations to use federal seabed lands in Canada's offshore for offshore renewable energy development.

For renewable energy developers interested in applying for an authorization to use the federal seabed, a request must be submitted to PSPC, who would require at a minimum that proponents submit: a business case and company profile; a detailed description of the project; preliminary project drawings; and a proposed project schedule. The applicant would also be required to provide:

1. Details on any record of any consultations and/or agreed accommodations with First Nations communities, undertaken in accordance with potential or established Aboriginal or treaty rights recognized and affirmed under *section 35* of the *Constitution Act, 1982;*

2. A record of consultations with all potential stakeholders, including but not limited to adjacent provinces, territories and municipalities, and other users of the seabed area who may have a stake in the seabed area in question; and,

3. A record of consultations with adjacent provinces whose government might assert a competing claim to the subject area, in order to obtain provincial collaboration.

Direct negotiation with PSPC for seabed authorization may be possible. However, in the case where PSPC determines that direct negotiation is not appropriate, in order to ensure fairness and transparency, a bidding or a request for proposals process will be initiated.

Federal-Provincial Offshore Energy Joint Management Frameworks

The regulations made under the CER Act will apply to ORE projects in Canada's offshore areas. However, respecting the long history of federal-provincial collaboration in the joint management of energy resources in the offshore (e.g., laws establishing the Canada-Nova Scotia and Canada-Newfoundland and Labrador Offshore Petroleum Boards) this work does not prevent Canada and interested provinces from exploring joint management approaches for ORE projects in the future. Any potential federal-provincial joint management regime for offshore renewables will also require safety and environmental protection regulations. Therefore, these regulations developed under the CER Act could serve as the basis for similar regulations under potential future offshore energy joint management regimes.

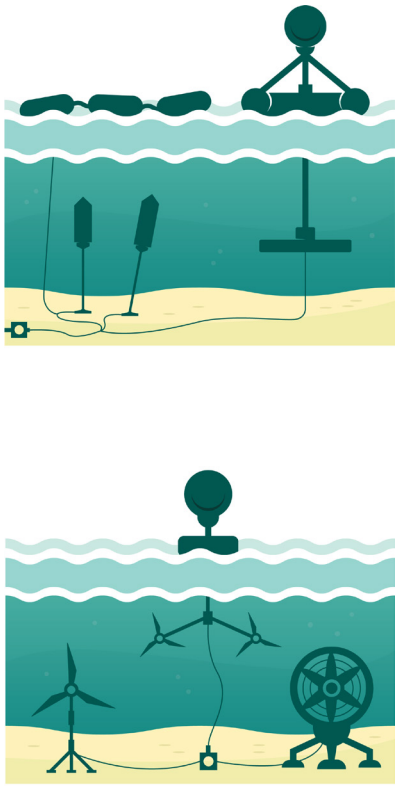


Fig. 1: Wave (top) and Tidal (bottom) Energy Technology (Source: Marine Renewables Canada)

3. Overview of Offshore Renewable Energy

Renewable energy is a growing industry around the world as countries look to transition to clean energy. While much of the attention in Canada has been on onshore renewable energy sources like hydro, wind and solar, offshore renewable energy sources are also becoming attractive. Tidal and wave energy facilities are in the research to demonstration phases and have great power generating potential for coastal provinces. For example, support for tidal energy forms part of Nova Scotia's plan to transition to clean energy while developing a nascent industry and creating new economic opportunities. Offshore wind is now becoming a mature industry globally and has reached commercially competitive prices in many jurisdictions.

3.1 How Offshore Wave & Tidal Energy Works

Wave and tidal energy are used in the offshore environment to generate zero-emission renewable electricity.

Wave energy is created by wind blowing across the ocean with the amount of energy generated determined by the wave's velocity, height, length, water density, and speed. The surface motion of the waves can be converted to electricity using several technologies such as attenuators that flex in the waves to drive hydraulic pumps that convert the energy, and point absorbers, such as a buoy, that extract energy from the rise and fall of the waves.

Tidal energy from tides and currents created by the gravitational pull of the sun, moon and the rotation of the earth is predictable and reliable. Turbines placed in the tidal current stream use the kinetic energy of moving water to generate electricity. Barrages may also be used to trap the tidal water to create a head, which is released slowly through the turbines. Due to the greater density of water the turbines used in tidal electricity facilities are smaller and have slower rotation speeds than wind turbines.

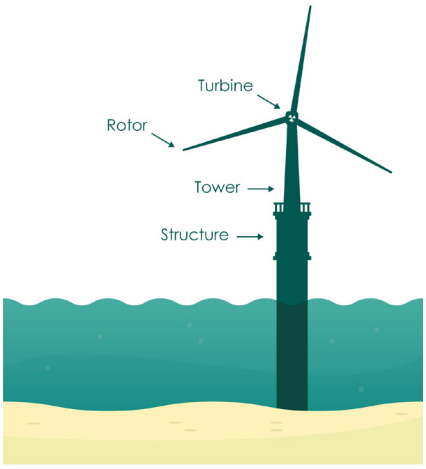


Fig. 2: Main parts of an offshore wind turbine. (Source: ABS Group)

The electricity produced is transported from the wind farm to shore via underwater cables. For larger wind farm projects, or those further from shore, offshore substations are used to collect the electrical power from the wind turbines and increase the voltage. Substations are installed offshore near the wind turbines.

3.2 How Offshore Wind Energy Works

Offshore wind energy is a renewable energy obtained by taking advantage of the force of the wind that is produced on the high seas, where it reaches a higher and more constant speed than on land due to the absence of barriers. Referring to *Figure 2,* energy is created when the force of the wind turns the rotor blades of an offshore wind turbine.

Figure 3 is an illustration of typical wind farm facility.

Fig. 3: Typical installation of an offshore wind farm. (Source: ABS Group)

Site Selection
& Planning

Design, Frabrication
& Construction

Operations &
Maintenance

Decommissioning
& Abandonment

3.3 Lifecycle Phases of an Offshore Renewable Energy Project

Offshore renewable energy projects progress through a series of lifecycle phases, which include site selection and planning, design, fabrication and construction, operations and maintenance, and decommissioning and abandonment. Major activities take place at each phase of the project lifecycle and present different considerations related to safety, environmental protection and, in some instances, reliability of electricity grids to which ORE facilities are connected. The following section of the paper describes each phase of an ORE project's lifecycle and the activities that typically occur during each phase. An offshore wind project is used as an example; however, the phases are the same or similar for wave or tidal projects. This section is a country neutral description of a project lifecycle and it therefore does not include an overlay of the regulatory review at each stage of the lifecycle.

The future ORER will apply to the entire lifecycle of offshore renewable energy projects and will be designed to ensure industry and other stakeholders have a clear understanding of the expectations regarding safety and environmental protection.

3.3.1 Site Selection & Planning

Once a proponent receives a seabed authorization, the ORE project lifecycle begins with project site selection and planning activities. This phase can often last years and involves site selection, site investigation, and permitting to confirm where the ORE facilities will be located. The selection can be based on a number of factors in addition to favourable wind conditions, including visibility and distance from shore, proximity to power demand sites and local electricity distribution infrastructure, impacts to shipping routes, existing buried infrastructure and bird flight paths.

Major activities that take place during this phase are surveys and reviews of physical, environmental and socio-economic factors, technical studies and site identification, characterization and selection activities. Meteorological studies are also conducted using weather buoys or towers to identify wind, wave, and current patterns and velocities. These activities pose lower direct safety and environmental risks than other phases of the lifecycle.

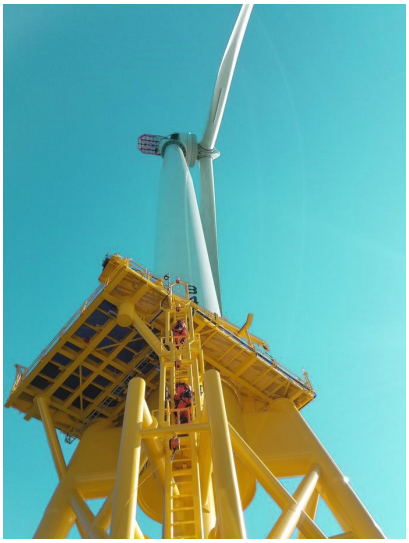
3.3.2 Design, Fabrication & Construction

The Design, Fabrication and Construction phase of the lifecycle applies the information collected and decisions made during the site selection and planning phase into the design of the project facilities and equipment. Once the design is completed, facilities and equipment are selected and fabricated, after which the proponent proceeds with construction activities on site.

Block Island Wind Farm (Source: ABS Group)

The bulk of the activities that happen both in port and offshore at the intended site take place during construction. There are typically several different entities working in coordination with each other, including the operator, turbine manufacturer, crane operators, foundation fabricators and others. Because of this interactive nature, the exterior location, and large masses being lifted and assembled, there is a much higher risk level for accidents during construction activities. Potential hazards include lifting accidents, collisions, slip, trips, falls, and dropped items. As such, a higher level of scrutiny by independent certification bodies and the regulator is warranted.

During construction activities, blades, turbines, towers and the structure are designed and fabricated at manufacturing plants throughout the world. These components, along with workers, are transported to the site in preparation for installation. Installation includes erecting the support structures and towers, installing the turbines, cable laying and connecting the turbines to the grid. Commissioning is typically the final activity in the construction phase, and involves functional, safety, and power performance testing before the facility begins commercial operation.



Block Island Wind Farm (Source: ABS Group)

3.3.3 Operation & Maintenance

Major activities during the operations and maintenance phase include routine inspections, maintenance and repairs to wind turbines and other infrastructure. Operations are also monitored to identify potential problems and ensure that all regulatory requirements and conditions set by regulatory authorities are being complied with. Repowering and lifecycle extensions are also considered during this phase.

Operator inspections of the site are conducted to keep the turbine in service to its fullest capacity, in accordance with an *Operations and Maintenance (O&M) Plan*. Under normal circumstances, each turbine is visited by a technician for regular service and maintenance.

3.3.4 Decommissioning & Abandonment

Decommissioning and abandonment activities may include the removal of turbines, towers, subsea cables, substations and other components. The design life for most wind facilities is 25 years and throughout the lifespan operators conduct assessments to determine if life extensions are feasible. Repowering activities, such as the replacement of turbines or other components may also take place during this lifecycle phase. As an alternative to the physical removal of the structure, abandonment activities can include converting the structure for other purposes or for use as an artificial reef by abandoning components in place.

Decommissioning activities in the offshore wind industry is relatively new. One of the first offshore wind decommissioning projects was completed in 2017 in Denmark where a facility was removed after 25 years in operation. More recently, an operator in the United Kingdom announced in March 2019 that it would begin decommissioning two 2-megawatt turbines off the coast of northeast England. Regulators can learn from years of research and experience in the offshore oil and gas industry to develop requirements for decommissioning.

Like the construction phase, the decommissioning and abandonment phase is the point in the life of the turbine with much higher operational safety and environmental risk. As such, a higher level of scrutiny by a certification authority and the regulator is warranted.

3.4 General Safety & Environmental Risks Related to Offshore Renewable Energy Projects

3.4.1 Safety Risks

Some of the more notable safety risks of ORE projects are linked to the integrity of the facilities, to the transfer of personnel to and from a facility, to falls from working at heights, and to electrical hazards. Navigation safety for marine traffic in the vicinity of an offshore facility is also a concern. Finally, risks associated with fire hazards must be considered during the design, construction and operation of the facility.

3.4.2 Environmental Risks

Environmental concerns related to ORE projects include, potential impacts to avian species and bats, risks of pollution from increased marine operations around the offshore facility and changes to marine habitats. Notably, marine operations during the site selection, planning and construction phases present risks to the marine environment. For example, pile driving and foundation construction can impact marine mammals, fish and other marine habitats.

3.4.3 Reliability

Although not a risk per se, development and expansion of ORE projects may require specific consideration of potential impacts to the reliability of the electrical grids to which those projects are connected. Grid reliability involves ensuring customers receive the electricity they need when they need it. Electrical grids around the world are undergoing rapid changes in generation resource mix with increasing amounts of renewable generation such as wind and solar photovoltaic (PV) power plants, which have variable production of electricity. This can have an impact on reliability if appropriate reliability standards and guidelines are not followed.

4. Guiding Principles

The development of the ORER will be guided by the following principles:

1. Identify safety as paramount;
2. Ensure impacts to the environment are properly assessed and managed;
3. Use a risk based approach that focuses resources on the higher risk areas and minimizes regulatory oversight of lower risk areas with minimal impacts on safety or the environment;
4. Where possible, adopt outcome based requirements to promote innovative solutions and technological advancements that increase levels of safety and environmental protection over time and reduce costs; and
5. Minimize administrative burden where possible to create a stream-lined regime that promotes competitiveness.

5. Key Components of the Proposed Offshore Renewable Energy Regulations

The ORER initiative's primary objective is to develop a regulatory framework for offshore renewable energy projects that fosters safe operations and protects the environment. This section outlines the key components that will be included in the ORER to meet those objectives.

5.1 General Requirements

The section on general requirements will include the general duties and responsibilities of the operator of the facility that apply throughout the lifecycle of the project. It will also include the details on the safety and environmental management system that operators will need to put in place prior to commencement of activities. Finally, the general requirements will address the monitoring, notification and reporting of safety and environmental incidents, as well as any record keeping requirements.

5.2 Site Assessment & Planning Requirements

This section will contain requirements for operators conducting site assessment activities such as surveys, geotechnical sampling or testing, or installation, operation, and decommissioning of measurement equipment such as met masts, buoys, or on-shore equipment. The section will outline the information to be submitted to the CER when applying for an authorization to undertake such early planning and site assessment activities. This includes general information about the project, a safety plan, an environmental protection plan, and a contingency plan.

The requirements will also govern how site assessment activities are to be carried out along with rules for notifying the CER of project status and conditions. Finally, it will include requirements to gather, retain and report to CER certain data collected during the site assessment lifecycle that will be required for the design, fabrication and construction phase of the project.

5.3 Design, Fabrication & Construction Requirements

This section contains requirements on the following activities:

1. Design of the project components with respect to structural integrity, personnel safety, and environmental protection;
2. Fabrication, transportation, installation, and commissioning of project components; and
3. Certificate of Fitness (independent third party verification and certification) of the ORE facility.

The regulatory framework follows the lifecycle phases and will include the following components:

1. General requirements (such as operator duties);
2. Requirements for site assessment and planning;
3. Requirements for the design, fabrication and construction of the offshore facilities;
4. Requirements for the operation and maintenance of the facilities; and
5. Requirements for decommissioning and abandonment.

The requirements of this section apply to all parts of the project including the wind, wave, current, or tidal generation devices, the substructures and foundations, the electrical service platforms, the inter-array and export cables, and any other permanently installed auxiliary structures.

Similar to the site assessment phase, this section will outline the information to submit as part of an application for project authorization, including the safety, environmental protection and contingency plans. It will also outline requirements for quality assurance and integrity management programs, as well as notification and reporting requirements.

5.4 Operation & Maintenance Requirements

The requirements for operations cover activities between construction and decommissioning of an offshore renewable energy facility. The requirements will include provisions for self-inspection, as well as requirements for continuous monitoring, periodic maintenance, and repairs according to the approve integrity management program.

This section will also include independent third-party inspections according to the approved certificate of fitness to verify continued compliance with the certificate. Recognizing the technical advances that are taking place in this industry, the operating requirements would also include provisions for an operator to apply for regulatory variances to repower the facility with new turbines or other components and to request lifecycle extensions of the facility and structure.

5.5 Decommissioning & Abandonment Requirements

Requirements included in this section of the regulations will touch on the information to be provided when applying for decommissioning and abandonment of a project. Once again, Safety, environmental protection and contingency plans will be required, along with reporting requirements.

6. Regulatory Approach

6.1 Outcome Based Requirements

Outcome based requirements state an outcome that is desired as opposed to a specific practice, technology or equipment. This approach ensures that regulations continue to remain relevant over time, raise the bar on best practices over time, and encourage the industry to innovate to come up with more efficient, economical and effective solutions for ensuring safety and environmental protection. Outcome based requirements also allow for solutions to be tailored to site specific environmental conditions, or specific types of installations/equipment as things evolve as opposed to being overly restrictive.

In practice, these types of requirements can be intricately linked to risk management framework approaches (e.g. Safety Case approach). They typically work best when regulating an industry that has adequate resources to undertake complex risk analysis and develop and implement appropriate mitigation plans, procedures and measures. They are also more appropriate in circumstances where technologies are evolving rapidly or vary widely.

NRCan will strive to adopt outcome based requirements where possible to support innovation and ensure the regulations stand the test of time.

6.2 Prescriptive requirements

Prescriptive requirements defines the specific technical and procedural requirement instead of the outcome that is desired. Such requirements will outline directly who does what, when and how, or how equipment should be designed in order to address a hazard (e.g. guard railing should be 4 feet high). Prescriptive requirements includes the reference to standards that outline specific equipment design, operation or maintenance features.

The prescriptive approach is more appropriate when regulating smaller companies that have less resources and prefer to be told how to comply as opposed to be provided a goal. It is also the preferred approach when the methods to address specific hazards in a given industry are well defined and understood and are unlikely to change over time.

NRCan will use pre-scriptive requirements where appropriate, such as to clearly outline the information required at the application phase and the contents of safety and environmental management systems. It is also proposed that standards be referenced only in the event they are clearly recognized as industry best practices with no alternative options and that they will continue to be so over time.

7. Project Milestones Timeline

To obtain early and ongoing feedback throughout the regulatory development process, NRCan will engage provinces and territories, stakeholders and Indigenous groups in three phases with different supporting products:

Phase 1 – Pre-engagement on regulatory approach (this discussion paper) – Fall 2020

Phase 2 – Pre-engagement on technical requirements/policy intentions – Winter 2020/21

Phase 3 – Pre-publication of draft ORER in Canada Gazette Part 1 for public comments – Fall 2022

The final version of the ORER is expected to be published in Part 2 of the Canada Gazette sometime in the Fall of 2023.

8. Discussion Questions

To ensure early and ongoing feedback on the ORER, NRCan is interested in your views on the proposed regulatory structure outlined in the Discussion Paper and provides the following questions to help guide your feedback:

Q1: NRCan has proposed five guiding principles (pg. 10) for the development of the ORER. Do the guiding principles make sense for developing safety and environmental protection requirements for ORE projects? What changes, if any, would you suggest to the guiding principles? Are there any other principles NRCan should use when developing the ORER?

Q2: NRCan has proposed five key components for the regulations that include requirements for project proponents to meet based on the type of activity proposed (pg. 11–12). Do the proposed components and requirements make sense? What changes, if any, would you suggest? Are there any other components or requirements NRCan should address when developing the ORER?

Q3: What are your views on the use of outcome based requirements for regulating ORE activities? Do you agree with using such an approach to these proposed regulations? Are there any specific areas where prescriptive based requirements would be more appropriate?

If you have any general feedback on this initiative or wish to provide specific responses to any of the questions above, please submit them by email to *nrcan.offshorerenewables-renouvelablesextracotieres.rncan@canada.ca* or by going to the ORER webpage. The deadline for submitting comments is January 8, 2021. If you are interested in learning more about the ORER initiative before submitting comments on the Discussion Paper, you may request further information from NRCan at *nrcan.offshorerenewables-renouvelablesextracotieres.rncan@canada.ca*

After the close of the comments period, a summary of written comments will be posted on the ORER webpage. Comments received by the deadline will be reviewed and considered for use to inform the next stage of engagement for the ORER in Winter 2020/21.

Please visit ORER web-page for information and updates on the proposed regulations, including information on public engagement.

The Offshore Renewable Energy Regulations Initiative – Discussion Papers.
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