ENERGY INSIGHTS

OFFSHORE ELECTRICITY INFRASTRUCTURE

An initial analysis of gaps and barriers in the National Electricity Rules

CRP0162: FINAL REPORT

AEMC

Australian Energy Market Commission

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About the AEMC

The AEMC reports to the energy ministers. We have two functions. We make and amend the national electricity, gas and energy retail rules and conduct independent reviews for the energy ministers.

Acknowledgement of Country

The AEMC acknowledges and shows respect for the traditional custodians of the many different lands across Australia on which we all live and work. We pay respect to all Elders past and present and the continuing connection of Aboriginal and Torres Strait Islander peoples to Country. The AEMC office is located on the land traditionally owned by the Gadigal people of the Eora nation.

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1 Introduction

Offshore electricity infrastructure is well established globally and presents an opportunity for Australia

Offshore electricity Infrastructure (OEI) is a suite of technologies and approaches to energy generation and transmission located on water, rather than on land. Offshore Wind Energy (OffW) is an OEI technology that involves an array of multiple wind turbines, located on offshore platforms to capture wind energy and convert it to electrical energy. This energy is then transmitted via subsea transmission cables and connected to onshore infrastructure.

OEI a well-developed and established industry globally. Around 75 GW of global offshore wind capacity was in operation at the end of 2023, with the bulk of that capacity installed in Europe and China. Annual offshore wind installations are expected to triple in 2028, from 10.8 GW in 2023. By 2033, they are expected to reach 66 GW, bringing the offshore share of new wind power installations from today's 9% to at least 25%.[1]

In Australia, OEI is an emerging opportunity and momentum for OEI is building. The Commonwealth Government has contemplated the roll out of OEI in Australia under the *Offshore Electricity Infrastructure Act 2021 (Cth)* (the OEI Act) and related policy changes.[2] The Victorian Government sees offshore wind energy as a key pillar in their renewable energy transition, legislating targets for at least 2 GW of offshore generation capacity by 2032, and then 4 GW by 2035, and 9 GW by 2040.[3]

There are gaps and barriers in the NER that would need to be addressed to enable OEI

Much of the regulatory dialogue to date surrounding offshore wind developments has focused on the licensing framework established under the OEI Act and associated regulations, which outlines how and where OEI can be installed and operate. There has not yet been any detailed consideration of the suitability of the regulatory framework set out in the National Electricity Law (NEL) and National Electricity Rules (NER), covering such areas as transmission connection and planning arrangements, power system security, and network economic regulation.

OEI and OffW share many similarities with onshore developments, but there are some differences that merit examination to either confirm the suitability of existing arrangements under the NER, or to identify regulatory gaps that should be filled to adequately support OEI and OffW development and operation in Australia.

Our early and targeted stakeholder consultation revealed concerns about the adequacy of the NER to support the development and operation of OEI. Stakeholders said there is a lack of clarity relating to how transmission planning and network connections (e.g., location of connection points) or power system security considerations (e.g., application of generator technical performance standards) will apply to OEI or OffW. Key themes from our initial consultation are outlined in section 4 of this report.

1 Global Wind Energy Council, Global Offshore Wind Report 2024, p.12, pp.125-126

2 The OEI Act and associated regulations outline how and where infrastructure projects for renewable energy generation or transmission can operate, including the declaration of suitable areas and licensing arrangements. The Commonwealth Minister for Climate Change and Energy has declared five areas off the coast of Australia as suitable for offshore wind. These are Gippsland (VIC), Hunter (NSW), Southern Ocean (VIC), Illawarra (NSW), and Indian Ocean off Bunbury (WA).

3 Victorian Government, https://www.energy.vic.gov.au/renewable-energy/offshore-wind-energy

The AEMC has assessed the extent to which the current NER framework can accommodate OEI. Our approach focused on harmonising onshore and offshore electricity regulatory arrangements in key areas. We adopted this approach because the regulatory arrangements under the NER are well understood by the market and extending the NER to include the regulation of OEI would provide for a consistent regulatory approach for onshore and offshore transmission and generation developments.

However, we also recognise that several jurisdictions have developed specific arrangements that work alongside the NER while also aiding the achievement of jurisdictional priorities.

The Commission considers that a harmonised national approach for regulating electricity infrastructure (whether onshore or offshore) is preferred, but we recognise that there will be circumstances where departures from the national framework may be warranted. We have considered this in the context of OEI where we have identified options for reform.

This paper outlines a high-level gap analysis of how the NER applies to OEI, informed by targeted stakeholder consultation. It identifies gaps and barriers in the NER to enabling OEI, and outlines potential next steps and opportunities for reform.

Contents of this paper

This paper explores three focus areas within the AEMC's remit for electricity regulation, which were chosen based on our initial stakeholder engagement. They comprise:

1. Network Connection and Planning
2. Power System Security
3. Network Economic Regulation.

For each of these focus areas, the paper summarises a gap analysis of the application of the NER to OEI and OffW. This gap analysis was conducted on the basis that current NER arrangements should be applied to OEI and OffW, unless a gap or barrier in the current NER arrangements meant that they could not apply effectively. In the case of such a gap or barrier, we have identified options for how these barriers and gaps could be addressed.

In addition, this paper contains the summary of a mapping exercise into two additional themes raised by stakeholders that are not directly within the AEMC's electricity regulation remit. They are:

4. Regulatory responsibilities and coordination. This section includes a high-level regulatory responsibility map.
5. Stakeholder engagement requirements. This section includes a map of stakeholder engagement requirements across the OffW project lifecycle.

Next steps

This paper represents a preliminary step in the AEMC's consideration of how to approach the regulation of OEI and OffW. It is not intended to replace, or otherwise limit, any other reform processes.

The AEMC is aware that the Commonwealth and various State governments are engaged in other related processes.[4] [5] The regulation of OEI and OffW may also be affected by current AEMC led reform processes.[6]

4 Engage Victoria (2024), 'Developing the first Victorian Transmission Plan', https://engage.vic.gov.au/victransmissionplan.

5 EnergyCo (2024), 'Access Schemes', https://www.energyco.nsw.gov.au/industry/access-schemes

6 See, for example, upcoming rule change requests on access standards submitted from AEMO

The AEMC will leverage insights from these related reforms and processes to inform any future regulatory changes to the NER to enable OEI.

The contents of this paper, and the feedback from targeted consultation run in relation to this paper, may help to inform and support future AEMC processes, including any future relevant rule changes that may be submitted to the AEMC.

We note that any future work on designing an appropriate regulatory regime for OEI would need to be subject to broader and more comprehensive consultation, including with industry given the potential for NER changes to impact on OffW projects that may be proposed by licence holders and the potential consequences for their design and output.

About the AEMC

The AEMC is the independent statutory body responsible for setting the rules that govern Australia's energy markets. The AEMC administers the NER which govern how market participants can operate in electricity generation, transmission, distribution, and retail in the National Electricity Market (NEM).

In administering the NER, the AEMC is guided by the national energy objectives which have, as their focus, the promotion of the long-term interests of consumers. To deliver on these objectives the AEMC looks beyond the challenges of today to consider where the sector is moving to so that we can deliver the right outcomes for consumers. This report is a self-initiated non-statutory internal review to help us understand the regulatory challenges associated with integrating offshore wind into the NEM.

2 Summary of regulatory gaps and barriers

The AEMC has identified regulatory gaps and barriers to enabling OEI

OEI and OffW is an emerging opportunity in Australia. Government and industry interest is high and growing. This AEMC project explores three focus areas within the AEMC's remit, shown below.

1. Network Connection and Planning
2. Power System Security
3. Network Economic Regulation.

Stakeholder consultations and the initial regulatory stock-take has identified nine key issues across the three focus areas. Our initial findings are discussed in this report and summarised in Figure 2.1.

Figure 2.1: Summary of OEI regulatory gaps and barriers

FOCUS AREAS	KEY ISSUES		ISSUE TYPE	POTENTIAL NEXT STEPS
Section 5 Network connection and planning	**Issue 1:** Clarify key NER definitions and roles	**1.1:** The appropriate NEM region and regional reference node for OffW is unclear	OEI Gap	Define new NEM regions or extend existing NEM regions
		1.2: The Jurisdictional Planning Body (JPB) and primary transmission network service provider (TNSP) is unclear in offshore waters	OEI Gap	Clarify or appoint the relevant transmission planner
	Issue 2: Clarify planning and coordination arrangements for OEI	**2.1:** The Australian Energy Market Operator's (AEMO's) role in planning OEI and considering OEI in the Integrated System Plan (ISP) is unclear	OEI Gap	Clarify AEMO's planning role in offshore waters
		2.2: Various planners and regimes could be coordinated to optimise OEI planning	Onshore challenge and OEI gap	Engage planners and refine remits to enable strategic and coordinated infrastructure planning
	Issue 3: Consider support for anticipatory investment	National frameworks may not drive timely, anticipatory investment in OEI	Onshore challenge and OEI gap	Consider enabling State-based regimes to support jurisdictional priorities for faster rollout of OEI
	Issue 4: Access rights may be needed to incentivise OffW developments	**4.1:** Stakeholders seek clarity on the applicable access regime for OEI and how multiple regimes may interact across jurisdictional boundaries	Onshore challenge and OEI gap	Engage jurisdictions to determine the appropriate access regime for OEI and communicate this to stakeholders
		4.2: The open-access regime may not be appropriate to manage investment risk in OEI	Optimise opportunity	Consider the suitability of a special access regime for OEI
	Issue 5: Revise technical OEI considerations related to the connection process	**5.1:** OEI technical requirements should be reflected in connection standards and processes to the extent they are not already	OEI Gap	Undertake engineering review of existing technical standards and their appropriateness for OEI technologies
		5.2: Current connection processes and standards could be better optimised to support connection hubs	Optimise opportunity	Consider aggregate connection processes and performance standards at connection hubs

Figure 2.1 (continued)

FOCUS AREAS	KEY ISSUES		ISSUE TYPE	POTENTIAL NEXT STEPS
Section 6 Power system security	**Issue 6:** Consider optimising generator requirements	**6.1:** Existing system security and performance settings may require adjustments to enable new OffW technologies and network configuration	**Potential OEI gap**	Conduct technical review of performance requirements and technical standards for OEI context
	Issue 7: Revise system-level security settings to better support OEI	**7.1:** The relevant system security nodes are unclear in an offshore context	**Potential OEI gap**	Clarify Commonwealth waters will use the relevant onshore system security node or define a new node
		7.2: Without appropriate planning criteria, OffW may lead to a significant increase in the size of the largest credible contingency	**Potential OEI gap**	Review transmission planning criteria to optimise OffW connection cost and system security impact, congestion, and Frequency Control Ancillary Services
		7.3: OffW may attract high costs or curtailment to address system security impacts	**Optimise opportunity**	Consider whether special arrangements for OffW generation and system security costs are appropriate
Section 7 Network economic regulation	**Issue 8:** Clarify regulatory boundaries for OffW activities	**8.1:** Stakeholders are uncertain as to which regulators oversee which activities and which regulatory frameworks apply	**OEI gap**	Regulatory roles in Commonwealth waters and at jurisdictional interfaces should be clarified
		8.2: Stakeholders are seeking clarity as to which economic regulation regimes may be applied to OEI	**OEI gap**	Communicate the general principle of harmonising onshore and offshore regulatory arrangements
	Issue 9: Clarify the regulatory settings to apply to OEI	Adopting onshore settings may not optimise National Electricity Objectives (NEO) due to OEI's specific characteristics	**Optimise opportunity**	Consider future regime optimisation commensurate to OffW industry certainty and scale

We broadly mapped the regulatory and stakeholder engagement landscapes

Stakeholders raised two additional themes which have significant effects on the OEI industry.

1. **Regulatory responsibilities and coordination.** OEI projects are subject to environmental, cultural heritage, tenure and native title regulation at both the State and Commonwealth levels. These regulatory schemes vary between jurisdictions. State and Territory laws apply to 3 nautical miles (M) from shore, with Commonwealth laws applying thereafter. This creates complexity for both proponents, and regulators, in determining how best to manage the approval and roll out of OEI projects.
2. **Stakeholder engagement requirements.** OEI projects are also subject to extensive stakeholder engagement requirements – in addition to stakeholder engagement which is expected, if not specifically regulated. Government and proponents each seek to engage with stakeholders affected by large projects such as those required for OEI. These engagements occur repeatedly over a protracted period of time. This can create a significant burden on stakeholders.

Both of these coordination and overlap challenges sit beyond the remit of the AEMC. However, we have progressed high-level mapping work to highlight potential gaps and opportunities for the sector to respond to these themes to the benefit of the OEI industry, and the energy sector more broadly.

3 Offshore electricity infrastructure context

OffW represents a new approach to electricity generation in Australia. All previous commercial renewable generation initiatives in Australia have been developed onshore. Ensuring that OffW energy generation can be effectively regulated is of critical importance to OffW proponents, and to energy consumers in Australia.

The following section of this report highlights some of the key background elements relevant to OffW and OEI that must be considered as part of its regulation. This section also sets out guidance on the current regulatory framework that applies to onshore projects – and to aspects of OEI – to provide a baseline for subsequent sections.

3.1 Background to offshore wind energy generation

OEI and OffW are an alternative model to onshore renewable energy generation. The technology and value chain of OEI – and in particular OffW – has rapidly expanded internationally due to significant technological advances, positioning it as a key option for many countries to meet net zero targets. The offshore renewable industry is well established in Europe, the United States and China, and is growing around the world. Total global offshore capacity is expected to reach 486 gigawatts (GW) by the end of 2033.[7]

In Australia, OEI and OffW will require government support in the near term. Government ambitions for net-zero by 2050 also require significant changes to Australia's energy mix, which can be supported by OEI and OffW projects. OEI and OffW provide opportunities for zero emission generation with a range of unique characteristics. Additionally, OEI and OffW improves energy reliability by enhancing the diversity of renewable generation sources.

Offshore wind generation requires other investments in OEI

Offshore wind projects typically incorporate the following features:

- An array of multiple wind turbines, located on offshore pylons, to capture wind energy and convert it to electrical energy.
- Collector stations, located on offshore platforms, to aggregate power generated by each turbine.
- Electrical sub-stations, located on offshore platforms, to collate power from a number of collector stations and transform it into electrical energy that can be fed into, and used by, the onshore grid.
- Power cabling – often on the sea floor – connecting each of these turbines and stations to each other, and connecting the electrical sub-stations to the on-shore grid.
- Crossing points onshore where offshore cables are run up to the land and connected to on-shore infrastructure.
- Transmission infrastructure to take electrical energy from the crossing points and ensure it can be connected to the wider onshore grid.

Each of these features requires a range of work to design, build, operate and maintain. Supporting onshore infrastructure includes suitable factories and port infrastructure. The servicing of OffW infrastructure requires specialised ships, equipment and skilled personnel. The viability of these projects is therefore dependent on shaping and incentivising an appropriate OffW industry.

7 Global Wind Energy Council, Global Offshore Wind Report 2024, p.125.

In addition, many aspects of OffW projects, and the OEI that supports them, are subject to regulation. This includes regulation of physical infrastructure by organisations like National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA). It also includes regulation of the electricity generated by the OffW projects, and how and when it may be transmitted to the onshore grid. Getting the regulatory settings right for OffW is also critical for the viability of OffW projects and the OffW industry that will support them.

Government and industry are interested in exploring offshore wind projects in Australia

Offshore wind energy is a generation technology which can diversify Australia's energy mix. The transition from coal-fired power to renewable sources highlights offshore wind's potential role in meeting Australia's greenhouse gas commitments by 2050. However, it is still an emerging industry in Australia with no operating offshore wind projects yet. Progress has been made with declared offshore areas, and feasibility licences being granted to offshore wind proponents in Gippsland, Victoria.

Offshore wind may be an important technology to deliver net zero targets. The Commonwealth Government is aiming for a 43% reduction from 2005 levels by 2030, and net zero by 2050.[8] This target is supported by a Commonwealth Government investment of $24.9 billion over this decade,[9] aimed to deliver energy transition priorities through policies, enabling regulatory frameworks and initiatives.

Similarly, state governments have set their own net zero targets. In addition to net zero targets, the Victorian Government has set a target to achieve 9GW of offshore wind by 2040, with at least 2GW by 2032.[10]

To facilitate offshore wind in Australia, the Commonwealth Government has declared five offshore wind areas consisting of an area of 15,000km2 off Gippsland in Eastern Victoria, an area of 1,854km2 off the Hunter Region in New South Wales, an area of 1,030km2 offshore from Warrnambool and Port Fairy in Western Victoria, an area of 1,022km2 offshore from Wombarra to Kiama in the Pacific Ocean off the Illawarra, and an area of 3,995km2 located off the coast of Bunbury in Western Australia between Dawesville and Cape Naturaliste.[11]

There is significant interest from the global offshore wind industry in the Victorian offshore wind market. The Commonwealth Government received 37 applications for feasibility licences in the Gippsland offshore wind zone.[12] Many applicants have decades of experience in developing, constructing, and operating offshore wind projects in overseas markets. As at July 2024, the Commonwealth Government has granted feasibility licences for 12 projects for the Gippsland declared offshore wind area.[13]

OEI and OffW shares similarities with onshore wind developments, with some key differences

OffW developments share many characteristics with onshore developments as a source of renewable energy. There are also similarities between offshore transmission and onshore transmission. However, there are some key differences between OEI projects and onshore developments (in the Australian context). These are set out in Table 3.1.

8 DCCEEW, https://www.dcceew.gov.au/climate-change/emissions-reduction/net-zero

9 DCCEEW, (2023), 'Reducing emissions and addressing climate change', https://www.dcceew.gov.au/sites/default/files/documents/oct-budget-2022-23-climate-change-fs.pdf

10 Victorian Government, https://www.energy.vic.gov.au/renewable-energy/offshore-wind-energy

11 As at 1 July 2024, https://www.dcceew.gov.au/energy/renewable/offshore-wind/areas

12 DCCEEW, (2024), 'Gippsland, Victoria declared offshore wind area', https://www.dcceew.gov.au/energy/renewable/offshore-wind/areas/gippsland

13 Ibid

To assess whether the current NER framework can accommodate OEI, this project has focussed on the characteristics of OEI that are different and specific to offshore infrastructure (relative to onshore) that may require, or warrant, revised NER settings. The scope of this project is contained to NER matters, however the table below identifies more broadly the key OEI characteristics used to inform the NER gap analyses.

Table 3.1: Key differences between offshore and onshore wind & transmission in Australia

Specific characteristics	Category	Onshore context	Offshore context
Project Scale	Asset scale (GW)	In 2023, large-scale renewable **average project size was 130MW** (n=22). The Central-West Orana Renewable Energy Zone (CWO REZ) intends to initially unlock at least **4.5GW of new network capacity** by the mid-2020s.[14]	**12 prospective projects** in Victoria's Gippsland region (average of ~**2GW** per project), which, if all developed, would total a potential power generation of **25GW**.[15]
	Investment scale ($)	Onshore renewable projects are **relatively smaller and cheaper** (Levelised Cost of Energy (LCOE) ~$60-80/MWh) and lower comparative weighted average cost of capital (WACC) to higher-risk offshore wind projects.	Offshore developments are **currently larger and more expensive** (LCOE ~$170/MWh, fixed foundation), at expected higher WACCs. Early projects are expected to be heavily reliant on Government support.
Operations and technology	Supply chain requirements	**Mature** supply chains.	**Immature** supply chains and **relatively unique needs.** E.g., Port upgrades, specialist vessels, specialist skillsets and labour.
	New technologies	Onshore wind generation and transmission technologies is **well-understood and widely deployed**.	Requires a **variety of new-to-Australia and expensive technologies** (e.g., offshore converter stations) which can challenge the development of redundant capacity.
	Planning and environmental considerations	Onshore renewables projects face many planning challenges and considerations: social licence, environmental and biodiversity considerations.	**Many of the same issues, *as well as*** highly sensitive coastal areas, unique visual amenity impacts and marine environment considerations.

Specific characteristics	Category	Onshore context	Offshore context
Regulatory considerations	Multiple jurisdictions	Onshore assets **generally sit within a single jurisdiction** – interconnectors the key exception.	Assets will necessarily **span multiple jurisdictional boundaries** e.g., Commonwealth waters, State waters, State land.
	Industry maturity	Mature and well developed, **26GW deployed**.	Emerging, **0GW deployed** (no projects in Australia).

Source: *Clean Energy Council (CEC); Commonwealth Scientific and Industrial Research Organisation (CSIRO) GenCost; Project developer publications; AEMO IASR; AEMC analysis*

Note: [14] [15]

3.2 Overview of current regulations and regulatory frameworks relevant to offshore electricity infrastructure

The operation of the electricity system and market in Australia is subject to significant regulatory oversight. There are national frameworks which focus on whole-of-system regulation. These frameworks have been developed with a focus on onshore electricity infrastructure and markets.

While some national laws, particularly for offshore infrastructure, have been developed with OffW and OEI in mind, the OEI Act is the only regulatory framework specifically designed for OEI. Many features of the NER could apply to OEI but they were not designed specifically for it. Additionally, jurisdictional-specific frameworks exist where individual jurisdictions have shaped how national energy regulation applies in their specific context (although these were not specifically developed for OEI either).

Existing national and state frameworks with relevance to OEI are summarised below.

3.2.1 National frameworks

National management of electricity transmission, generation and markets

The NEL and NER govern the operation of the NEM. Changes to the NER are made by the AEMC or Ministers. The NER has three chapters that are of particular relevance to this issues report:[16]

- Chapter 4 – Power System Security: Provides regulatory framework to achieve and maintain a secure power system. It outlines obligations and responsibilities of relevant parties (e.g., AEMO, Transmission network service providers (TNSPs) and generators).
- Chapter 5 – Network Connection Access, Planning and Expansion: This chapter relates to the planning of transmission and distribution networks and the connection of generation, large load and battery assets.
- Chapter 6A – Network Economic Regulation of Transmission Services: Details the classification and network economic regulation of transmission services.

These chapters have been tailored and developed based on the onshore context. In this report, we will explore how they apply offshore.

14 EnergyCo, 'Central-West Orana Renewable Energy Zone', https://www.energyco.nsw.gov.au/cwo-rez.

15 DCCEEW, (2024), 'Gippsland, Victoria declared offshore wind area', https://www.dcceew.gov.au/energy/renewable/offshore-wind/areas/gippsland

16 AEMC, Chapter Summaries, https://www.aemc.gov.au/regulation/energy-rules/national-electricity-rules/chapter-summaries#chapter5

Management of Offshore Electricity Infrastructure

The OEI Act and the *Offshore Electricity Infrastructure Regulations 2022 (Cth)* (the OEI Regulations) establish a licensing framework for OEI. These licences permit holders to construct, install, commission, operate, maintain, decommission, and assess the feasibility of, offshore renewable energy infrastructure (including offshore wind and offshore transmission infrastructure) in certain areas of Commonwealth waters.

3.2.2 State frameworks

States have also designed their own regimes supplementing and modifying the NER to optimise the development of renewable and/or offshore infrastructure in their respective regions. Examples from NSW and Victoria are provided as 'case study' examples below. Approaches and frameworks vary from jurisdiction to jurisdiction. However, as Victoria and NSW have declared offshore wind areas, they have been selected.

Approach taken in Victoria

The *National Electricity (Victoria) Act 2005 (Vic)* (NEVA) applies the NEL in Victoria. Part 3 specifies the parts of the NEL or NER that will not be applied in Victoria and where other arrangements may be adopted instead.[17]

For example, Section 16Y of the NEVA enables the Victorian Minister for Energy to make Orders which override the NER transmission planning process to fast-track augmentations to the shared transmission network in Victoria.

In addition, the Victorian Government has recently passed the Energy and Public Land Legislation Amendment (Enabling Offshore Wind Energy) Bill 2024. These amendments create a new category of licenses for OffW transmission, update definitions and clarify acts to better facilitate OffW establishment.[18]

Approach taken in NSW

In 2020, the NSW Government introduced the *Electricity Infrastructure Investment Act 2020 (NSW)* (EII Act). This Act aims to co-ordinate investment in new generation, storage and network infrastructure in NSW. It gives effect to NSW's Electricity Infrastructure Roadmap, which outlines the policy framework for investment in transmission and generator in NSW.[19]

This Act also authorises the NSW Minister for Energy to direct a network operator to carry out a network infrastructure project to connect a Renewable Energy Zone (REZ) declared under the EII Act.

17 Victorian Legislation, (2022), National Electricity (Victoria) Act 2005, https://content.legislation.vic.gov.au/sites/default/files/2022-05/05-8aa033%20authorised.pdf.

18 Victorian Legislation, (2024), Energy and Public Land Legislation Amendment (Enabling Offshore Wind Energy) Bill 2024, https://content.legislation.vic.gov.au/sites/default/files/bills/601109exi1.pdf.

19 NSW Government, (2020), Electricity Infrastructure Investment Act 2020, https://legislation.nsw.gov.au/view/html/inforce/current/act-2020-044.

4 Key challenges and opportunities for regulating offshore electricity infrastructure

The AEMC conducted an initial round of stakeholder consultations to assist in identifying key issues for OEI regulation and to refine the focus areas for this project. Stakeholders identified a broad range of issues relevant to OEI, including issues within and beyond the AEMC's remit. A summary of the key consultation themes is included in Figure 4.1 below.

Figure 4.1: Summary of themes from initial stakeholder engagement

FOCUS AREAS	KEY THEMES RAISED BY STAKEHOLDERS IN INITIAL CONSULTATIONS
Network connection and planning	• Ability of current regime to best support coordinated transmission and generation planning and investment, or anticipatory investment in general • Lack of clarity of access right regime(s) for OEI – and how they interface with REZ regimes
Power system security	• Size of OffW can drive a risk of large contingency events and may require system-level mitigation and management responses • Limited clarity regarding power system security requirements for offshore generators (i.e., the current Generator Performance Standards (GPS) may not appropriately account for OffW infrastructure scale and the technologies)
Network economic regulation	• Limited clarity regarding the shared network and connection asset boundaries for OffW developments • Limited guidance on requirements, and limited clarity, for OffW transmission development, delivery, operation; and risk and cost allocations
Coordination and consistency	• Limited harmonisation between State and Commonwealth regulatory frameworks, policies and regulatory approaches which may lead to unclear onshore/ offshore regulatory boundaries • Limited clarity on who and how to manage strategic decisions effectively (e.g. trade-offs between: system security, environment, community support, cost …)
Engagement, social licence	• Current community engagement could be improved. There is a need for timely and transparent engagement, with clear purpose and information. • A First Nations organisation representative indicated that they seek improved communication, cultural consideration in planning, and more meaningful participation in decision-making processes for OffW and related activities
Supply chain	• Limited coordination for investment, development and funding of OffW enabling infrastructure (e.g. ports) • OffW is uniquely exposed to thin supply markets (e.g. vessels, cabling, workforce) • Opportunity for job creation, reskilling and new industries
Environment and biodiversity	• Limited clarity in Commonwealth and State environmental requirements and how different frameworks interact • Additional planning and/or coordination may be required to mitigate and manage a broad suite of potential impacts (e.g. shore-crossings)
Commercial viability	• The first tranche of OffW projects will likely require government support for economic viability – this will need to be integrated with other processes • Additional regulatory clarify/certainty is needed by Victoria's 2026 auction to de-risk bids

Informed by the stakeholder engagement, the Commission proposes to focus on key issues within five focus areas, covered in the following sections:

- Section 5: Network planning and connection process
- Section 6: Power System Security
- Section 7: Network Economic regulation
- Section 8: Additional stakeholder-identified themes
  - Section 8.1: OEI regulatory frameworks (beyond the NER) map
  - Section 8.2: OEI stakeholder engagement mapping

5 Network planning and connection process

This section explores potential issues that arise when the current network planning and connection settings are applied to OEI. Specifically, this section investigates how well the transmission planning regime would work for offshore transmission as this asset will span multiple jurisdictions and is not typically developed in Australia (Basslink and Marinus link are the only two Australian offshore transmission projects to date). The connection process, and related access rights and performance standards for OEI are also explored in this section.

This section identifies and explores five key issues for network planning and connection process for OEI, summarised in Figure 5.1 below.

Figure 5.1: Network planning and connection process chapter summary

FOCUS AREAS	KEY ISSUES		ISSUE TYPE	POTENTIAL NEXT STEPS
Section 5 Network connection and planning	**Issue 1:** Clarify key NER definitions and roles	**1.1:** The appropriate NEM region and regional reference node for OffW is unclear	OEI Gap	Define new NEM regions or extend existing NEM regions
		1.2: The JPB (and Primary TNSP) is unclear in offshore waters	OEI Gap	Clarify or appoint the relevant transmission planner
	Issue 2: Clarify planning and coordination arrangements for OEI	**2.1:** AEMO role in planning OEI and considering OEI in the ISP is unclear	OEI Gap	Clarify AEMO's planning role in offshore waters
		2.2: Various planners and regimes could be coordinated to optimise OEI planning	Onshore challenge and OEI gap	Engage planners and refine remits to enable strategic and coordinated infrastructure planning
	Issue 3: Consider support for anticipatory investment	National frameworks may not drive timely, anticipatory investment in OEI	Onshore challenge and OEI gap	Consider enabling State-based regimes to support jurisdictional priorities for faster rollout of OEI
	Issue 4: Access rights may be needed to incentivise OffW developments	**4.1:** Stakeholders seek clarity on the applicable access regime for OEI and how multiple regimes may interact across jurisdictional boundaries	Onshore challenge and OEI gap	Engage jurisdictions to determine the appropriate access regime for OEI and communicate this to stakeholders
		4.2: The open-access regime may not be appropriate to manage investment risk in OEI	Optimise opportunity	Consider the suitability of a special access regime for OEI
	Issue 5: Revise technical OEI considerations related to the connection process	**5.1:** OEI technical requirements should be reflected in connection standards and processes to the extent they are not already	OEI Gap	Undertake engineering review of existing technical standards and their appropriateness for OEI technologies
		5.2: Current connection processes and standards could be better optimised to support connection hubs	Optimise opportunity	Consider aggregate connection processes and performance standards at connection hubs

5.1 OEI specific considerations

OEI's connection and planning should account for its scale, multi-jurisdictional nature, and environmental and social impacts. There are several unique considerations for OEI when compared to its onshore infrastructure, these considerations are outlined in Table 5.1.

Table 5.1: OEI specific network connection and planning considerations

OEI considerations		Description
Interface and coordination of multiple transmission planning regimes	Multiple jurisdictions	Transmission assets will be built across multiple jurisdictions: State land, State waters and Commonwealth waters. The Commonwealth/State water boundary is unique and may give rise to interface challenges. Similarly, OEI transmission may be planned by as many as three different planning bodies: National planning (AEMO), JPBs (e.g., TNSPs); and REZ planners (e.g., VicGrid, EnergyCo).
Coordinated and contingent supply chain development and investments	Industry maturity Supply chain requirements Investment scale ($) New technologies	The OEI supply chain is more complex than onshore and must be coordinated and developed in step with generation and transmission projects. There may need to be more investment in: • Ports access and upgrades • Skilled labour and specialist vessels • Local assembly and/or manufacturing capability • Sourcing new technologies and components.
Potentially very large-scale, greenfield asset development	Asset scale (GW) Investment scale ($) Industry maturity	Unlike onshore, offshore transmission has a 'blank slate' for transmission optimisation for the various OffW user groups, as no offshore transmission has been built to date – nor is there an existing offshore wind transmission regime. The scale of generation (and the capital investment) in OEI is generally higher than onshore, and more akin to large, concentrated REZs. There will be challenges integrating OEI into the onshore grid.
Managing complex environmental considerations and project trade-offs	Planning and environmental Supply chain requirements Multiple jurisdictions	Transmission planning will need to optimise across same categories as onshore, however there are specific considerations for offshore within those categories. For example: • Coastal areas are highly environmentally sensitive. (e.g., shore-crossings, impact to dunes, marine and seabed). • Social licence considerations are also unique and complex for offshore wind assets.

Potential for concentrated 'connection hubs'	Asset scale (GW) Planning and environmental	State governments have signalled their intent to coordinate OffW connections into concentrated connection hubs to minimise onshore transmission footprint and environmental impact. There are some similarities with onshore REZs, however offshore wind zones will see much higher capacity concentrated in few points in the network.
Long distance between generation and shared network	Planning and environmental	The distance of the offshore generator to the shared network is generally longer than that of new onshore generators.

5.2 How existing arrangements might apply to OEI

Transmission planning: There are several onshore planning and development regimes that may apply to OEI; however, there are some issues that would need to be addressed

Table 5.2 outlines the various planning and development regimes and when they may be applied to offshore transmission projects. Gaps are highlighted which are discussed in section 5.3.

Table 5.2: Transmission development regimes summary

Asset type	Regulatory regime	Description	How the regime might apply to offshore transmission
Generator asset	**Dedicated Connection Assets (DCA)**	Asset may be designed, constructed, owned, operated and maintained by the connecting party. Primary TNSP is responsible for assessing connections to the shared network.	The DCA framework would apply to OEI developments with a route length of less than 30km, unless the asset owner opts to treat it as a designated network asset. The planning and connections framework under the NER does not apply in jurisdictions where AEMO is authorised to exercise its declared network functions. Currently, this is only Victoria.
Shared network asset	**Designated network asset (DNA)**	Asset may be designed, constructed and owned by the connecting party. Other proponents may connect to this asset (via special third-party access regimes determined by the asset owner). Primary TNSP is responsible for operating and maintaining the asset.	The DNA framework would apply to OEI developments when: • Proposed transmission is a radial asset, separable from the shared network; and • The transmission connection asset has a route length of 30km or more; or the framework is voluntarily opted into (for assets less than 30km). As mentioned above, the planning and connections framework under the NER does not apply in Victoria.

Asset type	Regulatory regime	Description	How the regime might apply to offshore transmission
Shared network asset	**Shared network**	Asset planned and owned by central entity (e.g. Primary TNSP). Other generators may connect via the NER's open access regime.	AEMO identifies offshore shared transmission as an actionable or future ISP project. For shared networks • AEMO develops Optimal Development Path • Jurisdictional planners identify projects • Project goes through Regulatory Investment Test for Transmission (RIT-T) process. OEI projects may not satisfy the NER's investment tests as high development costs may reduce net market benefits relative to other onshore projects. The open access regime may also disincentivise OffW developers as the risks of curtailment reduce investment certainty.
	Funded augmentation	Proponent funds augmentation to the existing shared transmission network. Other generators may connect via the NER's open access regime.	This will apply when the proponent identifies and funds shared transmission extension. This will be delivered by the Primary TNSP. OffW developers are unlikely to fund augmentation to the shared network given the open access regime does not guarantee their access to the network.
Example Alternate Jurisdiction approaches[20]	**NSW REZs: Electricity Infrastructure Roadmap Framework** **VIC REZs: Victorian Transmission Investment Framework** **Tasmania REZs: Draft Energy Coordination and Planning Amendment REZ Bill**	NSW and VIC regimes were developed as departures from the NER and apply within declared Renewable Energy Zones (REZ). Each REZ model has unique transmission planning and procurement frameworks to deliver new transmission within the declared zones.	It is not clear whether existing REZ regimes would apply offshore under current legislative settings. This is because the enabling REZ legislation is limited to the State jurisdiction - for example, the NSW legislation provides for REZs to be declared in specified geographical areas of the State. However, we note section 248 of the OEI Act allows certain State or Territory laws to apply as laws of the Commonwealth in the included offshore area of that State or Territory as if that area were part of the Commonwealth. Whether this allows State-based schemes to apply in Commonwealth waters would need to be considered further.

Note: [20]

20 We have included NSW and VIC as they have offshore wind declared areas. Tasmania has consulted on a proposed legislative framework for an alternative planning approach for REZs. Other states also have alternate approaches.

Connection process: OEI's connection process could be similar to the onshore approach; however specific connection arrangements may encounter regulatory gaps and barriers

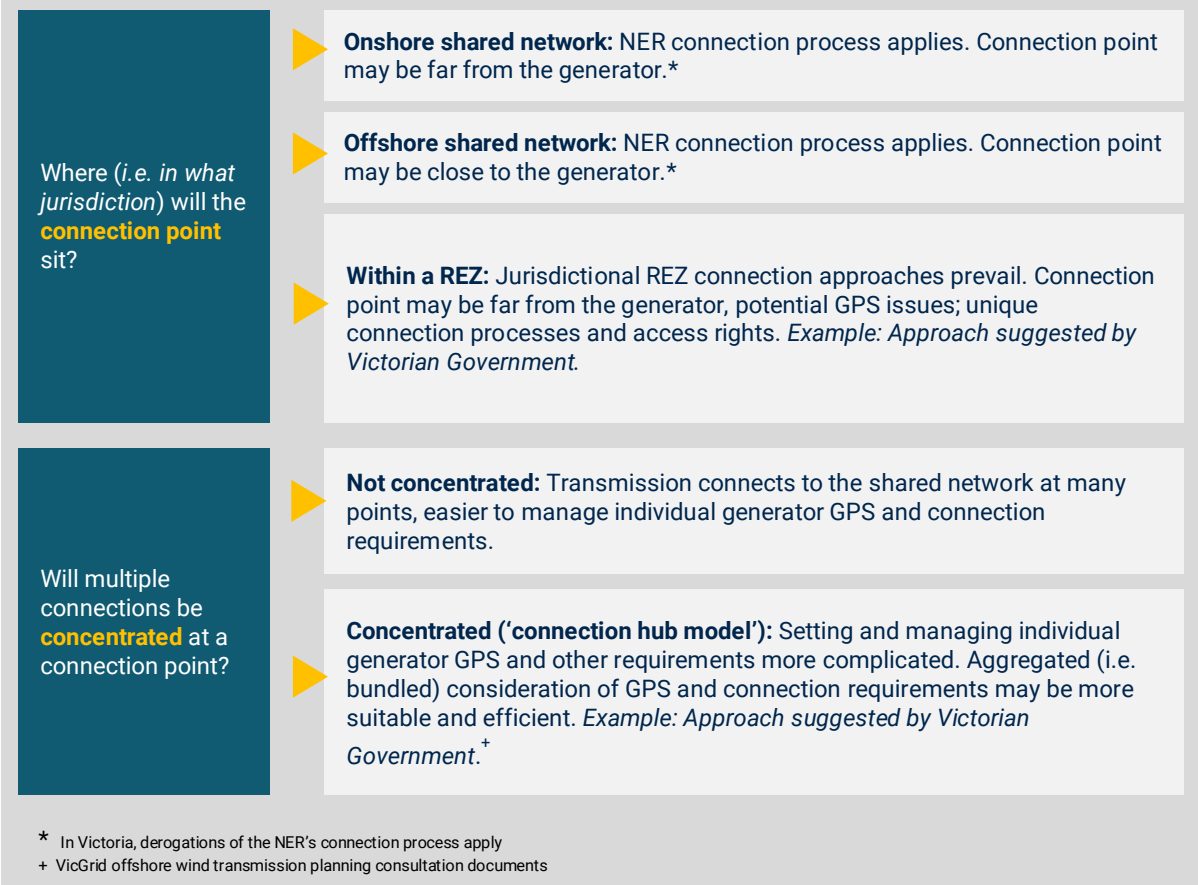
The connection process under the NER follows a four-stage process:

1. **Pre-feasibility:** Applicants consider the feasibility of project and begin discussions with the connecting network service provider (NSP), landowners and relevant government authorities.
2. **Enquiry:** The applicant submits a connection enquiry to the NSP. Enquiry determines suitable connection point and information required as part of application.
3. **Application:** Applicant submits application to connect to the NSP (application includes performance standard requirements).
4. **Completion:** This phase involves finalisation of market registration and commissioning of the facility, involving both AEMO and the NSP.

Jurisdictions may also have their own distinct connection processes, for example, REZ connection processes; and Victoria has a similar but unique process managed by AEMO.

Two key questions will inform the possible application of the NER connection process to OffW developments (see Figure 5.2 below). For each question, actions may be required to close regulatory gaps.

Figure 5.2: Potential offshore connection arrangements



5.3 Issue 1: Clarify key NER definitions and roles

OEI spans multiple jurisdictions. This contributes to uncertainty as to which State or Commonwealth entity is responsible for network connection and planning, and how the existing processes apply.

5.3.1 Define new NEM regions or extend existing NEM regions

Table 5.3: The appropriate NEM region and regional reference node for OffW is unclear (Issue 1.1)

Issue definition	OEI will be built in Commonwealth waters in the Commonwealth's jurisdiction. Stakeholders are seeking clarity around the implications of this for application of the NER and NEM regions.	**Specific OEI considerations** • Multiple jurisdictions
NER context: **Also an issue onshore?**	**No**	Not an issue onshore
Issue assessment	**OEI gap**	Should be clarified for stakeholders. The Commonwealth is a 'participating jurisdiction' and hence the NER and the NEL applies in Commonwealth waters (as defined under the NER, given effect by Australian Energy Market Act (AEMA) 2004). Similarly, as the NEL applies the rule making powers and functions of the AEMC also apply in the Commonwealth waters.[21] However, currently, the NER does not define any 'regions' in Commonwealth waters. If OffW generators were to connect into shared transmission built into Commonwealth waters it is unclear how the NER will apply in this geographic region. This raises questions around the associated reference price and Marginal Loss Factors (MLF), among other considerations in Commonwealth waters.
Next steps	Potential reform options include: • **Define a new region in Commonwealth waters:** Additional reforms and clarifications will then be needed (explored in other sections of this report). • **Extend relevant onshore region:** Alternatively, the onshore NEM region could be extended such that the generation and transmission is not considered as sitting within a new region, rather sitting within the associated onshore region (i.e. where the offshore wind connects to the onshore grid). To support this extended NEM region, Commonwealth and State Governments could work together to harmonise regimes to ensure they apply consistently throughout the extended region. Further analysis could consider bespoke region definitions, for example an OffW generation-only region (alike that which was contemplated – and abolished – for Snowy). We note that the establishing new NEM regions for Commonwealth waters would likely be a more challenging task compared to the expansion of existing regions. To maintain the national framework as much as possible, it may be more appropriate to expand the current NEM regions for the purposes of OEI infrastructure within those regions.	

Note: [21]

21 The AEMC's rule making power is set out in Part 4 of the NEL and includes the power to make rules regulating the operation of the NEM and the national electricity system (NEL s34). The Australian Energy Market Act 2004 (Cth) provides that the NEL applies as a law of the Commonwealth in the offshore area of each State and Territory (s6(1)). For this purpose, the reference to the NEL includes a reference to any Rules or other instruments made or having effect under that Law (s6(2). The effect of these provisions is that the AEMC's rule making powers and functions extend to the offshore areas and the NER apply in the offshore areas.

5.3.2 Clarify or appoint the relevant transmission planner

Table 5.4: The JPB (and Primary TNSP) is unclear in offshore waters (Issue 1.2)

Issue definition	The local NSP, Primary TNSP and JPB of onshore regions are clearly defined. However, it is unclear whether their remit extends offshore into State and Commonwealth waters. This issue is compounded by the jurisdictional interface when transmission spans both State and Commonwealth boundaries.		**Specific OEI considerations** • Multiple jurisdictions
NER context: **Also an issue onshore?**	**No**	Not an issue onshore	
Issue assessment	**OEI gap**	Should be clarified. There is no existing (or appointed) JPB/TNSP for Commonwealth waters.[22] The primary TNSP is defined as the operator of the largest transmission network in the jurisdiction. The JPB has transmission planning responsibility in the participating jurisdiction – this has not been assigned for the Commonwealth jurisdiction, nor is there any existing transmission. We note the uncertainty surrounding the application of State planning regimes into Commonwealth waters. Creating a new planning entity responsible for Commonwealth waters/jurisdiction may result in a planning tension at the offshore Commonwealth-State interface and creates a need for coordination of two planning regimes (and planning bodies). (further discussed in section 5.4.2). Identifying the Primary TNSP and/or JPB is also important because they have responsibility for appointing the relevant NSP. The NSP may be the primary TNSP or another TNSP itself depending on the contestability of the transmission assets. Defining the local NSP is important as the GPS require a tri-party negotiation between the NSP, AEMO and generator. If the relevant NSP is not clarified, these negotiations cannot occur.	
Next steps	Potential reform options include: • **If an extended onshore region is pursued, work with Governments to amend/clarify that relevant onshore JPB will plan related Commonwealth waters as well:** Under this option, the onshore TNSP/JPB will be responsible for planning transmission across the region including if it enters Commonwealth waters. This eliminates the planning friction at the jurisdiction boundary. The relevant Primary TNSPs and/or JPB will select the appropriate local NSPs. • **If a new region is pursued, engage Commonwealth Government and AEMO to appoint a JPB.** Introducing a new JPB for Commonwealth waters may complicate transmission planning as it will introduce a planning interface at three nautical miles off the coast, requiring additional coordination, alignment of planning regimes, procurement, project timing and interfaces risks. It may also place additional demand for skilled (technical) workers in an already competitive market (with demand from developers, consultants, and new jurisdictional planners).		

	Stakeholders have highlighted the value in treating contiguous onshore and offshore areas as one NEM region. For example, it would simplify planning arrangements by placing responsibility on the existing onshore JPB and mitigate risks associated with different JPBs and regimes.

Note: [22]

5.4 Issue 2: Clarify planning and coordination arrangements for OEI

OEI and OffW will not be built if onshore electricity transmission is not planned in step with industry and project development.

5.4.1 Clarify AEMO's national planning role in offshore waters

Table 5.5: AEMO's role in planning OEI and considering OEI in the ISP is unclear (Issue 2.1)

Issue definition	AEMO is currently the system planner and plans the NEM transmission system through the ISP. OEI sits at the boundaries of the existing network and stakeholders are seeking clarity as to whether AEMO will also be responsible for planning offshore transmission.		**Specific OEI considerations** • Multiple jurisdictions
NER context: **Also an issue onshore?**	**No**	Not an issue onshore	
Issue assessment	**OEI gap**	AEMO's role in planning and coordinating OEI should be clarified. Under the current arrangements, there is scope for AEMO to consider offshore transmission in their role as the national transmission planner for the NEM.[23] Further engagement with AEMO should be undertaken to determine if AEMO can/would pursue shared infrastructure planning offshore. It is also unclear as to which entity will be responsible for an actionable ISP project in Commonwealth waters, as there is no existing transmission system and TNSP (see section 5.3).	
Next steps	Potential reform options include: • **Engage AEMO to understand and clarify their role and where offshore transmission sits alongst their planning priorities.** • **Support AEMO to clarify the remit of the ISP.** • **Following above engagement, as required amend the NER with relevant clarifications.** If AEMO does not or cannot plan offshore transmission, the role of the JPB becomes more important (see section 5.4.2). Our initial stakeholder consultations suggest that there are limited benefits in creating new planning entities and frameworks for OEI. It would likely result in additional interface complexities while increasing demand for skilled (technical) workers in a tight market (with demand from developers, consultants, and new jurisdictional planners). We note that there may be circumstances where divergence from current arrangements may be warranted due to the specific characteristics of OEI, and this should be considered as part of any further work.		

Note: [23]

22 For Marinus Link, this issue was partly resolved through the creation of Marinus Link Pty Ltd (MLPL). MLPL is jointly owned by the Commonwealth, Tasmanian, and Victorian governments and is responsible for progressing the Marinus Link interconnector project.

23 AEMO is defined as the system planner of the NEM. Through the AEMA Act 2004, Commonwealth waters are defined as a jurisdiction of the NEM under the remit of the Commonwealth. Since, OffW generation and transmission assets are likely to be in Commonwealth waters, AEMO could therefore be the system planner for OEI.

5.4.2 Engage planners and refine remits to enable strategic and coordinated infrastructure planning

Table 5.6: Various planners and regimes could be coordinated to optimise OEI planning (Issue 2.2)

Issue definition	There are several REZ, State, and NER transmission planning regimes. It is unclear how these planning regimes will interact and integrate across State and Commonwealth jurisdictions, and how they will effectively optimise the planning and coordination of onshore and offshore generation and transmission, along with other supply chain investments (such as ports upgrades).[24]		**Specific OEI considerations** • Multiple jurisdictions • Asset scale • Investment scale • Supply chain • Planning and environmental
NER context: **Also an issue onshore?**	**Yes**	Coordinated planning and timely delivery of new renewable generation and transmission has been a challenge under the NER planning regime. To overcome this challenge, jurisdictions (NSW, VIC, and QLD) have introduced REZ regimes to undertake strategic place-based planning of electricity (and enabling) infrastructure. The interface between various planning regime frameworks also faces challenges onshore. For example, the CopperString transmission project in QLD seeks to establish a transmission line connecting the North West Queensland (NWQ) electricity supply system to the NEM. The NWQ electricity system is not currently part of the NEM. The planning for this transmission line was progressed via a private consortium: CuString. CuString led the economic access and negotiations with the Queensland Government to support the project, which is now being developed by Powerlink.	
Issue assessment	**Onshore challenge and OEI gap**	The planning challenges onshore may be magnified in an offshore setting as transmission spans across State and Commonwealth waters particularly if State planning regimes (such as REZ models) do not apply in Commonwealth waters. As a result, offshore transmission systems may be subject to multiple different planning regimes and the standards and priorities of multiple planners. We note section 248 of the OEI Act allows certain State or Territory laws to apply as laws of the Commonwealth in the included offshore area of that State or Territory as if that area were part of the Commonwealth. This could overcome the planning challenges associated with multiple jurisdictions although we would need to consider this further in the context of planning and coordinating OEI. There are broader challenges for coordinating the delivery of OEI that may require inter-departmental and inter-jurisdictional coordination (for example, coordinating supply chain investments, labour and workforce). These broader coordination challenges may warrant departures from the current planning approach in the NER to optimise OEI outcomes.	

Next steps	Potential reform options include: • **Engage relevant planners to understand how to manage regime interfaces:** Engage State Governments and JPBs to identify planning issues at jurisdictional boundaries and whether they can be resolved without NER amendments. • **Consider expanding remit of jurisdictional planners:** Engage Commonwealth and State Governments to understand interest and value in extending the onshore NER region and passing legislation to allow jurisdictional planning regimes (e.g., the Infrastructure Planner (EnergyCo) in NSW, or VicGrid in Victoria) to plan into Commonwealth waters. • **Optimise coordination and planning of transmission:** Collaborate with Commonwealth and State governments to refine existing regimes to accommodate for unique OEI considerations.

Note: [24]

5.5 Issue 3: Consider support for anticipatory investment

OffW relies on many anticipatory and major investments (generation assets, onshore transmission, offshore transmission, ports, etc); these are unlikely to occur unless there are mechanisms to facilitate and de-risk contingent investment decisions.

5.5.1 Consider enabling State-based regimes to support jurisdictional priorities for faster rollout of OEI

Table 5.7: National frameworks may not drive timely, anticipatory investment in OEI (Issue 3)

Issue definition	OEI, particularly OffW, will require significant and varied investments to establish the offshore wind industry. A single 2GW project can cost between $8 to $10 billion.[25] Investments in OffW come at a high cost and are contingent on other investments – creating significant stranded asset risks and deterrents to sector investments. Planning regimes are one way to mitigate these risks. However, the ability of the existing NER planning framework to deliver coordinated and anticipatory transmission and generation investments is a current focus of state based schemes in the NEM (see below and section 5.4.2).	**Specific OEI considerations** • Multiple jurisdictions • Supply chain • Investment scale
NER context: **Also an issue onshore?**	**Yes**	Timely, anticipatory investment in the planning and development of new transmission and generation is a challenge in onshore contexts as well. National transmission planning via the ISP helps to facilitate this. The existing regulatory approvals process requires a new transmission project to be fully committed before a TNSP can begin the RIT-T process. However, for a renewable project to reach financial close, its investors seek certainty in the availability of transmission to connect the asset to the network. The resulting 'just in time' transmission investment has previously delayed onshore renewable projects' financial close.

24 Unique considerations for network planning are detailed in Section 5.1.

		REZ models have emerged as a State-based response to the challenge of anticipatory and coordinated investments.[26] REZ models address these challenges through: • Strategic place-based infrastructure planning and coordination • Coordinating development of transmission and generation projects and providing incentives and rights (e.g., access rights and revenue support products) • Generally de-risking investments through clear investment signals, regional development, and community engagement activities. Additionally, other State legislation have been introduced to address these issues. For example, the Victorian Government's introduction of section 16Y of the NEVA Act.
Issue assessment	**Onshore challenge and OEI gap**	The timely delivery of anticipatory onshore transmission – notably extensions to the onshore connection point (if developed as shared network) – is also an issue for OEI. If this gap is not addressed in a timely manner, it may stifle the development of the OffW industry, particularly given the significant generation capacity of OEI. For OEI development, these issues are more pronounced because of the absence of existing transmission, much larger investment sizes, and requirement of additional anticipatory supply chain investments. While State REZ models may address these issues, they may not apply for OEI as REZ models are enabled via jurisdiction-based legislation (and may not apply in Commonwealth waters). However, we note section 248 of the OEI Act allows certain State or Territory laws to apply as laws of the Commonwealth in the included offshore area of that State or Territory as if that area were part of the Commonwealth.
Next steps	Potential reform options include: • **Extend relevant onshore region and pursue enabling legislation** (outlined in section 5.3.1). This option would enable State based regimes to apply in Commonwealth waters. • **Investigate bespoke planning and investment framework:** Noting unique OEI considerations, further analyses could consider the merit of bespoke planning and investment frameworks to facilitate concurrent investments in OEI. Stakeholders suggested that anticipatory investment frameworks should provide options rather than mandating a single approach. Any 'anticipatory or customer-funded investment' in offshore transmission should be coordinated with 'energy service agreement' funding arrangements (e.g. CIS, VRET, LTESA) that enable generation proponents to reach financial close.	

Note: [25] [26]

25 DCCEEW, Building an offshore wind industry, https://www.dcceew.gov.au/energy/renewable/offshore-wind/building-offshore-wind-industry.

26 EnergyCo, What's involved in a Renewable Energy Zone?, https://www.energyco.nsw.gov.au/renewable-energy-zones/whats-involved-renewable-energy-zone#coordinating-investment-and-infrastructure-projects.

5.6 Issue 4: Access rights may be needed to incentivise OffW developments

Network curtailment is a key risk and cost for developers, investors, and financiers. The open access regime under the NER creates uncertainty and could result in higher costs to customers (through risk adjusted bids) and/or dissuade investment. The greenfield nature of OEI developments presents an opportunity to consider a more suitable network access regime for OEI, including applying jurisdictional REZ access arrangements or developing a new bespoke framework.

5.6.1 Engage jurisdictions to determine the appropriate access regime for OEI and communicate this to stakeholders

Table 5.8: Stakeholders seek clarity on the applicable access regime for OEI and how multiple regimes may interact across jurisdictional boundaries (Issue 4.1)

Issue definition	Several access regimes operate alongside the NER's open access regime. These include special access regimes under the DNA framework and jurisdictional specific access regimes for REZs.[27] Stakeholders seek clarity on which regimes apply to OEI and how interfaces would be managed.	**Specific OEI considerations** • Multiple jurisdictions
NER context: Also an issue onshore?	**No**	Not an issue onshore.
Issue assessment	**Onshore challenge and OEI gap**	Currently, it is not clear what access regime would apply to offshore shared transmission assets. Current arrangements could expose shared transmission infrastructure to multiple access regime as transmission assets will span State and Commonwealth jurisdictional boundaries. It may be possible for onshore jurisdictional access regimes to be extended to offshore regions in the Commonwealth's jurisdiction to avoid shared transmission infrastructure becoming subject to multiple access regimes. This may require enabling legislation, although we note section 248 of the OEI Act allows certain State or Territory laws to apply as laws of the Commonwealth in the included offshore area of that State or Territory as if that area were part of the Commonwealth. This would need to be considered further in more detail. Additionally, under current arrangements, if a generator is outside the certain REZ boundaries (e.g., outside of CWO REZ in Commonwealth waters) it may be unable to connect to the REZ's network infrastructure.[28]
Next steps	Potential reform options include: • **Harmonise access regimes:** Engage Commonwealth and State Governments to clarify what access regime would apply to OEI and how differences between onshore and offshore access regimes can be harmonised and integrated to remove potential friction between access regimes. • **In collaboration with relevant Governments and entities, identify and communicate appropriate access right regime(s) that apply to OEI**	

Note: [27] [28]

27 See for example, NSW's physical access regime for the Central-West Orana REZ, NSW Government (2021) 'Access rights and scheme design: Central-West Orana paper'; Qld's proposed physical access regime, Queensland Government, (2021), 'Consultation on the model for QREZ design and access'; Victoria's proposed model under the Victorian Transmission Investment Framework, VicGrid, For industry, business and developers.

28 NSW Government, (2021), REZ access rights and scheme design: Central-West Orana.

5.6.2 Consider the suitability of a special access regime for OEI

Table 5.9: The open access regime may not be appropriate to manage investment risk in OEI (Issue 4.2)

Issue definition	Under the NEM's open access regime, generators can connect to the network anywhere they wish provided they meet the technical standards. If a generator connects to congested parts of the network then they have a greater chance of being curtailed, or of curtailing existing generators as a result of the dispatch process. In the context of offshore wind, where bespoke infrastructure is being built, largely on a spur basis, this approach may result in inefficient overbuilding of existing generation and in disorderly dispatch, where least cost generation is not dispatched first. Alternatives exist where generator connections may be coordinated, or where generators may be directed to connect to the network in specific locations chosen by others (as is the case with some REZs and potentially for OffW).		**Specific OEI considerations** • Planning and environmental
NER context: Also an issue onshore?	**No**	The current open access regime is clear onshore through the NER, noting that some jurisdictions have sought to modify these arrangements through their own REZ schemes.	
Issue assessment	**Optimise opportunity**	OffW generators may not have the opportunity to directly select their connection point and so may end up with a less preferential point. The greenfield nature of OEI provides an opportunity to consider a more suitable access regime that could involve applying jurisdictional REZ access arrangements or developing a bespoke access scheme, noting that the appropriateness of the access regime may depend on the nature of transmission infrastructure and asset configuration (e.g., radial or meshed transmission). When considering alternative regimes for OEI, it is noteworthy that currently no offshore generators and associated transmission assets exist, unlike onshore generation, and hence there are fewer constraints and less pressure to preserve existing rights/commercial positions when considering options.	
Next steps	Potential reform options include: • **Consider suitability of an alternative access regime for OEI:** This could consider the applicability of jurisdictional REZ schemes. Engage relevant jurisdictions to understand their connection point planning approaches and feasibility of REZ access regimes.		

5.7 Issue 5: Revise technical OEI considerations related to the connection process

Unlike typical onshore projects, OEI uses different technologies, typically has larger project sizes, and may be concentrated into specific parts of the network. In addition, if the OEI connection point is defined at the onshore substation, there is a long transmission cable between the actual generator and the connection point. The long transmission cable may impede the ability to meet technical performance requirements.

5.7.1 Undertake engineering review of existing technical standards and their appropriateness for OEI technologies

Table 5.10: OEI technical requirements should be reflected in connection standards and processes to the extent they are not already (Issue 5.1)

Issue definition	OEI utilises a range of technologies which are uncommon in the Australian energy system.[29] These include offshore HVDC converter stations and offshore DC reticulation networks with different operating characteristics and technical limitations to existing NEM technologies.	**Specific OEI considerations** • New technologies • Planning and environmental
NER context: **Also an issue onshore?**	**No**	OEI technologies are not used onshore and hence not an issue. However, there are ongoing reforms surrounding technical standards. AEMO has completed a review of access standards and provided AEMC with two rule change requests to amend access standards, including revising Schedule 5.3a of the NER making it applicable for all High Voltage Direct Current (HVDC) projects not just market NSPs. It is expected that further rule changes in this space may be lodged in future.
Issue assessment	**OEI gap**	OEI can potentially introduce a range of new technologies and greater generation scale, both of which, may impact power system security. For example, the cost-redundancy trade-offs may be different for OEI as transmission is far more expensive than for onshore renewables. This may suggest a different approach to network planning and/or adjustments to existing technical requirements. In addition, the proximity of a generator to its connection point can significantly affect its performance, particularly as offshore wind generation tends to be situated much farther from the existing shared network, often between 10-100km or more, and may utilise HVDC or High Voltage Alternating Current (HVAC) technology. The GPS typically expect that the generator is close to the connection point; a greater distance could make compliance with standards (which were drafted for onshore generators) overly difficult or expensive for offshore generators. Amendments to connection processes (under REZ schemes and potentially under the NER) and related technical standards may be required if OffW is connected under a REZ scheme. Our initial consultation with stakeholders suggest that REZ standards may not adequately cater for OffW technology. As such – if the REZ transmission operator and its remit extends offshore – technical standards for OffW would need to be developed.
Next steps	Potential reform options include: • **Conduct technical review of NER Chapter 5 for OEI:** To determine whether the connection processes and standards are appropriate for OEI and related technologies. This could be undertaken in concert with technical review suggested in section 6.3.1. We note that there are current rule changes lodged with the AEMC relating to such standards.	

Note: [29]

29 Specific OEI factors that impact connection access standard and power system security are explored further in Section 6, Power System Security.

5.7.2 Consider aggregated connection processes and performance standards at connection hubs

Table 5.11: Current connection processes and standards could be better optimised to support connection hubs (Issue 5.2)

Issue definition	Concentrating transmission cables through a hub may need the aggregated consideration of GPS and connection requirements as opposed to a focus on individual generator applications and requirements.	**Specific OEI considerations** • Planning and environmental • Multiple jurisdictions • New technologies
NER context: **Also an issue onshore?**	**No**	Not a pressing issue onshore. The CWO REZ in NSW has proposed hub processing models (e.g., 'batched' assessment studies) that aim to improve efficiency by addressing connection, limits and stability studies for all projects in one process.[30]
Issue assessment	**OEI gap**	In an OEI context, stakeholders have raised connection hubs as crucial to minimise environmental impact, through limiting the number of shore crossings.[31] There is a question as to whether these current arrangements are the most efficient ones for these hubs. The NER's generator connection process requires generators to achieve proposed individual performance standards. These standards can be impacted by nearby generators. Assessing individual performance standards is typically a sequential process currently (although there are some exceptions to this e.g. batched standards being considered through the NSW REZ). This can add to the length of the connection assessment timeframe, e.g. the assessment may need to be reworked to consider the performance of other generators. In comparison, the access arrangement for the CWO REZ seeks to encourage the efficient processing of many connections. This is achieved by the development of a REZ access standard and undertaking batch assessments to validate compliance of generators with the required access standard.[32]
Next steps	Potential reform options include: • **Review the merit of aggregated processes:** Consider reforms to connection processes and performance standards to better reflect constraints and considerations of OEI connection hubs, noting that AEMO, the Clean Energy Council, and industry are collaborating on improvements to the connection process via the Connections Reform Initiative (including batching).	

Note: [30] [31] [32]

30 Office of Energy and Climate Change, (2022), CWO REZ Access Rights and Scheme Design Positions Paper, https://www.energy.nsw.gov.au/sites/default/files/2022-08/cwo-rez-access-rights-and-scheme-design-positions-paper-220336.pdf.
31 VicGrid, (2024), Offshore Wind Transmission Gippsland Options Assessment Report, https://www.energy.vic.gov.au/ data/assets/pdf_file/0012/700221/Gippsland-options-assessment-report.pdf
32 AEMC, (2021), Integrating energy storage systems into the NEM, https://www.aemc.gov.au/rule-changes/integrating-energy-storage-systems-nem.

6 Power system security

This section explores potential issues that arise when the current power system security settings are applied to OEI (see Figure 6.1). Specifically, this section investigates how existing performance standards and requirements apply to OEI generators, and whether broader system-level settings would be appropriate in an offshore context.

Figure 6.1: Power system security chapter summary

FOCUS AREAS	KEY ISSUES		ISSUE TYPE	POTENTIAL NEXT STEPS
Section 6 Power system security	**Issue 6:** Consider optimising generator requirements	**6.1:** Existing system security and performance settings may require adjustments to enable new OffW technologies and network configuration	Potential OEI gap	Conduct technical review of performance requirements and technical standards for OEI context
	Issue 7: Revise system-level security settings to better support OEI	**7.1:** The relevant system security nodes are unclear in an offshore context	Potential OEI gap	Clarify Commonwealth waters will use the relevant onshore system security node or define a new node
		7.2: Without appropriate planning criteria, OffW may lead to a significant increase in the size of the largest credible contingency	Potential OEI gap	Review transmission planning criteria to optimise OffW connection cost and system security impact, congestion, and Frequency Control Ancillary Services
		7.3: OffW may attract high costs or curtailment to address system security impacts	Optimise opportunity	Consider whether special arrangements for OffW generation and system security costs are appropriate

6.1 OEI specific considerations

The arrangements governing OEI's power system security should account for its large-scale, and potentially concentrated connections into the shared network.

Table 6.1 outlines OEI specific considerations for power system security (compared to onshore developments).

Table 6.1: OEI specific power system security considerations

OEI considerations		Description
Project sizes and network configuration likely to significantly increase largest credible contingency	Asset scale (GW) Planning and environmental	OEI and offshore wind projects are likely to be large, GW-scale (e.g., Star of the South 2.2GW, Corio Generation 2.5GW) with the transmission cables connecting offshore wind providing little redundancy. A cable fault has the potential to disconnect a significant amount of generation thereby increasing the size of the largest generator contingency. The contingency size will depend on the size of the offshore wind farm, the design/configuration of the transmission connection and the utilisation of those connection assets. For example, a wind farm connected to the mainland grid by one or two subsea cables will preset a large contingency size than the same wind farm connected across a number of cables.

OEI considerations		Description
		The high cost of subsea cabling will drive higher capacity connections with fewer cables. If there is a single cable, the maximum contingency size will equal the generation capacity of the offshore wind farm. This is potentially far larger than the current largest credible contingencies in the NSW and VIC (750MW and 600MW respectively (Transgrid, AEMO)); and far larger than expected contingency size post-coal closures (~400MW).[33]
Many OffW connections may be concentrated into few points in the network - 'connection hubs'	Asset scale (GW) Planning and environmental	Further to the above, multiple offshore wind projects may be concentrated into few points in the network. States have signalled an interest in concentrating OffW connections into 'hubs' – for social licence, cost, and environmental benefits.
New technologies and operating characteristics: e.g., HVDC, subsea cables and floating substations, etc.	New technologies	Depending on the technical design and cost optimisation, OffW may use HVDC. There are currently a limited number of HVDC transmission projects in Australia. The only existing subsea HVDC project is a Market Network Service Provider (e.g. Basslink). HVDC has not been used for any generator connections in Australia. OffW is also likely to require platform/floating transmission substations and converter stations which are not used on any Australian transmission network. Additionally, as offshore technologies are expensive, the cost of connection for OffW generators is much larger than onshore.
No existing transmission planning criteria for OEI	New technologies Multiple jurisdictions Planning and environmental	Unlike land-based REZ connections, there is no defined transmission planning criteria for OEI. For example, the CWO REZ transmission is effectively planned to N-1 and N-1-1 secure criteria. This approach leads to double circuit transmission lines, providing redundancy. The additional costs of double circuits for subsea cabling may be uneconomic (as subsea transmission costs are far higher than overhead transmission lines), hence different planning criteria may be appropriate.

Note: [33]

33 Based on NSW generation capacities currently reported by AEMO AEMO | Generation information. Although the CWO REZ is anticipated to connect over 4500MW of generation, each generator connection is likely be designed to not exceed the largest generator contingency size and thereby avoid the risk of incurring addition FCAS charges. The additional connection equipment required to maintain a circa 400 MW contingency size would not significantly increase the costs for a large onshore windfarm.

6.2 How existing arrangements might apply to OEI

6.2.1 Existing arrangements for power system security could be extended to OEI, but there are some gaps that need to be addressed

The following summarises existing arrangements for the market and system operator, NSP, and generator requirements, including AEMO's and TNSPs' roles in the onshore context, and the implications of extending their responsibilities to the offshore context.

AEMO's responsibility for system security would extend to OEI where it connects to the national grid

The technology used to connect OffW will influence how OffW impacts NEM power system security. HVDC technology using Voltage Source Converters has the potential to somewhat decouple the offshore transmission from the onshore NEM transmission system.

If existing power system security arrangements were to be extended to OEI, AEMO would need to consider the transmission technology in defining the actions required to manage the system security impacts of offshore wind. OffW generators may require different standards because of the technology used and how transmission and generation assets are planned in offshore waters.

AEMO would collaborate with NSPs to, amongst many other activities:

- **Determine appropriate system strength requirements** for offshore assets including system strength and inertia requirements, schemes, and cost recovery mechanisms, which may need to be extended.
- **Manage inertia.** Offshore wind may increase the size of the largest credible contingency. If so, this will increase Rate of Change of Frequency risks. Additionally, OffW will likely displace synchronous generation and hence will indirectly reduce inertia in the power system.
- **Identify Network Support and Control Ancillary Services (NSCAS) and System restart ancillary services (SRAS) needs.**

AEMO would also need to extend existing forecasting capabilities to include offshore weather and wind speeds to support planning activities.

TNSPs are responsible for remediating system security issues, and may be required to do so for OEI

TNSPs are currently responsible for addressing any declared gaps or shortfalls in system security and providing AEMO with details of their proposed remediation activities.

If existing power system security arrangements were to be extended to OEI, the remit of system strength and inertia schemes would need to be extended to enable TNSPs to support OffW. This would require system strength nodes and System Strength Service Providers (SSSP) to be identified.

In the offshore context, the responsibilities of NSPs may depend on the regulatory classification of the asset (e.g., DCA, DNA, or shared network). If the asset is operated by the NSP, then it must meet requirements outlined by AEMO and the NER, such as:

- **Network Performance Requirements**[34] (including contingency event response requirements).
- **Performance requirements for HVDC.**[35]
- **Notify and coordinate outages** with AEMO.
- **Provide technical operation limits** of transmission to AEMO so it can outline its technical envelope.

Various regulatory issues and opportunities arise with these requirements for OffW, which are discussed in issues canvassed in Sections 5 and 6.

34 NER Schedule 5.1

35 NER Schedule 5.3a

OffW generators will need to meet requirements and standards

Offshore wind generators must comply with requirements and standards outlined in the NER, ensuring their operations are consistent with performance agreements and network performance obligations for system security and power quality. These requirements are imposed through:

1. **Generator Performance Requirements**[36] which must lie between the minimum and automatic standards and must be agreed between the Generator, the NSP and AEMO.
2. **Connection agreement:** Negotiated and agreed with the relevant NSP.

If existing power system security arrangements were to be extended to OEI, OffW generators would have a general requirement to 'do no harm' to the system. This can be achieved through the design of the generating system or by procuring services from third parties, such as system strength services from a SSSP.

However, large offshore wind projects may increase the size of the largest contingency in the NEM, which may significantly increase the cost of system security services to mitigate and/or respond to contingency events. It may be necessary to consider whether special arrangements for OffW generation and system security costs are appropriate.

6.3 Issue 6: Consider optimising generator requirements

OffW generators may require different standards because of the technology used and how transmission and generation assets are planned in offshore waters.

6.3.1 Conduct technical review of performance requirements and technical standards for OEI context

Table 6.2: Existing system security and performance settings may require adjustments to enable new OffW technologies and network configuration

Issue definition	Current performance requirements may not consider OffW technologies (e.g., the use of HVDC transmission projects, DC-to-AC converters, assets on platforms etc). The majority of generators in the NEM are connected to the transmission network via an AC connection. Australia's use of HVDC's is generally limited to the interconnector projects of which Basslink is the only undersea link. The other two HVDC projects are Murraylink and the Terranora interconnector.[37]	**Specific OEI considerations** • New technologies • Planning and environmental
NER context: **Also an issue onshore?**	**No**	Subsea technologies and configuration are not an issue onshore. AEMO has completed a review of access standards which includes revising Schedule 5.3a of the NER to be applicable for all HVDC projects not just Market Network Service Providers. This proposed revision would potentially allow Schedule 5.3a of the NER to be applied to HVDC transmission connecting OffW. AEMO has also submitted a rule change request to the AEMC on proposed changes to access standards but these have not been reviewed in the context of OEI.

36 NER Schedule 5.2

Issue assessment	**Potential OEI gap**	It is unclear whether there are clear gaps or an optimisation opportunity prior to a detailed engineering review. The existing NEM access standards are relatively flexible and broad. Notwithstanding this, historically existing NEM standards were developed for asynchronous generators with relatively limited consideration for the interaction of HVDC with generation as a DNA or a shared network asset. A review of requirements for DC connection points may be required depending on the design of the offshore network (i.e. in an offshore DC reticulation network). For example, while AEMO has proposed in its rule change request to the AEMC that Schedule 5.3a of the NER could be revised to apply to all HVDC projects, those proposed revisions did not consider changes to the HVDC performance requirements to align with those in Schedule 5.2 of the NER. The performance standards specified in Schedule 5.2 of the NER would apply for OffW connected via a HVAC connection. This introduces the potential for different OffW performance standards depending on the transmission technology utilised (i.e. if there is an offshore DC reticulation network). Currently, ride through requirements are not consistent for HVDC and HVAC. Additionally, the process for defining performance standards may need to be amended to allow for performance standards to be developed efficiently for offshore generators that connect at a 'connection hub' (if such arrangements were incorporated into the NER).
Next steps	Potential reform options include: • **Undertake technical engineering review for offshore technologies:** Review current performance standards and technical requirements to determine appropriateness for OEI technologies. • **Consider aggregated connection process reforms for OEI:** Further analyses should investigate the merits of revised arrangements to connection processes and performance standards for connection hubs for OEI.	

Note: [37]

6.4 Issue 7: Revise system-level security settings to better support OEI

The framework for managing system strength in the NEM relies on a TNSP being allocated as the SSSP for system strength nodes in their region of the NEM. It is currently unclear which TNSP would be allocated the SSSP role for OffW.

Similar to REZs, OEI may have large capacities of generation concentrated into a few points in the network. Unlike onshore REZs, the high cost of subsea transmission means it is unlikely that the transmission network connecting OffW will be planned to the same N-1 secure standard. This may cause larger contingency events and require additional system security responses and/or revised settings.

37 AEMO (2017), Interconnector capabilities, https://www.aemo.com.au/-/media/Files/Electricity/NEM/Security_and_Reliability/Congestion-Information/2017/Interconnector-Capabilities.pdf

6.4.1 Clarify Commonwealth waters will use the relevant onshore system security node, or define a new node

Table 6.3: The relevant system security nodes are unclear in an offshore context (Issue 7.1)

Issue definition	SSSPs must maintain minimum three phase fault level standards for 'system strength nodes' within their region.[38] These nodes are bound by NEM regions and, as outlined section 5.3.1, OEI may sit within Commonwealth waters, which are not within any current NEM region.		**Specific OEI considerations** • Planning and environmental • Multiple jurisdictions
NER context: **Also an issue onshore?**	**No**	System strength nodes and relevant regions are well defined onshore.	
Issue assessment	**Potential OEI gap**	The system strength node in the Commonwealth waters is not currently defined. If new system strength node(s) are defined in the Commonwealth waters, it may be difficult to determine the correct fault level node depending on the offshore network configuration. It would also be hard to identify the SSSP, which is defined as the region's JPB. As highlighted in section 5.3.2, the JPB in the Commonwealth waters is unclear.	
Next steps	Potential reform options include: • **Extend NEM regions offshore:** So that OffW can be associated to onshore system strength nodes. • **Define region(s) in Commonwealth waters and then identify JPB and new system strength nodes in this region.**		

Note: [38]

6.4.2 Review transmission planning criteria to optimise OffW connection cost and system security impact, congestion, and frequency control ancillary services (FCAS)

Table 6.4: Without appropriate planning criteria, offshore wind generation may lead to a significant increase in the size of the largest credible contingency (Issue 7.2)

Issue definition	Transmission planning criteria have not been defined for offshore transmission networks.		**Specific OEI considerations** • Planning and environmental • Asset scale (GW)
NER context: **Also an issue onshore?**	**No**	This is not an issue onshore. Transmission planning is in line with N-1 and N-1-1 criteria.	

38 NER Rule 5.20C.1; AEMC, 2022, System Strength Requirements Methodology, https://aemo.com.au/-/media/files/electricity/nem/security_and_reliability/system-strength-requirements/system-strength-requirements-methodology.pdf.

Issue assessment	**Potential OEI gap**	An appropriate transmission planning criteria is critical to ensure the transmission network is planned so that it provides sufficient capacity to facilitate secure operation of the power system. With the retirement of coal fired generation expected over the next ten years, there is likely to be a significant reduction in the level of dispatchable generation available to respond to contingency events. This increases the importance of setting an appropriate transmission planning criteria which in turn will prevent planning transmission networks that allow contingencies that are too big and threaten power system security. In the UK the planning criteria is specified in the System Quality of Supply Standard.[39] That standard includes a limit on the maximum generator contingency size. In the NEM the frequency operating standard for Tasmania also places a limit on the maximum contingency size. Also, increasing the size of the largest credible contingency may lead to system operation challenges (for example, the effective real- time co-optimisation of FCAS services and generation dispatch which is typically used by AEMO when FCAS services are scarce but may be used more frequently into the future).
Next steps	Potential reform options include: • **Review the planning criteria for the transmission network:** The review should assess the economic impacts of limiting the contingency size of OEI against the potential system security impacts and the potential costs of congestion and FCAS. • **Consider the feasibility of special protection schemes**.	

Note: [39]

6.4.3 Consider whether special arrangements for OffW generation and system security costs are appropriate

Table 6.5: OffW may attract high costs or curtailment to address system security impacts (Issue 7.3)

Issue definition	Large offshore wind projects may increase the size of the largest contingency in the NEM. If they do, this will increase the cost of system security services to mitigate and/or respond to contingency events. The impact of these system costs may result in: • Additional costs to OffW generators: Under the causer-pays framework for recovering costs for FCAS may fall to OffW generators. • OffW Curtailment: OffW may be curtailed by the system operator during dispatch optimisation as it has the potential to increase the size of the largest system contingency.	**Specific OEI considerations** • Planning and environmental • Asset scale (GW)

39 National Grid ESO, Security and Quality of Supply Standard (SQSS), www.nationalgrideso.com%2Findustry-information%2Fcodes%2Fsecurity-and-quality-supply-standard-sqss&usg=AOvVaw1A4zkxyOyy0uetUHiBeVaR&opi=89978449

NER context: **Also an issue onshore?**	**No**	The FCAS cost recovery model and other existing system strength and inertia services works appropriately onshore. There is currently a pending rule change request that seeks to charge larger generators the additional costs of procuring greater volumes of FCAS that are to manage system security should they have a sudden unexpected outage.[40]
Issue assessment	**Optimise opportunity**	The fundamental principle of 'causer pays' continues to remain relevant for OEI. However, in the context of pressing decarbonisation targets and high-levels of government support and subsidy for OEI projects in the near term, alternate system security responses and/or cost recovery approaches may wish to be considered to reduce costs to generate and/or curtailment of OffW. This should also be coupled with consideration of the appropriate planning criteria for the offshore transmission assets.
Next steps	Potential reform options include: • **Investigate effectiveness of scaling system security regimes to OffW:** Are there alternate approaches and/or cost recovery models that are more effective? • **Investigate the feasibility of a bespoke system security framework:** Stakeholders suggested amending the current system security framework to be more tailored in certain instances for OffW, e.g. to consider larger contingencies. This could be considered as analogous to having a different frequency operating standard for Tasmania. Onshore frameworks are seen as limited because they impose system security requirements tailored to onshore projects which may not suit the unique risks nor recognise the unique characteristics of OffW. Some existing onshore frameworks, such as system strength, are seen as creating prohibitive restrictions for OffW projects without mitigating the specific risks OffW projects present.	

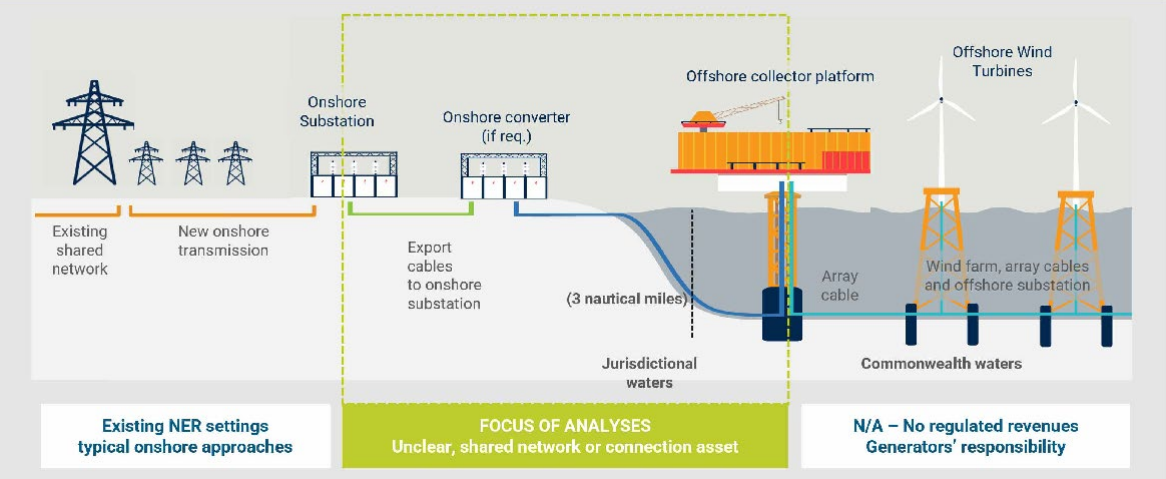
Note: [40]

40 AEMC, (2023), Allocating contingency FCAS costs, https://www.aemc.gov.au/rule-changes/allocating-contingency-fcas-costs.

7 Network economic regulation

This section explores potential issues that arise when the current network economic regulation arrangements are applied to OEI - see Figure 7.1 below. Specifically, this section investigates how well the network economic regulation framework for transmission would apply in an offshore context to shared transmission in State and Commonwealth waters – in the case transmission assets were not generator connection assets.

Figure 7.1: Overview of OEI assets for network economic regulation context (illustrative)



This section identifies and explores two key issues for OEI network economic regulation, summarised below.

Figure 7.2: Network economic regulation chapter summary

FOCUS AREAS	KEY ISSUES		ISSUE TYPE	POTENTIAL NEXT STEPS
Section 7 Network economic regulation	**Issue 8:** Clarify regulatory boundaries for OffW activities	**8.1:** Stakeholders are uncertain as to which regulators oversee which activities and which regulatory frameworks apply	**OEI gap**	Regulatory roles in Commonwealth waters and at jurisdictional interfaces should be clarified
		8.2: Stakeholders are seeking clarity as to which economic regulation regimes may be applied to OEI	**OEI gap**	Communicate the general principle of harmonising onshore and offshore regulatory arrangements
	Issue 9: Clarify the regulatory settings to apply to OEI	Adopting onshore settings may not optimise NEO due to OEI's specific characteristics	**Optimise opportunity**	Consider future regime optimisation commensurate to OffW industry certainty and scale

7.1 Specific OEI considerations

Table 7.1 outlines considerations that relate specifically to the network economic regulation of OEI when compared to onshore transmission.

Table 7.1: OEI related network economic regulation considerations

OEI considerations		Description
Potentially very large-scale, greenfield asset development	Asset scale (GW) Investment scale ($) Industry maturity	The scale of generation (and the capital investment) in OEI is *generally* higher than onshore, and more akin to large, concentrated REZs. OEI is greenfield as there are no existing OEI assets in Australia. Internationally, bespoke regimes to oversee greenfield OEI development have been developed. For example, the Offshore Transmission Owner (OFTO) regime was developed in the UK to create a new asset class investment opportunity, attracting cheaper costs of capital than would have otherwise been used to finance the infrastructure.
Technical complexity and specific skill sets	New technologies	Depending on the technical design and configurations, OEI may use HVDC backbones and DC reticulated networks to connect OffW developments. These technologies are expensive and have not been used for any generator connections in Australia. The technology, construction, and operation processes are new to Australia. For example, not all TNSPs/Planners may have the capability, or interest, to build, own, operate, and maintain OEI technologies.
Interface and coordination of multiple regulatory regimes	Multiple jurisdictions	Transmission assets will be built across multiple jurisdictions: State and Territory ('State') land, State waters and Commonwealth waters. The Commonwealth/State water boundary is unique and may give rise to regulatory interface challenges.

7.2 How existing arrangements might apply to OEI

There are several onshore network economic regulation arrangements that could be applied to offshore electricity transmission. Figure 7.3 summarises onshore transmission asset types and their regulatory arrangements, detailing roles in ownership, design and construction, operation and maintenance, funding models, and access regimes. This table also outlines when each regime may be applied to offshore transmission projects.

Figure 7.3 Onshore transmission ownership and cost recovery arrangements summary

Asset type	Regime	Need identification	Ownership	Design and construction	Operates and maintains	Funding model	Access regimes	How the regime might apply to offshore transmission?
Generator asset	Dedicated connection asset (DCA)	Proponent	Any party	Any party; Contestable	Any party (including PTNSPs, generators)	Third party-funded/ Connecting parties	Private asset	Outside of Victoria, this applies when the generator connection asset route length less than 30km. *DCA framework does not apply in Victorian waters*
Shared network asset	Designated network asset (DNA)	Proponent	Any party	Any party; Contestable	Relevant TNSP	Third party-funded/ Connecting parties	Special third-party access regime	Outside of Victoria, this applies when the OffW developer identifies and pursues project and the following conditions are met: • Radial asset, separable from the shared network; and • Route length of 30km or more; or the framework is voluntarily opted into. *DNA framework does not apply in Victorian waters*
	Shared network	TNSP or AEMO	TNSP	Any party; Contestable	TNSP	Consumer funded (TUOS charges)	NEM open access regime	AEMO identifies offshore shared transmission as an actionable or future ISP project. AEMO develops Optimal Development Path • Jurisdictional planners identify projects • Project goes through RIT-T process
	Funded augmentation	Proponent	TNSP	TNSP; Not contestable	TNSP	Third party-funded	NEM open access regime	This will apply when the proponent identifies and funds shared transmission extension. This will be delivered by the PTNSP.
Alternate Jurisdiction approaches	NSW REZs: Electricity Infrastructure Roadmap Framework	Infrastructure Planner (EnergyCo; within declared REZs)	REZ Network operator/s (appointed by EnergyCo)	REZ Network operator/s (appointed by EnergyCo); Not contestable	REZ Network operator/s (appointed by EnergyCo)	Consumer funded	REZ-specific access regime (physical access regime)	These regimes are unlikely to apply offshore under current legislative settings. This may be because the legislation is limited to the State jurisdiction - for example, the NSW legislation provides for REZs to be declared in specified geographical areas of the State. We note section 248 of the OEI Act allows certain State or Territory laws to apply as laws of the Commonwealth in the included offshore area of that State or Territory as if that area were part of the Commonwealth. Whether this allows State-based schemes to apply in Commonwealth waters would need to be considered further.
	VIC REZs: Victorian Transmission Investment Framework	VicGrid (within declared REZs)	Under consideration	Under consideration	Under consideration	Under consideration	REZ-specific access regime	

7.3 Issue 8: Clarify regulatory boundaries for OffW activities

The NER and associated regulatory regimes were not drafted with consideration of OffW and associated OEI, nor with generation in Commonwealth waters, resulting in uncertainty as to how OEI assets are regulated and who should be the regulator.

7.3.1 Regulatory roles in Commonwealth waters and at jurisdictional interfaces should be clarified

Table 7.2: Stakeholders are uncertain as to which regulators oversee which activities and which regulatory frameworks apply (Issue 8.1)

Issue definition	OEI will span Commonwealth and State jurisdictions. The areas of concurrent and exclusive regulatory responsibility between the Commonwealth and States are unclear and untested (i.e., there is no existing OffW developments).	**Specific OEI considerations** • Multiple jurisdictions • Supply chain requirements
NER context: **Also an issue onshore?**	**No**	Not an issue onshore
Issue assessment	**OEI gap**	This issue encompasses several issues covered in other sections of this report. The issues arise from a lack of regulatory rules and uncertain regulatory responsibilities for offshore developments in Commonwealth waters, leading to ambiguous regulatory boundaries over onshore areas and State and Commonwealth waters. The complex intersection of regulatory responsibilities for Commonwealth and State entities is outlined in section 8.1. As the NEL applies in Commonwealth waters (see section 5.3.1), the Australian Energy Regulator's (AER's) functions extend over Commonwealth waters. We note the possible option for jurisdictional schemes to apply in Commonwealth waters under section 248 of the OEI Act, although this would need to be considered further.
Next steps	Clarifying the appropriate NEM region may alleviate many of these points of uncertainty (canvassed in section 5.3.1). Additional, potential reform options include: • **Engage relevant Commonwealth, State and Jurisdictional entities** to clarify unclear responsibilities with offshore transmission assets. See section 8.1 mapping of responsibilities.	

7.3.2 Communicate the general principle of harmonising onshore and offshore regulatory arrangements

Table 7.3: Stakeholders are seeking clarity as to which network economic regulation regimes may be applied to OEI (Issue 8.2)

Issue definition	Several network economic regulation regimes apply to onshore transmission, notably: Connection assets, Designated Network Assets, Shared network, and REZ models (see section 7.2) Stakeholders are seeking clarity about the applicable model(s) for OEI.		**Specific OEI considerations** • Multiple jurisdictions • Industry maturity
NER context: **Also an issue onshore?**	**No**	Not an issue onshore	
Issue assessment	**OEI gap**	Shared offshore transmission will not be financed and built until there is certainty about the network economic regulation regime – ownership, regulated revenues, cost recovery, etc. The AEMC's starting position for this early OEI work is to extend the NER to OEI and OffW to promote a consistent application of regulatory arrangements. Consequently, we have focussed on identifying NER gaps which, if addressed, would allow for a harmonised approach. If the NER is to apply, various issues concerning allocation of planning roles and responsibilities, identification of the relevant TNSP and definition of regions (covered in prior sections) must be settled. We note stakeholder views that onshore REZs have emerged as an effective model to coordinate and deliver concentrated renewable energy and transmission. A similar model may be needed for the offshore wind industry[41] (whether by extending existing State-based REZ models, or developing a new REZ model).	
Next steps	The AEMC's approach to extend the NER to OEI and OffW and seek harmonisation where possible could be communicated to stakeholders to improve certainty while specific NER gaps identified across this report are further analysed. Next steps to progress specific NER issues and gaps are included in other sections of this report.		

Note: [41]

7.4 Issue 9: Clarify the regulatory settings to apply to OEI

Current regulatory frameworks were designed for onshore infrastructure and extending current onshore regimes may not deliver optimal regulatory outcomes as OEI has a range of specific attributes and considerations (see section 7.1). Internationally, a range of different economic regulatory models have been developed specifically for OEI (e.g., UK OFTO model).42

41 AEMO, ISP update: Renewable Energy Zones, 2020, https://aemo.com.au/newsroom/news-updates/isp-rez
42 Ofgem (UK Energy Regulator), Offshore Electricity Transmission (OFTO), https://www.ofgem.gov.uk/energy-policy-and-regulation/policy-and-regulatory-programmes/offshore-electricity-transmission-ofto.

7.4.1 Consider future regime optimisation commensurate to OffW industry certainty and scale

Table 7.4: Adopting onshore settings may not optimise NEO due to OEI's specific characteristics

Issue definition	The network economic regulation framework for transmission was not drafted with the consideration of OEI. OEI has specific considerations that may warrant a different regulatory approach (compared to onshore developments) and simply extending the existing economic regulatory framework may not achieve the best outcomes in terms of cost-effectiveness for consumers and incentivise OffW investment.	**Specific OEI considerations** • Industry maturity • New technologies • Investment scale ($) • Asset scale (GW)
NER context: **Also an issue onshore?**	**No**	Not an issue onshore. The NER's investment tests ensure that network developments proceed only where there is a net present benefit to the market. Investors may fund network capacity, although there has been limited appetite to do so under the open access regime as there is no guarantee of their ability to use this capacity and when their competitors can use these assets without contributing to its costs.
Issue assessment	**Optimise opportunity**	Extending onshore regulatory treatments to OEI may not deliver optimal value for money for customers or timely investments (and related decarbonisation benefits). Bespoke regulatory treatments for offshore transmission have been observed internationally, suggesting an opportunity for Australia to leverage insights and lessons from international experience to develop tailored reforms for the Australian context. For example, the UK's OFTO model[43] enables developers to compete for the rights to own, operate, and finance offshore transmission infrastructure in exchange for a regulated revenue stream from the National Grid. While this has promoted competition and has attracted better costs of capital for offshore transmission projects in the UK, the model does not promote coordinated infrastructure development and the UK is investigating alternate models to deliver better coordination. Matters to consider for optimisation include: • **Competition and asset ownership:** Shared transmission is typically owned and operated by the relevant onshore TNSP (with exceptions). Improved value for money could be captured through a competitive process to allocate asset ownership (e.g., NSW REZ model). • **Cost of capital:** Attracting lower costs of capital through establishing a tailored OEI asset class regime (e.g., OFTO).
Next steps	The AEMC could investigate alternative network economic regulation approaches to cater for the unique characteristics of OffW (e.g. scale and cost). This could begin by exploring international models and lessons learnt.	

Note: [43]

43 Ofgem, Offshore Electricity Transmission (OFTO), https://www.ofgem.gov.uk/energy-policy-and-regulation/policy-and-regulatory-programmes/offshore-electricity-transmission-ofto.

8 Additional stakeholder-identified themes

This report has focused on identifying gaps and barriers in extending the NER (and related laws and frameworks) to OEI.

We have identified two additional areas that may have significant influence on the approval and likelihood of OEI and OffW projects. These are the: suite of regulatory frameworks and arrangements – beyond the NER – that affect the delivery of OEI and OffW projects; and, the system of stakeholder engagement approaches that are relevant to the approval of OEI and OffW projects.

This section provides some background and explores some of the current challenges that affect stakeholders in these areas. These areas are beyond the AEMC's remit; however there may be value in exploring solutions to these challenges, as addressing these issues will support simpler approvals and greater likelihood for OEI and OffW projects.

Note: The information set out in sections section 8.1 and section 8.2 below is not legal advice. It has been prepared based on a high-level review by consultants engaged by AEMC, of relevant legislation, regulations and policy statements. This review has been conducted for the purposes of identifying potential areas of overlap or duplication between regulatory schemes and stakeholder engagement arrangements. It has not been undertaken to, and does not, provide authoritative advice on the application of the various acts, regulations or other arrangements cited.

Stakeholders reviewing this section should use it as a reference point for their own experiences, and to highlight potential areas of overlap or duplication. It should not be used, or relied on, to provide guidance as to the application of any of the pieces of legislation, regulations or other schemes considered.

8.1 Regulatory responsibilities and coordination (beyond the NER) map

The regulation of OEI extends far beyond the scope of the NER and the jurisdiction of the AEMC. Deploying OEI and OffW requires a series of processes and activities that are subject to other sets of regulation. The roll out of OEI and OffW will necessitate multiple major infrastructure projects. Each of these projects will be subject to regulation in the areas of tenure, environmental, planning, cultural heritage, and Native Title. These areas are covered by sets of regulation that are beyond the scope of the AEMC to manage, but which may affect the actions or options of the AEMC and those of OEI and OffW proponents.

Regulation in each of these areas also experiences similar jurisdictional issues to energy network and market regulation. The Commonwealth legislates in each of these regulatory areas, as do the States. Regulation in each of these areas is further complicated as the regulatory boundaries of the Commonwealth and the States differ when considering projects which occur offshore.

While this overlap is not in-and-of-itself a barrier to OEI and OffW projects, it creates complexity for proponents in determining project approvals. Over time, it would be beneficial for there to be greater coordination between the Commonwealth and the States in each of these areas of regulation and oversight. In particular, where OEI or OffW projects are contemplated, determining a 'lead agency' for managing regulatory processes and approvals would help to streamline project delivery.

This section is structured to provide an understanding of the legislative boundaries related to OEI. It sets out definitions of the relevant terms and boundaries that may affect the operation of regulations. It maps the regulatory responsibilities of the Commonwealth and of Victoria as a representative state across five areas of regulation (environment and planning, cultural heritage

approvals, Native Title, tenure, and electricity laws). It then provides details of possible challenges for the AEMC and OEI and OffW proponents resulting from this mapping.

OEI regulation is complicated by geographical boundaries

The application of State and Commonwealth laws and regulations area is affected by geography. In an offshore context, distance from shore has a material effect on which laws apply, and the how State and Commonwealth legislation interacts. For the purposes of this section, definitions on key boundary terms relevant to the application of legislation have been established. A summary of Commonwealth guidance on the key terms used in this section is set out at Table 8.1.

Table 8.1: Definitions of mapping boundaries

Terms	Explanations
Nautical mile (M)	A unit of distance equal to 1852 metres or 1.852 kilometres. It is also the unit adopted for the purposes of Australian Maritime Legislation. Refer to Schedule 1 (1) of the Seas and Submerged Lands Act 1973 (Cth) as published in the Commonwealth of Australia Gazette No.S29, 9 February 1983.[44]
Territorial Sea Baseline (TSB)	The baseline is normally the low water mark (LWM).[45] The term refers to the line from which the seaward limits of Australia's Maritime Zones are measured.
Coastal Waters (3M)	The waters extending seaward for 3M from the TSB (or the LWM).[46]
Territorial Sea (12M)	A belt of water not exceeding 12M in width measured from the TSB (or the LWM).[47]
Contiguous Zone (24M)	A belt of water contiguous to the territorial sea, the outer limit of which does not exceed 24M from the TSB (or the LWM).[48]
Exclusive Economic Zone (EEZ) (200M)	An area beyond and adjacent to the territorial sea. The outer limit of the EEZ cannot exceed 200M from the baseline from which the breadth of TSB.[49]
Low Water Mark (LWM)	The lowest level reached by water in one tidal cycle also known as low tide.[50] The Local Government Act 1989 (Vic), section 3(3A)[51] states: *"if a boundary of a municipal district is described by reference to the seacoast (regardless of whether it is referred to as the Sea shore or the waters of the sea or a bay or in any other way) that boundary is to be taken to be the line for the time being of the Low Water Mark on that sea coast"*.
High Water Mark (HWM)	The highest level reached by water in one tidal cycle also known as high tide.[52]

Note: [44] [45] [46] [47] [48] [49] [50] [51] [52]

44 Commonwealth Government, Geoscience Australia, Maritime Boundary Definitions, 2023, https://www.ga.gov.au/scientific-topics/marine/jurisdiction/maritime-boundary-definitions.
45 Commonwealth Government, Attorney-General's Department, Offshore Constitutional Settlement, https://www.ag.gov.au/international-relations/international-law/offshore-constitutional-settlement.
46 Commonwealth Government, Geoscience Australia, Maritime Boundary Definitions, 2023, https://www.ga.gov.au/scientific-topics/marine/jurisdiction/maritime-boundary-definitions.
47 Ibid.
48 Ibid.
49 Ibid.
50 he Public Land Consultancy, A Report for the Victorian Environmental Assessment Council, 2019, https://www.veac.vic.gov.au/component/investigations/document/getDownload?fid=MzU2
51 Victorian Current Acts, Local Government Act 1989 – SECT3, https://www5.austlii.edu.au/au/legis/vic/consol_act/lga1989182/s3.html
52 Ibid.

OEI regulatory responsibilities vary based on these boundaries

Regulatory approvals from both the Commonwealth and State Governments are required for most aspects of projects to roll out OEI and OffW. Where aspects of these projects are delivered onshore, or within 3M from shore, approvals are required for environmental issues, native title matters and points of interface with the energy market. Tenure rights for projects are generally a State matter within 3M from shore, as are cultural heritage approvals. Beyond 3M from shore – extending through Commonwealth waters into Australia's EEZ – the Commonwealth has sole responsibility for each of these matters.

A high-level mapping of the responsibilities of each jurisdiction is set out at Table 8.2. This mapping covers the regulatory areas of: Environment and Planning laws, cultural heritage approvals, recognition and management of native title and granting of tenure rights for land for projects. This table outlines areas of overlap, as well as areas of sole State or Commonwealth responsibility.

Victoria has been used as an example jurisdiction for the purposes of mapping the role of State Governments. Victoria's approach was selected as it is broadly analogous to the approach taken in other jurisdictions. Victoria also represents a jurisdiction with a relatively mature consideration of the interaction points between its laws and those of the Commonwealth for the perspective of OEI and OffW. However, this table may not perfectly map areas of individual responsibility and overlap in other jurisdictions.

Table 8.2: Map of regulatory responsibilities

Boundary/ categories	Environment and Planning	Cultural heritage approvals	Native Title	Tenure
Inland	State and Commonwealth	State	State and Commonwealth	State
Mean HWM	State and Commonwealth	State	State and Commonwealth	State
Mean LWM (or TSB)	State and Commonwealth	State	State and Commonwealth	State
Coastal Waters (3M)	State and Commonwealth	State	State and Commonwealth	State
Territorial Sea (12M) or Commonwealth waters	Commonwealth	Commonwealth	Commonwealth	Commonwealth
Extra-Territorial Sea (12M+)	Commonwealth (up to the EEZ)[53]	Commonwealth (up to the 24M)[54]	Commonwealth (up to the EEZ)[55]	Commonwealth (up to EEZ)[56]

Note: [53] [54] [55] [56]

53 EPBC Act 1999 (Cth), Volume 1, Subdivision F- Marine environment. Section 24.

54 Underwater Cultural Heritage Act 2018 (Cth), Part 1, Division 1, 7 Extraterritorial operation of this Act.

55 Native Title Act 1993 (Cth), Part 1, 6 Application to external Territories, coastal sea and other waters.

56 Offshore Infrastructure Regulator, Legislative framework, OEI Act 2021 (Cth), Legislative framework | OIR

The current regulatory frameworks present challenges in terms of duplication and oversight

Successful OEI and OffW projects require regulatory certainty regarding land use and tenure, environmental approvals, cultural heritage and Native Title approvals, and access to the national energy grid and market. In each of these areas, both Commonwealth and State Government laws will impact projects. This is because OEI and OffW projects have an onshore, close offshore (within 3M) and far offshore (beyond 3M) aspect. In some cases, within 3M, there may be frameworks from two different jurisdictions operating in parallel.

Any duplication of regulatory regimes or regulatory oversight creates the risk of uncertainty for project proponents. This is because the approach taken by them to address the requirements of one jurisdiction or framework, may not address the requirements established over the same geographic area by another regulatory framework. For OEI and OffW projects, this is a particular challenge as they have significant exposure against each of the areas of regulation considered, across areas managed by both State and Commonwealth frameworks.

We understand that work has commenced to address this issue with respect to OEI licensing and associated regulation, with DCCEEW to consult with state governments about the application of laws to OEI projects in Commonwealth areas, and that the Major Projects Facilitation Agency is also providing support to licence holders who have been awarded major project status.

Addressing or managing this duplication is likely to require collaboration between the Commonwealth and State Governments. This coordination sits beyond the remit of the AEMC and could be achieved through the Energy and Climate Change Ministerial Council, supported by engagement between relevant officials/ working groups, committees. As one of the regulatory agencies that will engage with proponents for OEI and OffW projects, it is important for the AEMC to understand the broader regulatory landscape that proponents face. It is also in the interests of AEMC's broader regulatory objectives to ensure that proponents for OEI and OffW projects can simply and expeditiously address all relevant regulatory requirements.

8.2 Stakeholder engagement requirements map

OEI and OffW projects may have a significant effect on the people and communities that live adjacent to the waters they are built on and the onshore facilities that service them. Engaging with these people and communities is an important part of the successful roll out of OEI and OffW projects. Various points of consultation points by government and industry are required or expected throughout the process of developing an OEI or OffW project.

When delivered well, this consultation process provides valuable insights for proponents and government that can help shape the delivery of OEI or OffW projects. However, when it is not managed well, there is the potential for communities to be under- or over-consulted.

This section outlines a range of the requirements established for consultation in the context of OEI and OffW, it also highlights pain points raised by stakeholders who have experienced this process in the past.

The development of offshore wind infrastructure involves engagement with community stakeholders at every stage of the end-to-end process

The development of an offshore wind industry in Australia depends on the ability of government and industry proponents to build social licence. Building social licence is primarily achieved through effective and appropriate engagement with affected stakeholder groups and communities. Both Government and Industry groups must be involved in this process. However, excessive, uncoordinated, or otherwise unstructured consultations, can result in a poor experience for stakeholders.

A mapping of stakeholder engagement requirements for major offshore projects in Australia highlights multiple required points of engagement, occurring over many years. In addition, government and industry groups also choose to engage beyond these required points to collect additional insights and build relationships. Parties undertaking stakeholder engagement activities are doing so in their own capacity – these efforts are rarely coordinated with others, and may occur without any awareness of engagements that have occurred previously.

Parties engaged in these meetings often include: Traditional Owners and other First Nations communities with connection to the lands or waters under development; other community groups such as local residents and environmental organisations; and, commercial groups with interests in areas affected by OEI or OffW development.

We understand that the Commonwealth is working through several initiatives to better engage with stakeholders, including reviewing its approach to community consultation (as obligated under the OEI Act), as well as developing frameworks which ensure that proponents engage effectively with stakeholders.

Government and industry proponents share the responsibility of engaging with community stakeholders from the pre-declaration phase to the decommissioning phase of offshore wind development. The Commonwealth Government is required to lead public consultation before an OffW zone is declared. Thereafter, it is the responsibility of industry proponents to conduct community engagement during the feasibility testing, planning, commercial licencing, construction, operation, and decommissioning phases of OffW development.

A high-level mapping of the required and voluntary consultation activities is laid out in Figure 8.1; with pain points raised in limited, initial stakeholder consultation set out in Figure 8.2. The map also references government guidelines on best practice for community engagement, development of benefit sharing strategies, and culturally considered consultation with First Nations peoples in the context of renewable energy projects.

Figure 8.1: Mapping of stakeholder engagement

PHASE	Phase 1: Pre-declaration	Phase 2: Feasibility and planning	Phase 3: Commercial licence and construction	Phase 4: Operation	Phase 5: Decommissioning
	10-15 years before operations	5-10 years before operations	0-5 years before operations	Approx. 30 years of operation	30-35 years after operations
PHASE SUMMARY	This phase involves evaluating the potential suitability of sites for offshore wind development, including initial stakeholder and community consultations to identify and address early-stage environmental, social, and economic considerations.	In this phase, extensive consultations are carried out, gathering detailed data on the identified sites to assess technical feasibility and environmental impacts, and to engage with communities and stakeholders about the proposed development.	In this stage, developers secure commercial licences and undertake the construction of the wind facilities, engaging with stakeholders and communities throughout to mitigate concerns, manage impacts, and optimise the development's benefits for local communities.	Once operational, the project requires ongoing engagement with stakeholders and the community to ensure the project adheres to regulations, operates efficiently, and maintains community support, contributing to a sustainable social licence over the long term.	The final phase, decommissioning, necessitates collaboration with stakeholders and the community to manage the cessation of operations in a manner that minimises environmental impacts and considers the socio-economic implications for the community.
ACTORS	**Industry proponents, Commercial groups, Traditional Owner groups and Community groups**				
	• Commonwealth Government • State Government • Transmission network service providers	• Commonwealth Government • State Government • Transmission network service providers • Regulators (e.g., environmental, planning, cultural heritage)	• Commonwealth Government • State Government • Transmission network service providers	• State Government	• Commonwealth Government • State Government
ENGAGEMENT Government-led [G] Proponent-led [P]	**Required consultation** • Public submissions are open for at least 60 days [G] • Public information sessions [G] • Engagement with communities and other stakeholders in the region [G] **Voluntary consultation** Proponents may engage with community as part of early investigations [P]	**Required consultation** • After a licence is granted, proponents must consult with users of the area who may be directly impacted by OffW development [P] • Engage with Traditional Owner groups [P] • Develop a Management Plan with stakeholder input to address community concerns [P]	**Required consultation** Proponents must also engage during the development of the project's management plan for a commercial licence. [P] **Voluntary consultation** Community stakeholders can provide specific feedback to proponents throughout the construction process, including in the form of urgent and emergency complaints [P]	**Required consultation** Management Plans must be reviewed and approved by the Offshore Infrastructure Regulator every 5 years. Also proponents will be required to publish, and engage in line with, a stakeholder engagement strategy [P] *As the industry develops in Australia, it will be necessary to establish other processes for engagement to maintain social license during operation. New regulations are currently being developed and are expected to be made later this year.*	*As the industry develops in Australia, it will be necessary to establish processes for engagement to manage environmental and socio-economic issues during decommissioning.*

PHASE	Phase 1: Pre-declaration	Phase 2: Feasibility and planning	Phase 3: Commercial licence and construction	Phase 4: Operation	Phase 5: Decommissioning
Guidelines		**Voluntary consultation** • Develop a Community Benefit Plan with stakeholder input to address local priorities for enhanced community benefits [P] • Establish a Community Consultative Committee to meet at critical stages of project development [P]			
	Community Engagement and Benefit Sharing • ECMC – Community engagement and benefits for electricity transmission projects (these guidelines set expectations for effective and responsible community engagement by transmission developers when undertaking new transmission projects). • AEIC - Considerations for Offshore Wind Industry on Community Engagement (a practical resource which provides key considerations on effective community engagement for use by offshore wind industry proponents and major stakeholders) • Clean Energy Council - A Guide to Benefit Sharing Options for Renewable Energy Projects (a practical tool to assist project proponents, financiers, policy makers and communities in understanding the range of benefit sharing methods available, and guidance on how to develop an effective benefit sharing strategy through robust community engagement) • Victoria DEECA - Community Engagement and Benefit Sharing in Renewable Energy Development in Victoria (sets the Victorian Government's expectations for leading practice community engagement and benefit sharing across all renewable energy technologies) • Renewables, Climate and Future Industries Tasmania - Guideline for Community Engagement, Benefit Sharing and Local Procurement (sets out what is meant by social licence to operate and provides principles and practical questions to guide the process and key outcomes sought for community engagement, benefit sharing and local procurement)				
	First Nations Engagement • Clean Energy Council - Leading Practice Principles: First Nations and Renewable Energy Projects (a leading practice guide for engaging with Australia's First Nations peoples on renewable energy projects) • NSW Office of Energy and Climate Change - NSW Electricity Infrastructure Roadmap: First Nations Guidelines (a resource to set out the expectations for increasing employment and income opportunities for First Nations communities in the construction and operation of new electricity infrastructure projects in NSW) • NSW Office of Energy and Climate Change - region-specific Guidelines for First Nations engagement in the Central-West Orana REZ, Hunter-Central Coast REZ and South West REZ (outline the local Aboriginal communities' goals and aspirations for income and employment opportunities, as well as their preferred method of engagement with Roadmap project proponents and Government)				

Figure 8.2: Map of pain points in community engagement for the OEI sector

PHASE	Phase 1: Pre-declaration	Phase 2: Feasibility and planning	Phase 3: Commercial licence and construction	Phase 4: Operation	Phase 5: Decommissioning
	10-15 years before operations	5-10 years before operations	0-5 years before operations	Approx. 30 years of operation	30-35 years after operations
PAIN POINTS (based on stakeholder feedback)	Consulting at the wrong time can cause confusion in the community about the process stage and may lead to distrust towards industry and government. Proponents should not pre-empt the declaration process and consult with communities before a zone is declared. Some communities may be unfamiliar with the offshore regulatory process and may conflate industry consultation with government consultation. There is a lack of clarity on the roles of government and industry in engaging with community and building social licence. This may lead to duplication of engagement between government and industry. There is a lack of transparency in the site selection process, from the perspective of community. Inconsistent messaging on what offshore wind is and the infrastructure that is required can create confusion at this early stage.	Stakeholders may feel overwhelmed by the volume of engagement required of them by various industry proponents and government agencies, resulting in engagement fatigue. This can lead to lower response rates and, in time, may result in engaging only with those stakeholders that are either strongly supportive or strongly opposed. The level and nature of community engagement may not always be appropriate for the context and scale of the project, including the social context of the region. There may be a lack of coordination between proponents in instances where multiple developers are prospecting the same area, resulting in duplication of engagement between developers. There may also be duplication of engagement between phases of the development, as the input of the same stakeholders is required across multiple stages of the approval and project planning process. The cumulative impacts of multiple developments may not be adequately considered. Engagement with stakeholders may not 'empower' community groups or involve collaboration in the development of social licence strategies (e.g., in benefit sharing arrangements)	Where multiple developers are constructing projects in the area at the same time, a lack of coordination between proponents may result in duplication of efforts in identifying and resolving construction impacts and issues (e.g., road access, sea channel blockages, accommodation).	The operation and decommissioning stages of an offshore wind project are a long way away for any offshore developments in Australia. There is expected to be less impact and disruption during these phases, and therefore less requirement for consultation of stakeholders.	

Abbreviations

AC	Alternating Current
AEMA	Australian Energy Market Agreement 2004
AEMC	Australian Energy Market Commission
AEMO	Australian Energy Market Operator
AER	Australian Energy Regulator
CEC	Clean Energy Council
CHMP	Cultural Heritage Management Plan
COGATI review	Coordination of General and Transmission Investment review
CSIRO	Commonwealth Scientific and Industrial Research Organisation
Cth	Commonwealth
CWO REZ	Central-West Orana Renewable Energy Zone
DC	Direct Current
DCA	Dedicated Connection Asset
DCCEEW	Department of Climate Change, Energy, the Environment and Water (Cth)
DEECA	Department of Energy, Environment and Climate Action (Vic)
DNA	Dedicated Network Assets
EES	Environment effects statement
EEZ	Exclusive Economic Zone
EII Act	Electricity Infrastructure Investment Act 2020 (NSW)
FCAS	Frequency Control Ancillary Services
GPS	Generator Performance Standards
GW	Gigawatt(s)
HVAC	High Voltage Alternating Current
HVDC	High Voltage Direct Current
HWM	High Water Mark
ISP	Integrated System Plan
JPB	Jurisdictional Planning Body
LCOE	Levelised Cost of Energy
LWM	Low Water Mark
M	Nautical Mile
MW	Megawatt(s)
MLF	Marginal Loss Factor
NEL	National Electricity Law
NEM	National Electricity Market
NEO	National Electricity Objectives
NER	National Electricity Rules
NEVA	National Electricity (Victoria) Act 2005
NOPSEMA	National Offshore Petroleum Safety and Environmental

	Management Authority (Cth)
NSCAS	Network support and control ancillary services
NSP	Network service provider
NSW	New South Wales
NWQ	North West Queensland
OEI	Offshore electricity infrastructure
OffW	Offshore wind
OFTO	Offshore Transmission Owner
PTNSP	Primary transmission network service provider
QLD	Queensland
REZ	Renewable Energy Zone
RIT-T	Regulatory Investment Test for Transmission
SSSP	System Strength Service Provider
State	State and Territory
TNSP	Transmission network service provider
TSB	Territorial Sea Baseline
TUOS charges	Transmission Use of System charges
UK	United Kingdom
VIC	Victoria
WACC	Weighted average cost of capital