

SYNTHESIS REPORT

**PRECONDITIONS FOR THE
DEVELOPMENT OF OFFSHORE WIND
ENERGY IN AUSTRALIA**

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1. Executive Summary

Offshore wind development is preconditioned by jurisdictional, legal, policy and regulatory arrangements, market and economic conditions, including supply chain and logistic arrangements and community acceptability and support.

Initial constraints on the development of offshore wind energy centred on lack of regulatory certainty for developing, operating and managing such activities, particularly in areas outside state waters (beyond 3 nautical miles of the shoreline). Uncertainty with respect to offshore renewable energy in Commonwealth waters was addressed with the development and enactment of the Offshore Electricity Infrastructure Act 2021.

The Offshore Electricity Infrastructure Act 2021 and associated regulations and delegations were a major initiative and provided the framework for developing offshore wind in Australia. This regulatory system is new and is being tested as offshore renewable energy zones are declared, and the process of allocating feasibility licenses and development of management plans begins. Drawing on experiences of other jurisdictions highlights the significance of stakeholder consultations and what the proponents do with the feedback from the stakeholder consultation periods.

It is clear that ‘place’ holds a critical place in ethics involving ocean development, particularly for emerging industries, the concept of place includes the marine zone, the coastal/littoral and the adjacent region conjointly with the cultural and amenity dimensions and perspectives which frame interdependent experience.

Place attachment is a key ethical principle. Best practice includes inclusive and thorough policy, and community participation. This analysis highlights that social acceptance should not be assumed simply based on broad support for renewable energy. There should be an overall, coherent plan for community understanding and framing of place, engagement across all relevant layers of government and industry.

The features of the offshore wind supply chain are central to successful development of the sector. Utilising a lifecycle key approach links the development and supply of wind turbines, and procedures for project development, procurement, construction, operation and maintenance (O&M), and decommissioning. There are clear challenges and risks inherent in the supply chain. These challenges encompass five key aspects: permitting and social acceptance, component supply, port availability, vessel availability and workforce availability.

2. Preconditions for the Development of Offshore Wind Energy in Australia

Project Summary

Across four work packages, this project addresses industry needs regarding social acceptability, law and policy settings and supply chain operations. With the passage of recent legislation, Australia's offshore wind energy industry is poised to grow over the coming years. This project provides an opportunity for the Blue Economy CRC and industry partners to seize the opportunity provided by recent legislation to build efficacy, integrity and good governance into Australia's burgeoning offshore wind power industry.

This project aims to:

- » Identify best practices in policy and regulatory processes applicable to offshore wind development that may be considered in the Australian policy and regulatory context.
- » Identify key elements of social acceptability for offshore wind development and assist industry in addressing an integrated integrity system approach to offshore wind projects.
- » Identify supply chain systems for the development of offshore wind industry and provide strategic direction.
- » Provide a synthesis of research in forms useful and usable by Blue Economy CRC Research Programs 1, 3, and 4; Blue Economy CRC partners and third-party stakeholders (including the Australian and State governments).

This report synthesises work undertaken in phase 1 2023-2024, with Appendix 2 outlining project activities and milestones for phase 2, 2024-2025.



3. Development of Offshore Wind in Australia

Research conducted by the Blue Economy Cooperative Research Centre has highlighted the potential of offshore wind in Australia's future energy planning (Briggs, et al. 2021). With suitable sites located across all Australian states, (Queensland, NSW, Victoria, Tasmania, South Australia, and West Australia) (Briggs, et al. 2021) offshore wind promises to establish Australia as an 'energy superpower.'

Despite this, potential development has lagged initiatives in Europe, North Africa and North-East Asia due in great part to a lack of clarity and certainty over legislative and regulatory approvals (permitting, leasing, operation and production) for renewable energy in offshore areas. Offshore wind projects will typically cross Commonwealth and State jurisdictions, therefore, consideration needs to be given in the framework on the ways to provide complementary processes for activities that occur in both Commonwealth and State waters (Briggs, et al. 2021: 79).

“Australia’s offshore wind resource potential is large, with high average wind speeds found offshore around most coastal regions. The gross potential capacity for Australian OSW energy was estimated at 27,562 GW and when constrained by depth (<1000 m) and distance to infrastructure (<100 km), reduced to 2233 GW. Estimates for gross and technical energy generation potential were 136,845 TWh/year and 9,396 TWh/year” (Briggs, et al. 2021: 42).

Offshore wind development is preconditioned by key settings:

1. Government jurisdictional, legal, policy and regulatory arrangements;
2. Market and economic conditions, including supply chain and logistic arrangements; and
3. Community acceptability and support (including first nations cultural licence).

The synthesis and integration of data from the analysis of the preconditions described above centres on two aspects:

1. How the development and generation of offshore renewable energy, with particular focus on wind, impacts, integrates with and contributes to the operation of Australian society, places and their socio-economic and environmental futures, in concordance with their values and goals. This has multiple strategic, operational and cultural dimensions, including significant “onshore” challenges related to grid development and connectivity.
2. How, and the degree to which, policy, community acceptability and supply chains and the factors complement each other and combine to activate development to deliver direct impacts and flow-on benefits. This includes the consideration of support packages to facilitate the development of offshore wind projects in Australia.

Our approach to exploring these issues in relation to offshore wind is to apply a dynamic systems framework built around the key preconditions identified in the section above, that shape planning and development of offshore activities. At the same time, we recognise, and note, that on-shore development through grid connectivity and transmission pose significant further challenges.

4. Legislative and Regulatory Framework

Initial constraints on the development of offshore renewable energy centred on lack of regulatory certainty over developing, operating and managing such activities.

The federal division of powers and responsibilities in offshore Australia, based on the Offshore Constitutional Settlement (OCS) of 1979 (Haward 1989) provides the states and Northern Territory with legislative responsibilities for activities in waters within three nautical miles from low water mark (or a declared baseline), with the Australian (Commonwealth) government responsible from three nautical miles to the edge of national jurisdiction. Uncertainty with respect to offshore renewable energy in Commonwealth waters was addressed with the development and enactment of the *Offshore Electricity Infrastructure Act 2021*.

The *Offshore Electricity Infrastructure Act 2021* was a major initiative and provided the framework to support offshore wind developments in areas of Commonwealth jurisdiction. The OEI Act provides improved legislative certainty in relation to construction, operation, maintenance and decommissioning of offshore electricity projects in Commonwealth waters. Importantly, too, it clearly prohibits unauthorised offshore infrastructure activities in Commonwealth waters. The Act outlines processes for declaring areas and establishing public consultation on the declared area. It also uses the same definitions as the *Offshore Petroleum and Greenhouse gas Storage Act 2006* with respect to offshore areas of a state or territory (Haward and Farley 2024).

The *Offshore Electricity Infrastructure Act 2021* and *Offshore Electricity Infrastructure (Regulatory Levies) Act 2022* are key elements in developing a regulatory regime for offshore wind.

The *Offshore Electricity Infrastructure Act 2021* outlines processes for declaring areas and establishing consultation/submissions from the public on the declared area and establishes various license categories (Feasibility, Commercial, Research and Development, and Transmission and Infrastructure). The act also establishes the basis for offshore wind interactions with other marine users and users. Assessment and approval of potential offshore wind projects are linked to the provisions of the *Environment Protection Biodiversity Conservation Act 1999*.

The *Environment Protection Biodiversity Conservation Act 1999* (EPBC Act) provides the legislative base to the Australian government's environmental interests, and mandate processes where activities impact on or potentially impact on "matters of national environmental significance", that include Commonwealth marine areas. The EPBC act also addresses nationally threatened species and ecological communities, migratory species, wetlands of international importance. The EPBC Act establishes requirements for environmental impact assessments including cumulative impact assessments. Proposals for activities outside state waters may also need to address key ecological features under the EPBC Act.



In early August 2022 the Australian government announced the first six areas for offshore wind projects, Southern (originally off South Australia-Victoria), Gippsland (off Victoria), Bass Strait (off Tasmania), Hunter (off Central New South Wales), Illawarra, (South Coast New South Wales) and Bunbury (south-west of Western Australia). The first area, Gippsland, the area of the proposed Star of the South project, (the most advanced offshore wind project proposed to date in Australia), was declared in December 2022, moving through the project application process set out in the OEI Act. The application process for submitting feasibility licenses closed in April 2023, and successful applicants formally announced in May 2024.

Other areas have been declared – the Hunter (July 2023), the Southern Ocean region off Victoria (March 2024), Illawarra (June 2024), Indian Ocean off the Bunbury (August 2024) and Bass Strait (December 2024).



The regulatory framework has yet to be fully tested. The allocation of feasibility licenses in Gippsland resulted in a legal challenge to the Minister's decision not to award a license to a specific proponent. This case (*Seadragon Offshore Wind Pty Ltd v Minister for Climate Change and Energy*) sought judicial review of the decision.

*The question which arises is whether the Minister has the power under s 33(1) to grant a feasibility licence over an area reduced in size from the area in respect of which the application for the licence was made. In broad terms, the Minister indicated to Seadragon that he was contemplating not granting the licence because the area it had applied for overlapped with other licence applications of greater merit. Seadragon submitted to the Minister that he should, in that circumstance, grant it a licence over a reduced area from which the overlapping parts had been excised (*Seadragon Offshore Wind Pty Ltd v Minister for Climate Change and Energy para. 2*).*

The ministerial review decision, completed in late February 2025, saw the original decision upheld (Durkin 2025). It is likely that other aspects of the framework will be subject to legal challenge (as has occurred in other jurisdictions), a process that will add clarity to this emerging and dynamic system.

4.1. Contributions from the work package

Work Package 1 provided input to the review of The Offshore Electricity Infrastructure (OEI) Amendment Regulations 2024. This input centred on recommendations related to the consultation process of the OEI Amendment Regulations 2024 to provide for more inclusive consultation and consideration of environmental risks during the planning and operation of offshore wind energy projects.

The key recommendations are:

- » The draft OEI Regulations be redrafted to provide for an Environment Plan to be included. This Environment Plan can then form the basis and be included within the Management Plan to avoid duplication of information, and to enable the Regulator to manage the environmental conditions stipulated by DCCEEW.
- » A Stakeholder Engagement Strategy be included within this Environment Plan, which can then form the basis, and be included within the Management Plan to avoid duplication of information.
- » Alternatively, a separate regulation providing for the potential environmental impacts resulting from the offshore renewable energy industry activities be compiled.

From assessment of international best practice, Work Package 1 has provided guidance on the timeframe for stakeholder consultation to Work Package 2 works on social acceptability.

The *Offshore Electricity Infrastructure Act 2021* indicates that at least 60 days should be allocated for public consultation feedback when a proposal to declare an area is issued (para 18(d), and at least 30 days from date when the proposal to declare an area is varied (para 24(e). However, there is no set timeframe given for the proponent to engage with stakeholders nor what or how this engagement should take place during the feasibility or construction licensing application phase. There is just a requirement to consult with any person that may be affected by activities carried out under the licence, and to provide the outcomes of any consultation (para 115(2)(e)(f). The OEI Amendment Regulations 2024 lists who is to be consulted (para 57 and 58) before applying for a management plan approval but no set timeframe is provided. The Regulator has 90 days to assess the application (para 60(1)).



Under the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2023 there is a requirement to provide an implementation strategy for an environment plan (para 22) which includes:

- » a report on all consultations of any relevant stakeholders, a summary of each response made by relevant stakeholders;
- » an assessment of the merits of any objection or claim about the adverse impact of each activity to which the environment plan relates;
- » a statement of the titleholder's response, or proposed response, if any, to each objection or claim; and
- » a copy of the full text of any response by a relevant person (para 24).

A similar Environment Regulation should be added to the OEI Act that adequately provides for consultation with stakeholders, the identification and analysis of factors and response, clarifying potential issues impacting decision processes. Again, there is no set timeframe for consultation, but a reasonable period is indicated. **The following summarises processes and procedure in Europe, Scotland, the United Kingdom, Canada and Norway.**

Europe

In the Environment Impact Assessment Directive 2014/52/EU, the timeframes for consulting the public concerned on environmental impact assessment reports cannot be shorter than 30 days. EU Member States shall ensure that the public is given early and effective opportunities to participate in the preparation, and modification or review of the plans. This is stipulated in Article 2(2) of Directive 2003/35/EC providing for public participation in respect of the drawing up of certain programmes relating to the environment. Including the amendments with regards to public participation, and access to justice Council Directives 85/337/EEC and 96/61/EC - Statement by the Commission. Article 2 is also referred to in the Directive 2014/89/EU establishing a framework for marine spatial planning.

Scotland

In the Marine Licensing (Pre-application Consultation) (Scotland) Regulations 2013 ("PAC Regs") a period of at least 12 weeks between a notice being given and an application being submitted. Applicants must hold at least one pre-application event at which relevant bodies notified, and members of the public may provide comments to the applicant. Applicants must publish in a local newspaper a notice containing a description of the activity, detail where further information may be obtained, the date and place of the event, how and when comments should be submitted to the applicant. A PAC report, as per the schedule to the PAC Regs should be submitted alongside the marine licence application. The Pre-application Consultation event must be held no earlier than six weeks after the date on which notification of such event is given and the date of notification that an application for a marine licence is to be submitted is given.

United Kingdom

In the Marine Works (Environmental Impact Assessment) Regulations 2007, the appropriate authority must [as soon as reasonably possible] either supply a copy of the application, the environmental statement, and a letter stating that any representations in response to consultation regarding the application should be made in writing to the appropriate authority, at an address specified by the appropriate authority, within 42 days from the date of the letter (or such longer period as may be agreed between the consultation body and the appropriate authority in accordance with paragraph.

Canada

The Canadian Energy Regulator Act (CER Act) came into force in 2019 setting out the legislative framework for the oversight of the full life cycle of an ORE project and offshore power line. Proposed Canada Offshore Renewable Energy Regulations (the “proposed Regulations”) to operationalise Part 5 of the CER Act is currently undergoing a consultation process. In phase 1, the public was given a 90-day written notice period to comment, and phase 2 provides a further 90-day written notice period to comment on the technical aspects of the proposed Regulations. Under article 74 of CER Act, the Regulator must establish processes that the Regulator considers appropriate to engage meaningfully with the public — and, in particular, Indigenous peoples of Canada and Indigenous organizations — when public hearings are held under section 52 or subsection 241(3), the Regulator must establish a participant funding program to facilitate attendance? (art 75). The Regulator may enter into arrangements with any government or Indigenous organization to establish collaborative processes (art 76). Within 30 days after the day on which the Minister enters into an arrangement, the Regulator must publish it on the Regulator’s website. Part 5 of the CER Act, art 298 (3), establishes that in determining whether to issue an authorization, the Commission must take into account:

1. the environmental effects, including any cumulative environmental effects;
2. the safety and security of persons and the protection of property and the environment;
3. the health, social and economic effects, including with respect to the intersection of sex and gender with other identity factors;
4. the interests and concerns of the Indigenous peoples of Canada, including with respect to their current use of lands and resources for traditional purposes;
5. the effects on the rights of the Indigenous peoples of Canada recognised and affirmed by section 35 of the Constitution Act, 1982;
6. the extent to which the effects of the project or power line hinder or contribute to the Government of Canada’s ability to meet its environmental obligations and its commitments in respect of climate change; and
7. any relevant assessment referred to in section 92, 93 or 95 of the Impact Assessment Act 2024.

Under Article 11 of the IA Act, the Agency must ensure that the public is provided with an opportunity to participate meaningfully, in a manner that the Agency considers appropriate, in its preparations for a possible impact assessment of a designated project, including by inviting the public to provide comments within the period that it specifies, but it does not provide a specific timeframe.

Norway¹

Norway is a relative latecomer to the European offshore wind market but has made significant progress the last several years in developing offshore wind. In 2022, the government announced its new ambition levels for offshore wind in Norway. This specified that by 2040, there would be licenses granted for areas that would produce a total of 30 000 MW of energy from offshore wind in Norway – as much as what was produced that year in total. In recent years the first offshore wind park, Hywind Tampen, was established in 2023 and potential future areas for wind energy installations notified.

Norway has a multi-level governance regulatory framework for offshore wind, with municipal and national governments having key roles. Norway, although not a member of the EU, follows several EU regulations. Municipal governments are area planning authorities in Norway for land area and for 1 nautical mile (1852 meters) outside the baseline. National legislation frames the development of offshore wind projects, identifies areas, provides subsidies, licenses, finances research, develops regulations that govern activities. Though Norway is not a member of the EU, it is a member of the European Economic Area (EEA) and the Schengen Area.

The approval/development process can be lengthy. An identification of sites occurred in 2010, followed by a Strategic Impact Assessment (SIA) by the Norwegian Water Resources and Energy Directorate (NVE) in 2012. This latter was then taken up again in 2017 when the offshore wind enthusiasm gained momentum again, and the SIA was confirmed as still valid, leading to the recommendation of the two areas in 2019 and the later calls for proposals. Applicants must pay a processing fee of 100,000 NOK (approximately 14,000 AUD or 9,000 USD) to the State via NVE before the application process could begin, as stipulated by the Offshore Energy Regulations, and covers the costs of processing and ensures an efficient and thorough review of the project.

The impact assessment regulations in Norway implement two specific EU directives on Environmental Impact Assessment (EIA) and Strategic Environmental Assessment (SEA). The former, the Directive on the assessment of the effects of certain public and private projects on the environment, aims to ensure a “...*high level of environmental protection*” and that “...*environmental considerations are integrated into the preparation and authorisation of projects*” by carrying out environmental assessments of certain private and public projects. The latter, the Directive on the assessment of the certain effects of plans and programmes on the environment, on the other hand, aims to “...*ensure a high level of environmental protection and that environmental considerations are taken into account when preparing, adopting and implementing plans and programmes*”, and it “...*promotes sustainable development by ensuring that environmental assessment is carried out of certain plans and programmes likely to have significant effects on the environment*”.

¹ Material taken from Hatlebrekke, D. J. Dankel and R. Tiller 2024. *Blue Economy CRC – Report on the Offshore Wind status quo in Norway and reflections on best practices*. SINTEF, Norway Report 2024:00769 ISBN 978-82-14-07048-4 2024.

4.2. Key Findings

Analysis of the developing Australian regulatory regimes and assessment of international best practices highlight the significance of stakeholder consultation, its purpose, the readiness of the community to participate, scope, inclusion and factors arising. A key element is what the proponents do with the feedback from the stakeholder consultation periods. This feedback is required to have been adequately addressed within the proponent’s environmental socioecological assessment (Management Plan) and demonstrated that the input has been addressed. This is not currently emphasised under the OEI Regulations. Also at least one pre-application event is best practice to be held during this consultation period at a location suitable to the stakeholders, i.e., in person within First Nations communities.

5. Social Acceptability²

Research in works package 2 has highlighted the critical role ‘place’ holds in ocean ethics involving ocean development, particularly for emerging industries.

Place attachment is a key ethical principle, the concept of place includes the marine zone, the coastal/littoral and the adjacent region conjointly with the cultural and amenity dimensions and perspectives which frame interdependent experience. Best practice is found in Scotland, Canada, and Maine, USA with respect to inclusive and thorough policy, and community participation.

5.1. Contributions from the work package

Ethical best practice is inclusive of making mutual learning accessible – sharing of knowledges and creating appropriate community benefits. These benefits include economic and social opportunities derived from rents derived from use of the ocean commons as well as compensation for loss. A key challenge is such how economic transfers are framed. The work package notes that *“what constitutes compensation versus a bribe depends on many factors: the timing of the benefit, the substance (fund or in-kind) of the proposed benefit, the place of the benefit in a larger community consultation program, the independence and integrity of other parts of the governance system, whether the benefits are institutionalised and expected (or discretionary), and the nature of the agreement, and the impact of experience.”* (Bossi et al. 2024)

5.2. Key Findings

- » Decision-makers should consider carefully the range of ethical principles applicable to offshore wind energy, and the potential ethical risks that a given technology in any given locale might present.
- » Social acceptance should not be assumed simply on the basis of broad support for renewable energy. There should be an overall, coherent plan for community engagement across all relevant layers of government and industry.
- » Community engagement and the factors which impact the relevance and capacity to meaningfully engage should happen early in the process.
- » The policy-making process should prioritise opportunities for trustworthy and independent research and learning, and knowledge-sharing between community and developers.
- » The management of adaptation pathways and energy transitions ought to be respectful and reflective of the dynamic quality of the place – the changing ocean, its ecosystem already under pressure, and its relationship with a local community.

International review indicates a purpose scope ranging from awareness, information gathering, learning and beyond to key factor analysis which shapes further engagement and development as project phases roll-out.

² Material taken from L. Bossi, H. Breakey, R. Marshallsay, K. Cooper and C. Sampford, *Practitioner Summary: Ethics, values & social licence for offshore wind development*, Blue Economy CRC 2024.

6. Supply chains and logistics³

Work Package 3 has mapped the lifecycle stages of the Australian offshore wind industry and identified the critical factors for the development of offshore wind projects in Australia, focusing on the supply chain requirements and challenges.

We recognise that this work focuses on identifying the elements and interactions in the development of offshore wind operations. A key element in industry viability will be the type and structure of commercial agreements between governments and industry to supply energy to the market.

6.1. Contributions from the work package

To quantitatively assess supply chain demands, this study developed a supply chain analysis model. Using the offshore wind zones in the Bass Strait and Southern Ocean region (Cluster 2) as a case study, the model estimated supply chain requirements under three target scenarios.

6.2. Key Findings

Based on this case analysis and the current state of industry development, key supply chain challenges were identified, including the capability and capacity for turbine-related component supply, port, vessel, and workforce availability, and component recycling and reuse.

The primary challenges include:

- » **Component Supply:** The international supply chain for offshore wind components faces potential shortages to meet Australia's demand, while establishing a robust domestic supply chain to offset and potentially develop strategic capacity still lacks sufficient investment confidence.
- » **Port Capacity:** Australian ports are beginning to prepare for offshore wind development, but the alignment of port capacities with project scale and timelines remains unresolved.
- » **Vessel Shortage:** Australia is likely to face a shortage of large vessels for offshore wind farm construction.
- » **Workforce Availability:** Workforce capacity and skills remain underdeveloped to meet offshore wind project demands.

³ Material taken from P. Chen, S. Cahoon and H. Fan Progress Report: Supply Chain Challenges in Australia's Offshore Wind Development November 2024.



Image courtesy of BMT



To address these challenges, the following recommendations are proposed:

- » **Domestic Supply Chain:** Establishing feasible domestic supply chain elements for offshore wind components is essential. Collaboration between government and industry can foster investor confidence and drive supply chain development.
- » **Port Development:** Ports can collaborate with government, developers, and other ports to optimise resource use and build a platform for efficient operations. A two-pronged approach to port infrastructure investment and support is recommended for both fixed-bottom and floating projects. First, immediate action should focus on funding facilities capable of supporting initial commercial deployments with minimal upgrades, enabling gradual expansion to specialised or larger ports over time. This approach would ensure early project deployment, stimulate commercialisation, and attract future investment. Second, investment should target key ports, developing them as (1) large-scale integration hubs for the region and (2) optimal sites for manufacturing and assembly.
- » **Vessel Availability:** Large international developers, with broader resource networks, can leverage their assets to ensure vessel availability. Local Australian developers should plan proactively for new builds or chartering options, potentially adopting flexible financing strategies to mitigate investment risks.
- » **Workforce Development:** Given that offshore wind construction in Australia is expected to commence around 2028, establishing training programs now is critical. Partnerships with vocational training institutions like Technical and Further Education (TAFE) institutes and universities could support the creation of specialised training courses. This training should complement that developed for terrestrial wind farm development.

Proactive planning and collaborative efforts across supply chain sectors will be instrumental in establishing Australia's offshore wind industry. By strategically developing port infrastructure, localising component supply chains, securing vessel availability, and fostering a skilled workforce, Australia can overcome these challenges, positioning itself as a strong player in the global renewable energy sector.

7. Offshore Wind in Australia as a complex dynamic system

Synthesis of project research to date

The findings from the project’s work packages provide an opportunity to assess current approaches to establishing offshore wind in Australia. The findings highlight key policy, strategy and operational interdependencies in the offshore wind sector, and between this sector, other uses and users of marine areas, other industry, and communities. The findings highlight that opportunities and tensions are heavily values dependent, particularly from local cultural, amenity, environmental and economic perspectives.

Australian offshore wind is a good case study of the development of a complex, dynamic system, where pre-existing energy generation, national and regional economies and communities are “shocked” by the introduction of a large-scale development. As Ellis and Herbert have noted “complex interactions and interdependencies emerge within ... [a system] which cannot be understood or predicted simply by studying individual elements of the system” (Ellis and Herbert 2011, 34). Complex dynamic systems are “a special instance of systems based on the recognition that these systems contain adaptive components and capacities. The adaptive components allow systems to change and evolve over time in response to feedback and changes in the system context” (Prieser 2018, 1; see also Brownlee 2007).

Conceptualising offshore wind development as a complex, dynamic system enables a framing that connects overarching strategic intentions to a value chain formed by the policy and regulatory processes shaping project approval, design, construction, and operations, shaped by community acceptability and supply chains. Importantly too, Australian offshore wind is part of a global industry, and concomitant global supply chains and capital markets. As a result, the system is shaped by two dimensions, geography and enablers:

1. The geographical span of activity from international to local contexts, and
2. The scope of enablers including policy, community acceptability and supply chain settings and their enabling market intersections.

The following table maps these as key factors derived from the research packages and current development initiatives and responses.



Table 1. Key Factors.

Integration					
	Dimensions	Policy settings	Community acceptability	Supply Chain	Market connection and capability
Integration	International	Treaties, emission targets, relativities	Environmental	Critical owe supply chain element, skills sourcing	Finance, developer, construction
	National	Energy, source, renewable energy zones - location, regulation & proclamation	Carbon emission reduction, broad societal values	Local supply at scale	Finance, developer, construction, materiel, labour, energy, distribution/sales
	State	Renewable energy zones activation, planning, industry, labour market	Carbon emission reduction, renewable energy zones, development	Supply chain, Infrastructure, logistics	Fabricators Renewable Specialists Logistics Energy distribution/sales
	Regional	Development, community capital	Environment, visual, amenity, current & cultural practice, jobs, housing impact	Contribution into supply chain, infrastructure, direct, indirect employment	Business profile, labour, value add
	Local	Planning, development, Economic	Environment, visual, amenity, current & cultural practice, jobs, housing impact	Contribution into supply chain, infrastructure, direct, indirect employment	Business profile, labour, value add

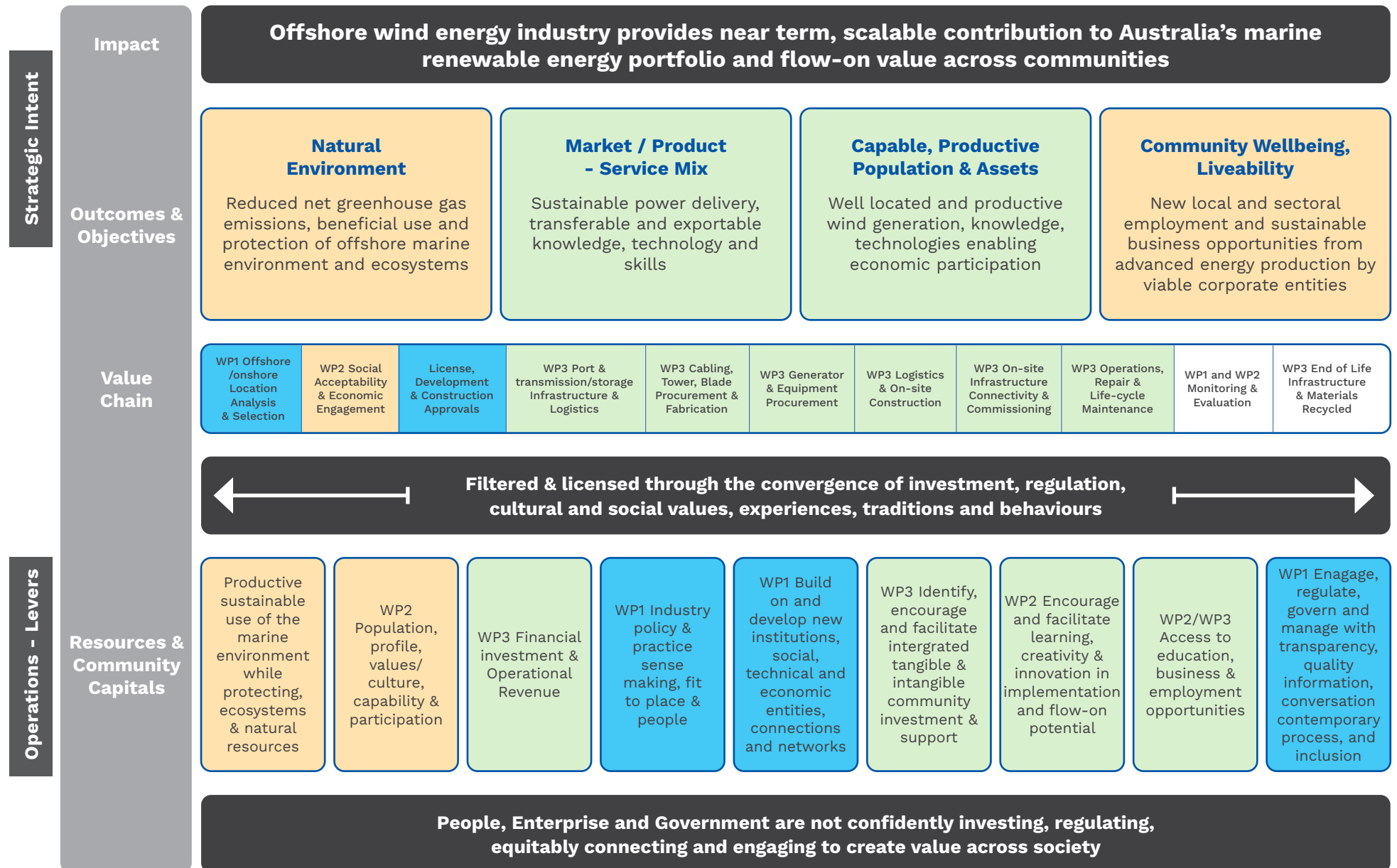
Approaching offshore wind developments as a complex, dynamic system enables it to be framed in a way that connects overarching national strategic intentions to the industry’s development and operations in a regional or place-based context. Figure 2 following represents the industry as a dynamic system metaframework illustrating how resources are (or can be) applied to the industry value chain to deliver renewable energy and then utilise this to deliver key, societal strategic objectives.

By bringing the critical elements, perspectives and dimensions into a such a framework, a picture of industry operability emerges and with it an opportunity to clarify how the system elements contribute and work together to deliver the value sought from multiple perspectives. The metaframework is vertically arranged from short, to medium, through to long term time horizons. It also includes a horizontal representation of how available resource capabilities are applied to the industry value chain across these horizons. The interrelationships are omni-directional recognising the multiple socio-technical and cause-effect interdependencies. As a system it can be deconstructed allowing consideration of individual or grouped elements and reconstructed to consider the implications of changes propagating through the system as enhancing or constraining performance.

The dynamics of the relationships are mapped onto the framework below and linked to the work packages introduced earlier in this report.

The areas of focus of work package 1 are colour-coded blue. The flow-on impact from the performance of the policy framework is most evident on the focus of work package on social acceptability area, coloured fawn. The framework highlights the concern relating to cultural and value- based community capital including aspects of respect, ethics, coastal amenity and use traditions and multi-perspective marine environment uncertainty. As highlighted in the value chain this creates a choke point in the project approval process which generates uncertainty and delay in approval and the activation of the focus of work package 3 (green).

Figure 1. Mapping offshore wind value chain intersections.



The framework highlights three critical key phases in offshore wind developments:

1. Location, licensing and development and construction approvals;
2. Construction and commissioning; and
3. Operations, maintenance and de-commissioning.

Policy settings, together with market conditions are key community capital foundations of offshore wind development. While policy and regulatory decisions have tangible and direct impacts, their characteristics propagate through the system. Policy decisions also provide signals that play a role in stimulating acceptance, ambivalence and rejection responses. In large scale, disruptive contexts, the policy signal and the way it is introduced and translated across impacted communities and markets necessitates a strategic approach to community engagement and business development.

Contestation over offshore wind energy policy is an outcome of the system where, for example, a renewable zone declaration raises community concerns. These concerns may centre on perceived risks to the marine environment, community liveability or wellbeing. In such a contested arena, project proponents face considerable challenges and risks. Productive offshore wind energy development is dependent upon the individual and interdependent performance of the whole system. Poor performance in one element, and/or poor interconnections between elements threatens the operability and responsiveness and resilience of the system.

As noted in the research to date social acceptability is both a precursor to development and a key element of optimising local benefit from these developments. As a precursor, there are discrete cultural values which frame the perspective taken to development proposals. Members of coastal and adjacent communities reflect a range of values, some of which frame their relationship with the ocean, First Nations reflect land-sea values and perspectives, each of which inform responses to offshore renewable energy and offshore wind development proposals.

The technical nature of offshore renewable energy in general and offshore wind in particular generates shocks to current, generally settled, interrelationships and interdependencies. Our research indicates that managing these shocks interconnects and integrates national, state, regional and local issues, recognising the diversity of values, objectives and priorities which are in play and are important preconditions for investment.



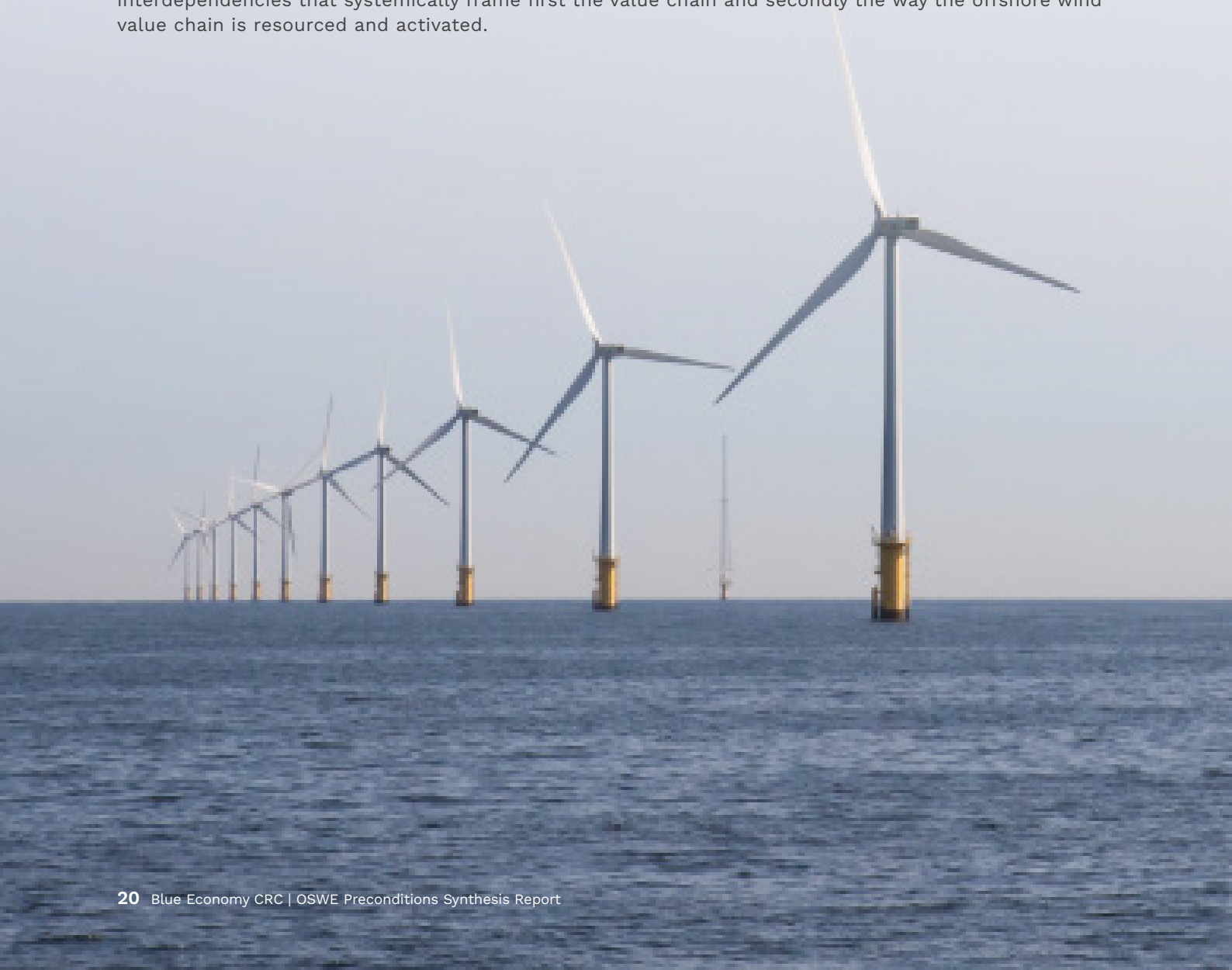
8. Conclusion

We have noted that offshore wind development is preconditioned by jurisdictional, legal, policy, and regulatory arrangements, market and economic conditions, (including supply chain and logistic arrangements), and community acceptability and support (including first nations cultural license). Offshore wind development is based on purposeful, agreed strategic intent and intersecting, multiple development pathways.

While bounded by regulatory and administrative arrangements, offshore wind development in Australia is subject to external shocks, (competing global financial, material and labour supply, and logistics infrastructure) and internal pressures, such as economy wide capacity and the diversity of Australian cultural values. Our use of a systems approach is designed to support collaboration and integration by providing “a safe place” from which to identify factors, their causes and consequences.

Recent analysis in the United States highlights that, despite development being progressed within existing legal and environmental assessment processes, the “US Wind Project” now faces significant challenges (Broughel 2024). These challenges include high financing costs and supply chain disruptions as well as legal challenges resulting to what has been termed a “failure to build a ‘chain of trust’ with local communities” (Broughel 2024).

These challenges and insights are replicated in our research to date on “Australia’s offshore wind project”. Material presented above highlights the preconditions for Australian offshore wind energy development; and evolving regulatory framework linked to domestic and export supply chains, and the influence of social acceptability. These preconditions are also clearly interdependent. It is these interdependencies that systemically frame first the value chain and secondly the way the offshore wind value chain is resourced and activated.



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Legal Case

Seadragon Offshore Wind Pty Ltd v Minister for Climate Change and Energy [2024] FCA 1290.

Appendix 1: Synthesis of the Value Chain

Site selection/location analysis	
Government Documents	Work package research
<p>Offshore Infrastructure Regulator (NOPSEMA)</p> <p>OEI Act and Regulations</p> <p>https://www.oir.gov.au/guidance-and-regulation/legislative-framework</p>	<p>Site selection/location analysis is shaped by regulatory requirements and settings under the OEI Act and EPBC Act.</p> <p>Place attachment, community attitudes and social acceptability are a key factors and First Nations people interests are likely to increase. Place attachment is seen as a key ethical principal requiring attention in offshore renewable developments. A key issue is the question of scale – larger arrays (in size and number) have larger impacts on local, regional, and global communities. Research to date has highlighted the emergence of the “Blue vs Blue debate” identified in the US and its migration to the Illawarra during June of 2023. Other competing but also complementary social regulatory systems to the social and cultural license to operate. First Nations communities and family groups are diverse and thus each require respectful consultation to capture their plurality. First Nations inclusion can complement and even enhance strategic creative and innovative ways to sustainably manage resources and development in an of our oceans as well as address many of the BE values listed above.</p> <p>Coexistence between OWE and other uses and users has been a significant factor and is likely to increase in significance and managing manage use conflicts (fisheries) is likely to be significant. Navigation, and defence priorities are recognised in the declaration of zones.</p> <p>Proponent driven site evaluation, environmental impact – cost – efficacy perceptions with other impacts such as multiple or duplicated science assessments and analysis may occur. It could be beneficial to proponents (industry) to develop project specific marine spatial planning (MSP) since proponents already need to conduct:</p> <ul style="list-style-type: none"> » site suitability/feasibility assessments for OWF infrastructure, » environmental impact assessments as part of the approval process, and » manage conflict with other marine users and proposed developments as part of the stakeholder engagement and ongoing management during the construction, operation and decommissioning of OWE infrastructure projects. <p>In addition, there would be overlapping data requirements with the MSP process. These site-specific MSP could then feed into a national MSP driven by the Australian government speeding up the process.</p>
<p>DCCEEW</p> <p>EPBC Act</p> <p>https://www.dcceew.gov.au/environment/epbc</p>	

Design and Development	
Government documents	Work package research
<p>Offshore Infrastructure Regulator (NOPSEMA)</p> <p>OEI Act and Regulations</p> <p>https://www.oir.gov.au/guidance-and-regulation/legislative-framework</p>	<p>Policy and Regulatory Issues</p> <p>Development approvals are currently shaped by the proponent driven process under OEI Act. The management of adaptation pathways and energy transitions ought to be respectful and reflective of the dynamic quality of the place – the changing ocean, its ecosystem already under pressure, and its relationship with a local community.</p> <p>A best practice for granting leases for offshore wind projects has not yet emerged. According to the (World Bank 2021) leasing award formats generally fall into one of the following categories:</p> <ol style="list-style-type: none"> i. a bilateral process, where developers apply for a lease and are awarded on a first-come, first-served basis; ii. a stand-alone competitive bidding process; and iii. a competitive bidding process combined with revenue support. <p>In Australia, offshore wind projects generally require approval by the Commonwealth Government (e.g., under the EPBC Act 2000), in addition to approvals under state legislation. Bilateral agreements between the Commonwealth and state governments for streamlining environmental and social assessments may not cover projects proposed in the Commonwealth marine area. Without legal reform, additional arrangements to solve this gap may need to be negotiated in an ad hoc basis.</p> <p>Would it be beneficial for Australia to adopt an additional pathway for environmental permitting of offshore wind projects based on the centralised and/or hybrid models? In the future, with the consolidation of the offshore wind industry in Australia, could the government consider greater involvement in the environmental permitting phase for priority areas (or for transmission infrastructure and grid connection systems)? Or is the decentralised model, currently adopted, the most suitable for our local conditions? How are intergovernmental issues and engagement between Commonwealth and state agencies- to be managed?</p> <p>The one-stop-shop approach, in which a single government body is responsible for managing the environmental permitting system, has been considered best practice for offshore wind projects. The best structure for a one-stop-shop model varies according to the jurisdiction. What would be the alternatives for creating this model in Australia? Should we think of an accredited government agency in each state playing this role and ensuring the application of the EPBC Act through the observance of National Environmental Standards to be proposed in the future by the Commonwealth Government? Or would it be more appropriate for the future independent Environmental Protection Agency (EPA), to be created by the Commonwealth Government, to play this role, with states supporting the federal agency according to their peculiarities?</p>
<p>DCCEEW</p> <p>EPBC Act</p> <p>https://www.dcceew.gov.au/environment/epbc</p>	
<p><i>Offshore Electricity Infrastructure Framework Regulatory Process Map</i></p> <p>https://www.nopsema.gov.au/sites/default/files/2021-11/Offshore%20electricity%20infrastructure%20framework%20regulatory%20process%20map.pdf</p>	
<p>DCCEEW 2023, GUIDANCE- KEY ENVIRONMENTAL FACTORS FOR OFFSHORE WINDFARM ENVIRONMENTAL IMPACT ASSESSMENT UNDER THE ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999, Department of</p> <p>Climate Change, Energy, the Environment and Water, Canberra, July.</p> <p>https://www.dcceew.gov.au/sites/default/files/documents/key-environmental-factors-offshore-windfarm-environmental-impact-assessment-under-EPBC-Act.pdf</p>	

<p>Offshore renewables environmental approvals</p> <p>https://www.nopsema.gov.au/sites/default/files/documents/Guidance%20-%20Offshore%20renewables%20environmental%20approvals%20-%20Rev%201%20Oct%202022.pdf</p>	<p>Social acceptability and ethical Issues</p> <p>Qualitative indicators are just as important as quantitative data collection and analysis. They help identify the nuances key to effective stakeholder engagement.</p> <p>Benefits vs Bribes when it comes to transparent engagement with all stakeholder groups, particularly local communities, “what constitutes compensation versus a bribe depends on many factors: the timing of the benefit, the substance (fund or in-kind) of the proposed benefit, the place of the benefit in a larger community consultation program, the independence and integrity of other parts of the governance system, whether the benefits are institutionalised and expected (or discretionary), and the nature of the agreement, and the impact of experience.”</p> <p>Blue vs Blue debate, and the politicisation of vulnerable local community groups</p> <p>Kinship worldviews that inspire an eco-centric thinking necessary in ocean spaces are jarring for the kind of siloed developments of terrestrial industry.</p> <p>Curbing development ambition: “Consistent with an ecosystem-based plan, biodiversity both above and below the surface would help ensure the kind of research and development, political transparency, and community engagement that would exemplify the ocean ethics we have already established. Without any offshore windfarms in Australian waters, research so far supports curbing ambition in support of cautious development with a focus on filling place-based knowledge gaps for the greater good of the ecosystem.”</p> <p>Ethical Best Practice: Attending to the 7 BE ethical principles (environmental sustainability, stakeholder participation, fairness, harm prevention, beneficence, trustworthiness & accountability, place attachment) Making mutual learning accessible -- knowledges sharing Creating appropriate community benefits</p> <p>First Nations perspective: “Kneebone advises that risk conscious financiers are increasingly insisting on the treaty-based Free Prior Informed Consent (FPIC) Agreement outlined by the UN Human Rights Office. This is an ethical commitment, since the Australian Government is yet to create investment certainty for offshore wind proponents that demonstrate an end to the myth of terra nullius.” First Nations communities and family groups are diverse and thus each require respectful consultation to capture their plurality. First Nations inclusion can complement and even enhance strategic creative and innovative ways to sustainably manage resources and development in an of our oceans as well as address many of the BE values listed above.</p>
<p>Environmental management</p> <p>https://www.oir.gov.au/guidance-and-regulation/environmental-management</p>	
<p>Design notification scheme</p> <p>https://www.oir.gov.au/sites/default/files/Preliminary%20information%20-%20Design%20notification%20scheme.pdf</p>	
<p>Guideline: Offshore Electricity Infrastructure Licence Administration – Feasibility Licences</p> <p>https://www.dcceew.gov.au/sites/default/files/documents/GuidelineOEILicenceAdministrationFeasibilityLicencesDec2022.pdf</p>	
<p>Management plan</p> <p>https://www.oir.gov.au/guidance-and-regulation/management-plans</p>	

Ports and infrastructure provision, fabrication	
	Work package research
	<p>Ports and infrastructure provision is significant and a key issue in developing OWE in Australia.</p> <p>While all the declared zones are relatively close to ports, most of these ports are already developed, such that expansion or redevelopment for OWE may be a challenge or constrained.</p> <p>The environmental impacts of such development are clearly important.</p> <p>The proposal to develop the Port of Hastings in Victoria raised concerns over impacts on coast areas (wetlands) that were subject to EPBC triggers, and a Commonwealth veto.</p>
Marine on site construction	
	Work package research
	<p>Marine site construction activities transport of materials and prefabricated components to sites and assembly at sites. Access to appropriate vessels for these operations is a key logistics challenge.</p> <p>Links to environmental factors eg underwater noise emerging as key issues.</p> <p>The site array and export cable as well as transmission grid connectivity are key factors. This links back to port capacity and capability, load capacities, port investment feasibility.</p>
Operation and maintenance	
	Work package research
	<p>Operation and maintenance are major elements in the lifecycle of OWE.</p> <p>O&M is a central element associated with supply chain and logistics management of any installation.</p>
Monitoring	
	Work package research
	<p>Monitoring is driven by first the external requirements under the OEI regime (and any state legislation) as part of the licensing process and compliance regime and second the operator's management systems.</p>
End of life decommission	
	Work package research
	<p>Project "End of Life" decommissioning is clearly established through the Australian regulatory regime under the OEI Act.</p> <p>Planning for decommissioning starts in the design phase of structures and reinforces the interdependencies of all elements in the value chain.</p>

Appendix 1: Project Work Plan 2024-25

Project Activities					
Activity Number	Start	Duration	End	WP	Activity
PA-00652	01/Aug/2023	14 month(s)	30/Sep/2024	1	Review of international best practice legal and policy frameworks to guide the OWE project Assessment and Approval Pathways in Australia
PA-00659	01/Jul/2024	14 month(s)	31/Aug/2025	2	Work will reflect on the results from previous 18 months research and decisions made from the work package review.
PA-00673	01/Jul/2024	14 month(s)	31/Aug/2025	4	Future development pathways (testing with industry partners and data from WPs 1, 2 and 3).
PA-00667	01/Aug/2024	14 month(s)	30/Sep/2025	3	Development of strategies for proposed supply chain system to support the Australian offshore wind industry.
PA-00660	01/Oct/2025	2 month(s)	30/Nov/2025	2	Integrating ethics and social acceptability with law, policy, and supply chain factors in the Australian offshore wind.
PA-00653	29/Aug/2025	2 month(s)	28/Oct/2025	1	Offshore Wind Energy Assessment and Approval Pathways Stakeholder workshop.
PA-00668	30/Sept/2025	3 month(s)	30/Dec/2025	all	Report and publication writing.
PA-00674	31/Oct/2025	2 month(s)	30/Dec/2025	all	Wrap up and project finalisation. Project evaluation.

Project Milestones 2024-2025			
MILE-00560	30/Dec/2024	University of Tasmania	Synthesis to date. Assessment of development pathways.
MILE-00554	30/Jun/2025	The University of Queensland	Offshore wind assessment and approval pathways.
MILE-00555	30/Sep/2025	Griffith University	Integrity system for offshore wind operations.
MILE-00556	30/Sep/2025	University of Tasmania	Supply chain strategies.
MILE-00557	30/Sep/2025	University of Tasmania	Future Development Pathways.
MILE-00558	30/Dec/2025	University of Tasmania	Project completion and final reporting.



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